STATE OF KANSAS
DEPARTMENT OF HEALTH AND ENVIRONMENT
DIVISION OF ENVIRONMENT

Hazardous Waste Management Facility Permit

In accordance with the provisions of Kansas Statutes Annotated (K.S.A.) 65-3430 et seq. permission is hereby granted for hazardous waste storage and treatment in containers, tanks, and corrective action for Solid Waste Management Units and Areas of Concern to:

Facility Name: Ash Grove Cement Company
Facility Operator: Ash Grove Cement Company
Facility Owner: Ash Grove Cement Company
Facility Location: 1801 North Santa Fe Street
Chanute, Kansas 66720

EPA Identification Number: KSD031203318

This Hazardous Waste Management Facility Permit is being issued in accordance with rules and regulations of the Kansas Department of Health and Environment (KDHE) and the following-named conditions and requirements, to wit: Ash Grove Cement Company (Permittee) must comply with all terms and conditions in Section I through Section VII of this Permit. The Permit consists of the terms and conditions contained herein, including those in any attachments; the approved Permit Application (Part A and Part B); documents submitted in response to a condition in this Permit and approved by the Secretary; and the applicable regulations contained in 40 CFR Parts 124, 260 through 264, 268, and 270, as such applicable regulations are adopted and modified by K.A.R. 28-31-4 through 28-31-279a. This Permit also contains provisions for corrective action as necessary to protect human health and the environment to address any Release(s) from any solid waste management unit (SWMU) or area of concern (AOC) at the Facility, identified above, or those which may have migrated beyond the Facility property boundary.

This Permit shall become effective on ________________ and shall remain in effect until ________________ unless revoked and reissued, or terminated or continued in accordance with K.A.R. 28-31-124b.

Done at Topeka, this _____ day of ________________

_____________________________________
Lee A. Norman, M.D., Secretary
Kansas Department of Health and Environment
FACILITY OVERVIEW

Ash Grove owns and operates a five-stage pre-heater/pre-calciner cement kiln that burns hazardous waste to supplement the facility’s fuel needs. The cement manufacturing process requires large amounts of thermal energy and hazardous waste, also referred to as Waste Derived Fuel (WDF), is capable of supplying a significant portion of this energy.

In addition to cement production related activities such as quarrying and crushing limestone, proportioning and grinding raw materials, pyroprocessing of raw material mixes to form portland cement clinker, and the grinding of clinker with gypsum to form Portland cement; Ash Grove also operates three distinct hazardous waste management systems to supplement the facility’s fuel needs. These systems include a Liquid Waste Derived Fuel (LWDF) storage tank system, a Bulk Waste Derived Fuel (BWDF) system for storage and pneumatic conveyance of dry particulate waste, and the Solid Waste Derived Fuel (SWDF) system which includes various container storage buildings and areas permitted for the storage of containerized waste.

The principle waste management activity at the facility is the receipt of hazardous waste liquids, solids, and semi solid sludge from off-site generators and other hazardous waste processors via rail and over the road in both bulk and palletized containers, which are then processed into a fuel for use in the pyroprocessing cement kiln. In addition to the active hazardous waste management systems, the facility also has multiple solid waste management units with ongoing Corrective Action monitoring requirements. The facility also operates and maintains an active industrial waste landfill #653, a cement kiln dust landfill #759, an active solid waste processing permit #868, and two closed solid waste landfills #177 and #345; all of which are permitted under solid waste regulations.
HAZARDOUS WASTE FACILITY PERMIT
Ash Grove Cement Company
Chanute, Kansas
EPA I.D. # KSD031203318

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ACRONYMS AND ABBREVIATIONS

ACL  Alternate Concentration Limit
ANPR  Advanced Notice of Proposed Rulemaking
AOC  Area of Concern
AR  Administrative Record
AST  Aboveground Storage Tank
ASTM  American Society for Testing and Materials
ATSDR  Agency for Toxic Substances and Disease Registry
BERA  Baseline Ecological Risk Assessment
bgs  below ground surface
BMP  Best Management Practice
BWM  Bureau of Waste Management
CA  Corrective Action
CAMU  Corrective Action Management Unit
CAP  Corrective Action Plan
CERCLA  Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFR  Code of Federal Regulations
CM  Corrective Measures
CMCC  Corrective Measures Construction Completion
CMC  Corrective Measures Completion
CMD  Corrective Measures Decision
CMI  Corrective Measures Implementation
CMS  Corrective Measures Study
COC  Contaminant of Concern
CQA  Construction Quality Assurance
CS  Confirmatory Sampling
CSM  Conceptual Site Model
CUP  Continuous Use Program
DCC  Description of Current Conditions
DNAPL  Dense Non-Aqueous Phase Liquid
DOT  U.S. Department of Transportation
DQO  Data Quality Objective
EC  Engineering Control
EDD  Electronic Data Deliverable
EI  Environmental Indicator
EPA  U.S. Environmental Protection Agency
FA  Financial Assurance
FSP  Field Sampling Plan
ft  feet
GIS  Geographic Information System
GPS  Global Positioning System
GWPS  Groundwater Protection Standard
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>QAPP</td>
<td>Quality Assurance Project Plan</td>
</tr>
<tr>
<td>QA/QC</td>
<td>Quality Assurance/Quality Control</td>
</tr>
<tr>
<td>RUA</td>
<td>Recreational Use Area</td>
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<tr>
<td>RAGS</td>
<td>Risk Assessment Guidance for Superfund</td>
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<tr>
<td>RAL</td>
<td>Removal Management Level</td>
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<tr>
<td>RAO</td>
<td>Remedial Action Objective</td>
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<tr>
<td>RAP</td>
<td>Remedial Action Plan</td>
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<tr>
<td>RCRA</td>
<td>Resource Conservation and Recovery Act</td>
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<tr>
<td>RFA</td>
<td>RCRA Facility Assessment</td>
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<tr>
<td>RFI</td>
<td>RCRA Facility Investigation</td>
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<tr>
<td>RSK</td>
<td>Risk-Based Standards for Kansas</td>
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<tr>
<td>RSL</td>
<td>Regional Screening Level</td>
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<tr>
<td>SAP</td>
<td>Sampling and Analysis Plan</td>
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<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act of 1986</td>
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<tr>
<td>SLERA</td>
<td>Screening Level Ecological Risk Assessment</td>
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<tr>
<td>SOP</td>
<td>Standard Operating Procedures</td>
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<tr>
<td>SOW</td>
<td>Scope of Work</td>
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<tr>
<td>SVOC</td>
<td>Semi-Volatile Organic Compound</td>
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<tr>
<td>SWMU</td>
<td>Solid Waste Management Unit</td>
</tr>
<tr>
<td>TPH</td>
<td>Total Petroleum Hydrocarbons</td>
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<tr>
<td>TPH-DRO</td>
<td>TPH-Diesel-Range Organics</td>
</tr>
<tr>
<td>TPH-GRO</td>
<td>TPH-Gasoline-Range Organics</td>
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<tr>
<td>TSDF</td>
<td>Treatment, Storage, and Disposal Facility</td>
</tr>
<tr>
<td>TU</td>
<td>Temporary Unit</td>
</tr>
<tr>
<td>USCS</td>
<td>Unified Soil Classification System</td>
</tr>
<tr>
<td>USGS</td>
<td>U.S. Geological Survey</td>
</tr>
<tr>
<td>UIC</td>
<td>Underground Injection Control</td>
</tr>
<tr>
<td>UST</td>
<td>Underground Storage Tank</td>
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<tr>
<td>VOC</td>
<td>Volatile Organic Compound</td>
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<td>VSI</td>
<td>Visual Site Inspection</td>
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<td>Waste Analysis Plan</td>
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<td>WMU</td>
<td>Waste Management Unit</td>
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SECTION I - STANDARD PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

Ash Grove Cement Company ("Permittee") is the Owner and Operator of the Facility and is authorized to store and treat hazardous waste and perform required corrective action in accordance with the terms and conditions of this Permit, K.S.A. 65-3430 *et seq.*, and K.A.R. 28-31-4 through 28-31-279a.

Any treatment, storage, or disposal of hazardous waste not authorized in this Permit is strictly prohibited. This Permit consists of the terms and conditions contained herein, including those in any Attachments; the approved Permit Application; documents submitted in response to a condition in this Permit and approved by the Secretary; and the applicable regulations contained in 40 CFR Parts 124, 260 through 264, 268, and 270, as such applicable regulations are adopted and modified by K.A.R. 28-31-4 through 28-31-279a. Applicable regulations are those in effect on the date of issuance of this Permit. [40 CFR § 270.32(c)] All citations to federal regulations are for convenient reference. Some modifications to federal regulations by applicable state regulations are noted in this Permit, but all modifications to federal regulations by state regulations are incorporated herein. To the extent that state regulations exclude any sections of applicable federal regulations, those sections of federal regulations shall remain in effect but shall not be enforceable by the Secretary. In the instance of inconsistent language or discrepancies between Permit conditions, state regulations, or federal regulations, state regulations shall govern. In the event a conflict or discrepancy exists between language or documents in the Permit Application and the conditions or Attachments of this Permit, this Permit or the Attachments shall control. This Permit contains terms and conditions as the Secretary determines are necessary to protect human health and the environment. [40 CFR § 270.32(b)(2)]

Subject to 40 CFR § 270.4, compliance with this Permit constitutes compliance, for purposes of enforcement, with K.S.A. 65-3430 *et seq.* and K.A.R. 28-31-4 through 28-31-279a, and Subtitle C of RCRA, as amended by the HSWA. Issuance of this Permit does not convey any property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of state or local law or regulations. [40 CFR § 270.4 and 270.30(g)] Compliance with the terms of this Permit does not constitute a defense to any order issued or any action brought under Sections 3008(a), 3008(h), 3013, or 7003 of RCRA; Sections 106(a), 104, or 107 of CERLCA (42 U.S.C. 9606 *et seq.*, ); or, any other state or federal law providing for the protection of public health or the environment.
I.B. PERMIT ACTIONS

I.B.1. Permit Modification, Revocation and Reissuance, and Termination

This Permit may be modified, revoked and reissued, or terminated for cause, as specified in 40 CFR §§ 270.41, 270.42, and 270.43 and K.S.A 65-3439. If cause exists, the Secretary of KDHE (Secretary) may modify or revoke and reissue this Permit in accordance with 40 CFR § 270.41, K.S.A 65-3439, and K.S.A. 65-3440. If this Permit is modified, only the conditions subject to the modification are reopened. If this Permit is revoked and reissued, the entire Permit is reopened and subject to revision, and may be reissued for a new term. During the revocation and reissuance proceedings, the Permittee shall comply with all conditions of the existing Permit until a new final permit is reissued. [K.A.R. 28-31-124b(c)(4)]

The Secretary will, upon request by the Permittee, approve or deny modifications to this Permit in accordance with 40 CFR § § 270.42 and K.A.R. 28-29-124b. The modification will become an enforceable part of this Permit. The filing of a request for permit modification, revocation and reissuance, or termination, or the notification of planned changes or anticipated noncompliance on the part of the Permittee, does not stay the applicability or enforceability of any permit condition. [40 CFR § 270.30(f)]

Failure to submit the information required by the conditions of this Permit, failure to comply with the conditions of this Permit, or misrepresentation of any submitted information, is grounds for suspension, revocation, or termination of the Permit in accordance with 40 CFR § 270.43, and for an enforcement action pursuant to Permit Condition I.E and Permit Condition I.K.

Any requirement in the Permit for a permit application shall include the requirements set out in K.A.R. 28-31-124a.

I.B.2. Permit Renewal

If the Permittee wishes to continue an activity regulated by this Permit after the expiration date of this Permit, the Permittee must apply for and obtain a new permit as specified in 40 CFR § 270.30(b), 40 CFR § 270.10(h), and Permit Condition I.E.3. Review of any application for a permit renewal shall consider improvements in the area of control and measurement technology, as well as changes in applicable regulations.

I.C. SEVERABILITY

The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this Permit to any circumstance is stayed or held invalid,
the application of such provision to other circumstances and the remainder of this Permit shall not be affected thereby. [40 CFR § 124.16]

I.D. DEFINITIONS

For purposes of this Permit, terms presented in Attachment 1 of this Permit and used herein shall have the same meaning as those in K.S.A. 65-3430 and K.A.R. 28-31-260a, and in 40 CFR Parts 124, 260, 261, 262, 264, 266, 268, and 270, as adopted by applicable state regulations, unless this Permit specifically provides otherwise. When the same word is defined in the Kansas statutes or regulations and in the federal regulations and the definitions are not identical, the definition in the Kansas statutes or regulations shall control. [K.A.R. 28-31-260a(b)] “Secretary” means the Secretary of the Kansas Department of Health and Environment (KDHE), or a designee or authorized representative of the Secretary. Any reference to “KDHE” shall mean the Secretary. Where terms are not defined in the regulations or the Permit, the meaning associated with such terms shall be defined by standard dictionary reference or the generally accepted scientific or industry meaning of the term.

I.E. DUTIES AND REQUIREMENTS

I.E.1. Duty to Comply

The Permittee shall comply with all conditions of this Permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit. [40 CFR § 270.61] Any permit noncompliance, other than noncompliance authorized by an emergency permit, also constitutes a violation of RCRA and the Kansas Hazardous Waste Program, and is grounds for an enforcement action, permit termination, revocation and reissuance, modification, or denial of a permit renewal application. [40 CFR § 270.30(a), K.S.A. 65-3441, K.S.A. 65-3444]

I.E.2. Compliance Schedules

Any schedule of compliance established after the issuance of this Permit shall be adopted by reference as a condition of this Permit, as though fully set out herein. Furthermore, all plans and schedules, as required by this Permit, upon written approval from the Secretary, shall similarly be incorporated into this Permit. Any noncompliance with such approved plans and schedules shall be deemed noncompliance with this Permit. The Permittee shall only receive extension(s) of the specified compliance schedule due date(s) for the submittal(s) required by this Permit upon written approval from the Secretary.

I.E.3. Duty to Reapply
If the Permittee wishes to continue an activity regulated by this Permit after the expiration date of this Permit, the Permittee shall submit a complete application for a new permit at least one-hundred and eighty (180) days before this Permit expires, unless permission for a later submission date has been granted by the Secretary. In addition, the Permittee must submit an application for a new permit at least one-hundred and eighty (180) days before this Permit expires if ongoing closure, corrective action and/or post-closure activities remain in effect. [K.A.R. 28-31-124a, 40 CFR §§ 270.10, and 270.30(b)]

I.E.4. Permit Expiration

Pursuant to 40 CFR § 270.50 and K.S.A. 65-3439(a) this Permit shall be effective for a fixed term not to exceed ten (10) years. As long as KDHE is the permit-issuing authority, this Permit and all conditions herein will remain in effect beyond the Permit's expiration date if the Permittee has submitted a timely, complete application under state laws and regulations [40 CFR § 270.10, 40 CFR §§ 270.13 through 270.28], and, through no fault of the Permittee, the Secretary has not issued a new permit. [40 CFR § 270.51]

I.E.5. Corrective Action Obligations

The Permittee is obligated to complete Facility-wide corrective action under the conditions of this Permit regardless of the operational status of the Facility. The Permittee must submit an application for a new permit under Section I.E.3, unless the Permit has been modified to terminate the corrective action and the Secretary has released the Permittee from financial assurance requirements for corrective action.

I.E.6. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Permit. [40 CFR § 270.30(c)]

I.E.7. Duty to Mitigate

In the event of noncompliance with the Permit, the Permittee shall take all reasonable steps to minimize Releases to the environment and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment. [40 CFR § 270.30(d)]

I.E.8. Proper Operation and Maintenance
The Permittee shall at all times properly operate and maintain all Facility systems of treatment and control, and related appurtenances, which are installed or used by the Permittee to achieve compliance with this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit. [40 CFR § 270.30(e)]

I.E.9. Duty to Provide Information

The Permittee shall furnish to the Secretary, within a reasonable time period as specified by the Secretary, any relevant information which the Secretary may request to determine compliance with this Permit, or whether cause exists for modifying, revoking and reissuing, or terminating this Permit. The Permittee shall also furnish to the Secretary, upon request, copies of records required to be kept by this Permit. [40 CFR §§ 264.74(a) and 270.30(h)]

I.E.10. Access, Inspection and Entry

Pursuant to 40 CFR § 270.30(i) and K.A.R. 28-31-12, the Permittee shall allow the Secretary, upon the presentation of credentials and other documents as may be required by law, to conduct any of the activities set forth in 40 CFR § 270.30(i) and K.A.R. 28-31-12(a).

The Secretary, and any agent or contractor designated by the Secretary, shall be allowed and authorized by the Permittee to enter and freely move about all property at the Facility for the purpose, among other things, of interviewing Facility personnel and contractors; inspecting records, operating logs, and contracts related to the activities set out in the work plan(s); reviewing the progress of the Permittee in carrying out the conditions of this permit; conducting such sampling and tests as the Secretary deems necessary; using a camera, sound recording, or other documentary type equipment to record interviews or observations of work or to conduct other activities to assure compliance with this Permit or applicable regulations; and verifying the reports and data submitted to the Secretary by the Permittee. The Permittee shall allow such persons to inspect and copy all records, files, photographs, documents, and other writings, including all sampling and monitoring data that pertain to work undertaken pursuant to this Permit or as required by applicable law.

To the extent that work required by this Permit must be completed on property not owned or controlled by the Permittee, the Permittee shall use its best efforts to obtain access agreements from the present owner(s) of such property within
thirty (30) days of the date the need for access is provided to Permittee. Any such access agreement shall be incorporated by reference into this Permit. In the event that agreements for site access are not obtained within thirty (30) days of the date the need for access is provided, the Permittee shall notify the Secretary regarding both the lack of and its failure to obtain such agreements within seven (7) days thereafter. In the event the Secretary takes any action to obtain access for the Permittee, all costs incurred by the Secretary shall be reimbursed by the Permittee. Upon the Secretary’s obtaining access for the Permittee, the Permittee shall undertake approved work on such property. The Secretary shall not be responsible for any injury or damage to persons or property caused by the negligent or willful acts or omissions of the Permittee, its officers, employees, agents, successors, assigns, contractors or any other person acting on the Permittee’s behalf in carrying out any activities pursuant to the conditions of this Permit, in accordance with the Kansas Tort Claims Act.

I.E.11. Monitoring and Records

I.E.11.a. Representative Samples

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. [40 CFR § 270.30(j)(1)] The method used to obtain a representative sample of the medium to be analyzed for a given hazardous constituent must be the appropriate method from Appendix I of 40 CFR §, Part 261, or an equivalent method approved in writing by the Secretary. Laboratory methods must be those specified in the latest revision of EPA Publication SW-846, “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, or an equivalent method approved by KDHE.” All constituent chemical analysis shall be performed by a laboratory certified by KDHE in accordance with K.A.R. 28-31-264a(e) and (f).

I.E.11.b. Records Retention

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip charts and recordings for continuous monitoring instrumentation, copies of all reports and records required by this Permit, the certification required by 40 CFR § 264.73(b)(9), and records of all data used to complete the application for this Permit, for a period of time as specified in Permit Condition I.J. of this Permit or as specified in applicable regulations. This period may be extended by written request of the Secretary at any time and is automatically extended during the course of any unresolved enforcement action regarding this Facility. [40 CFR §§ 264.74(b) and 270.30(j)(2)]
Furthermore, the Permittee shall maintain records from all past, present, and any future groundwater monitoring wells and associated groundwater surface elevations, for the active life of the Facility and the corrective action period and, if applicable, any post-closure period, and including all records required by 40 CFR § 270.30(j)(2). All raw data, such as laboratory reports, drilling logs, bench-scale or pilot-scale data, and other supporting information gathered or generated during activities undertaken, pursuant to the conditions of this Permit, shall be maintained at the Facility, or such other location as approved in writing by the Secretary, in accordance with Permit Condition I.J. of this Permit. Such information shall be made available to the Secretary upon request.

I.E.11.c. Contents of Record

Records of monitoring information shall include and specify:

i. The dates, exact place, and times of sampling or measurements;

ii. The individual(s) who performed the sampling or measurements;

iii. The dates analyses were performed;

iv. The individual(s) who performed the analyses;

v. The analytical techniques or methods used; and

vi. The results of such analyses, including laboratory QA/QC documentation. [40 CFR § 270.30(j)(3)]

I.E.12. Reporting Planned Changes

The Permittee shall give written notice to the Secretary as soon as possible, but no later than twenty (20) days prior to any planned physical alterations or additions to the permitted Facility. [40 CFR § 270.30(l)(1)] This includes advance notice to the Secretary of any planned physical alterations or additions which may affect any hazardous waste management units (HWMU’s), SWMUs, AOCs, contaminated media or debris, or existing Institutional Controls (ICs), or Engineering Controls (ECs). The replacement of worn or broken parts need not be reported as long as replacement is with an equivalent component, which does not significantly affect the designed operating procedures or performance of the Facility.

I.E.13. Reporting Anticipated Noncompliance
The Permittee shall give notice to the Secretary no later than twenty (20) days prior to any planned changes in the permitted Facility or activity which may result in noncompliance with permit requirements. Such notification does not waive the Permittee’s duty to comply with this Permit pursuant to Permit Condition I.E.1. [40 CFR § 270.30(l)(2)]

I.E.14. Transfer of Permit

Before transferring ownership or operation of the Facility or any part of the Facility, the Permittee shall notify the new owner and/or operator in writing of the requirements of K.A.R. 28-31-124a(b), 40 CFR Parts 264 and 270, and this Permit. At least ninety (90) calendar days prior to the anticipated date of transfer, the owner and/or operator shall submit to the Secretary certification that the new owner and/or operator has been notified of the requirements, terms, and conditions of this Permit and of the regulations cited in this paragraph. [40 CFR § 264.12(c)] If the property transfer involves subdividing the property to more than one owner or operator, a map and legal description shall be provided to the Secretary that identifies the properties to be occupied by each new owner.

The Permittee’s failure to notify the new owner and/or operator of the requirements of this Permit in no way relieves the new owner or operator of his obligation to comply with all applicable requirements. [40 CFR § 264.12, Comment]

The Permit may be transferred by the Permittee only if the Permit has been modified or revoked and reissued in accordance with 40 CFR § 270.40(b) or 270.41(b)(2). The Secretary may incorporate such other requirements as may be necessary under the Kansas Hazardous Waste Program as part of the modification to this Permit. [40 CFR § 270.30(l)(3)]

In order to transfer the Facility or any part of the Facility, the new owner and/or operator shall submit a revised permit application to the Secretary no later than ninety (90) days prior to the scheduled change in ownership and/or operational control. A written agreement containing a specific date for transfer of Permit responsibility between the Permittee and new Permittee(s) must also be submitted no later than ninety (90) days prior to the scheduled change in ownership and/or operational control. [40 CFR § 270.40(b)]. As soon as the Permit responsibilities are transferred to the new permittee, the new permittee shall become the “Permittee” in this Permit.


Whenever this Permit is transferred to a new permittee, the old Permittee shall maintain compliance with the requirements of Permit
Condition II.M., until such time as the new permittee has demonstrated to the Secretary’s satisfaction compliance with these requirements. The new permittee shall demonstrate compliance with the requirements of Permit Condition II.M. within six (6) months of the date of the transfer of this Permit. Upon the new permittee’s demonstration of compliance with Permit Condition II.M., the Secretary shall notify the old Permittee that maintaining financial assurances is no longer required pursuant to Permit Condition II.M.

I.E.14.b. Bankruptcy

In the case of bankruptcy of the Permittee pursuant to Title 11 of the United States Code, Permittee shall comply with 40 CFR § 264.148. Permittee shall ensure that the bankruptcy Trustee provides the required notices to the Secretary and shall ensure that any new owner and/or operator submits a revised permit application no later than ninety (90) days prior to the scheduled change in ownership and/or operational control. A written agreement containing a specific date for transfer of permit responsibility between the bankruptcy court and/or the old Permittee and new permittee(s) must also be submitted no later than ninety (90) days prior to the scheduled change in ownership and/or operational control. Upon the new permittee’s satisfactory demonstration of compliance with 40 CFR § Part 264, Subpart H, and/or Permit condition II.M., the Secretary shall notify the Permittee that maintaining such financial assurance is no longer necessary.

I.E.15. Twenty-Four Hour Reporting

I.E.15.a. Pursuant to 40 CFR § 270.30(l)(6), the Permittee shall report to the Secretary any noncompliance with the Permit which may endanger health or the environment. Any such information shall be reported orally within twenty-four (24) hours from the time the Permittee becomes aware or reasonably should have become aware of the circumstances reported in accordance with this section. The report shall include the following:

i. Information concerning any Release which may cause an endangerment to public drinking water supplies;

ii. Any information of a Release or discharge or of a fire or explosion from the hazardous waste management Facility, which could threaten the environment or human health outside the Facility; and
I.E.15.b. The description of the occurrence and its cause shall include:

i. Name, address, and telephone number of the owner or operator;
ii. Name, address, and telephone number of the Facility;
iii. Date, time, and type of incident;
iv. Name and quantity of materials involved;
v. The extent of injuries, if any;
vi. An assessment of actual or potential hazard to the environment and human health outside the Facility, where this is applicable; and
vii. Estimated quantity and disposition of recovered material that resulted from the incident.

I.E.15.c. A written submission shall also be provided within five (5) days of the time the Permittee becomes aware of the circumstances described in this section. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected; the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Secretary may waive the five-day written notice requirement in favor of submission of a written report within fifteen (15) days. [40 CFR § 270.30(l)(6)]

I.E.15.d. Notwithstanding the requirements of the foregoing section, the Permittee shall comply with all applicable federal, state, and local laws regarding notification to authorities of Release into the environment, including the reporting requirements of K.A.R. 28-48-1 and 28-48-2.

I.E.16. Other Noncompliance

The Permittee shall report all instances of noncompliance not otherwise reported in compliance with 40 CFR § 270.30(l)(4) and (5) and Permit Conditions I.E.12, I.E.13, or I.E.15, at the time monitoring reports are submitted. The reports shall contain the information listed in Permit Condition I.E.15. of this section. [40 CFR § 270.30(l)(10)]

I.E.17. Information Repository

As set forth at 40 CFR § 270.30(m), the Secretary may require the Permittee to establish and maintain an information repository at any time, based on the factors
set forth in 40 CFR § 124.33(b). The information repository will be governed by the provisions in 40 CFR § 124.33(c) through (f).

I.E.18. Other Information

Whenever the Permittee becomes aware that it failed to submit any relevant facts in the Permit Application, or that it submitted incorrect information in the application or in any report to the Secretary, the Permittee shall submit such facts or information to the Secretary in writing within 10 days of discovery. [40 CFR § 270.30(l)(11)]

I.E.19. Other Requirements

I.E.19.a. Within thirty (30) calendar days after receipt of the final Permit, the Permittee shall submit a certification that the applicant has read the Permit in its entirety and understands all Permit conditions contained herein and agrees to operate the Facility within the conditions of this Permit.

I.E.19.b. All sample collection and analysis shall be performed in compliance with the approved work plan(s), including scheduling of analyses, documentation of sample collection, handling and analysis. Specifically, unless otherwise directed or approved by the Secretary, all corrective action-related work plans of an assessment or investigative nature shall include both a Sampling and Analysis Plan (SAP) and a Quality Assurance Project Plan (QAPP). On a case-by-case basis, as approved by the Secretary, reference may be made to existing project-related SAP/QAPP documentation if applicable to the work to be performed.

I.E.19.c. The Permittee shall ensure its analytical data meet the data quality objectives (DQOs) stated in the corresponding QAPP. DQOs shall be prepared consistent with available EPA guidance documents: Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4, EPA/240/B-06/001, February 2006); Guidance for Developing Quality Systems for Environmental Programs (EPA QA/G-1, EPA/240/R-02-008, November 2002); and any subsequent revisions or editions, or as otherwise directed or approved by the Secretary. QAPPs shall be prepared consistent with EPA guidance document titled EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5, EPA/240/B-01/003, March 2001), and any subsequent revisions or editions, or as otherwise directed or approved by the Secretary.
I.E.19.d. To demonstrate protection of human health and the environment, the detection limit for each hazardous waste constituent shall be less than or equal to the corresponding screening or threshold level as directed or approved by the Secretary. If the detection limit cannot be achieved due to matrix interference or other analytical limitations, provided that appropriate supporting documentation is provided to the Secretary, the affected sample and associated chemical analysis may be exempted from this requirement. Such an exemption does not, however, in any way relieve the Permittee from achieving corrective action objectives.

I.E.19.e. Any deviation from the procedures and methods set forth in these documents must be approved by the Secretary prior to use. The Permittee shall notify the Secretary in writing within five (5) working days of notice or knowledge of a potential deviation from prescribed procedures and methods. Such notice shall provide information as to the nature of the deviation, if known, and outline a proposed investigation to determine whether the sample or results are representative or should not be considered valid. If the results cannot be validated by evaluation of the quality assurance/quality control (QA/QC) procedures, historical data and/or laboratory protocol, the Permittee will re-sample if directed to do so by the Secretary.

I.E.19.f. The Permittee shall use the quality assurance, quality control, and chain-of-custody procedures specified in the QAPPs which are part of the work plan(s), for all sample collection and analysis performed pursuant to this Permit, unless otherwise agreed to by the Secretary.


As outlined in Permit Condition I.H., the Permittee shall submit identified, required, or requested documents to the Secretary within the timeframes established in this Permit, or as otherwise approved, required, or specified by the Secretary. The Secretary may review the document and send a written letter to the Permittee indicating approval, approval with comment, approval with conditions, denial, or such other designation as the Secretary determines appropriate. If the Secretary requires a written response and/or document revision, the Permittee shall provide such in the form and by the due date specified in the Secretary’s letter.

If the Secretary conditionally approves the document, Permittee will be notified of the conditions. The conditionally approved, modified document shall be the approved document.
If the Secretary denies approval of the document, the Secretary may either: (1) notify the Permittee in writing of the document’s deficiencies and specify a due date for submission of a revised document; or (2) revise the document and notify the Permittee of the revisions, and the revised document shall be the approved document.

If the Secretary requires a written response and/or document revision, the Permittee shall provide such in the form and by the due date specified in the Secretary’s letter.


In the event that the Permittee does not respond to the Secretary’s written request or requirement as described in Section I.E.20., or if the Secretary finds that a document submitted pursuant to this Permit is deficient, the Secretary may issue a letter to the Permittee requesting that the Permittee make specific modifications to any document required by this Permit. The letter will set out the deficiencies in the document or work, describe the necessary modifications to address the deficiencies, and provide a timeframe to correct the deficiencies. Failure to timely revise, correct, or otherwise adequately respond to the Secretary’s notice shall be a violation of this Permit and may subject the Permittee to additional tasks, actions, or penalties.

I.E.22. Work Takeover – Notice

If the Permittee fails to timely revise, correct, or otherwise respond to the Secretary’s written requirement for document modification or work performance, or if the Secretary determines the Permittee either: 1) has ceased implementation of any of the work, 2) is seriously or repeatedly deficient or late in its performance of the work, or 3) is implementing the work in a manner which may cause an endangerment to human health or the environment, the Secretary at its discretion, may assume or arrange for a contractor or contractors to assume the performance of all or any portions of the work, as the Secretary determines necessary. If the Secretary determines that such a work takeover is necessary, the Secretary will send the Permittee a Notice of Work Takeover specifying a date upon which the Secretary may assume or arrange for a contractor or contractors to assume the performance of all or any portions of the work. In the event of work takeover, pursuant to K.S.A. 65-3453(a)(4), K.S.A. 65-3453(a)(6) and 65-34,175, the Permittee shall pay for all costs incurred by the Secretary and by any contractor who performs work pursuant to this Paragraph. For purposes of this paragraph, “work” shall mean any condition, task, or schedule required by this Permit.

I.E.23. Additional Tasks May Be Required
The Secretary may determine that tasks or conditions may be required in addition to those specified in the approved work plans or associated documents/reports, as identified in III.V. of this Permit. In the event the Secretary makes such a determination, the Secretary will notify the Permittee in writing that additional tasks or conditions are necessary in order to meet the goals and objectives of this Permit, to assess risk in accordance with Permit Condition III.I.4. for any additional contaminant(s) detected, to conform to applicable laws, and/or to protect public health or safety or the environment. If such tasks are required, they shall be completed as specified by the Secretary and within the timeframes established by the Secretary.

I.E.24. Failure to Comply

Failure to comply with any of the terms and conditions of this Permit shall be considered a violation of this Permit and may subject the Permittee to such administrative actions and penalty provisions as set forth in this Permit or otherwise authorized by law as set out in Permit Conditions I.E.1. and I.K.

I.F. SIGNATORY REQUIREMENT

All applications, reports or other information submitted to or requested by the Secretary, a designee, or authorized representative, shall be signed and certified in accordance with 40 CFR §§ 270.11 and 270.30(k). All plans, reports, notifications, and other submissions to the Secretary, as required by this Permit, shall also be signed and certified in accordance with 40 CFR §§ 270.11 and 270.30(k). In addition, as required by the Kansas State Board of Technical Professions, pursuant to K.S.A. 74-7001 and K.A.R. 66-6-4, the Permittee shall ensure that all work products that constitute the practices of geology, engineering, architecture, or surveying will be sealed, signed, and dated by a professional licensed by the Kansas State Board of Technical Professions to practice in the State of Kansas.

I.G. WASTE MINIMIZATION

I.G.1. Pursuant to 40 CFR § 264.73(b)(9), the Permittee must record and maintain in the Facility operating record, at least annually, a waste minimization certification that:

I.G.1.a. Specifies the Permittee has a program in place to reduce the volume and toxicity of all hazardous waste and/or hazardous constituents generated by the Facility's operation to the degree determined by the Permittee to be economically practicable; and

I.G.1.b. The proposed method of treatment, storage or disposal is the practicable method currently available to the Permittee which minimizes the present and future threat to human health and the environment.
I.G.2. The Permittee shall maintain copies of this certification and supporting documents in the Facility operating record as required by Permit Condition I.J.4. and 40 CFR § 264.73(b)(9).

I.H. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE SECRETARY

Unless otherwise directed by the Secretary, in writing, one (1) hard copy and one (1) editable electronic copy of all reports, notifications, or other submissions which are required by this Permit or by the Secretary shall be reported or sent directly to:

Chief, Hazardous Waste Permits Section
Kansas Department of Health and Environment
Bureau of Waste Management
1000 SW Jackson, Suite 320
Topeka, Kansas 66612-1366
Telephone Number (785) 296-1609

All communications, notifications and requests required under this Permit shall be made in writing. Electronic transmission shall be considered in writing and may be utilized provided the Permittee provides a hard copy to the Secretary within three (3) working days of the electronic transmission.

I.I. CONFIDENTIAL INFORMATION

In accordance with K.S.A. 65-3447, the Permittee may claim as confidential any information required to be submitted by this Permit. This written claim must be asserted at the time of submission. Such claims shall be evaluated by the Secretary as to whether the claim is satisfactory pursuant to K.S.A. 65-3447.

I.J. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

Throughout the term of this Permit, the Permittee shall maintain at the Facility the following documents, and amendments, revisions, and modifications to these documents:

I.J.1. A copy of this Permit, including all approved permit modifications.

I.J.2. A copy of the approved Permit Application including, but not limited to the following:

I.J.2.a. Inspection schedules and documents, as required by 40 CFR § 264.15(b) and this Permit.

I.J.2.c. Corrective action documents as required by this Permit. These documents must be maintained for at least three (3) years after the Secretary has deemed the corrective action process terminated, corrective measures completed, and/or Corrective Measures Complete.

I.J.3. Personnel training documents and records as required by 40 CFR § 264.16(d) and (e) and this Permit. The training records of former employees must be kept for at least five (5) years from the date the employee last worked at the Facility.

I.J.4. Operating record, as required by 40 CFR § 264.73 and this Permit.


I.J.6. All other documents required by Permit Condition I.E.11, this Permit, or the Secretary.

I.K. PENALTIES

Failure to comply with the terms of this Permit may subject the Permittee to an administrative and/or civil penalty, a criminal penalty, and/or an action to suspend, revoke, or terminate this Permit. Failure to minimize or mitigate any adverse impact on the environment resulting from noncompliance may increase the severity of administrative or civil penalties. [K.S.A. 65-3441, 65-3444, and 65-3446]

I.L. PROPERTY RIGHTS

This Permit does not convey any property rights of any sort, nor any exclusive privilege. [40 CFR § 270.30(g)]

I.M. DISPUTE RESOLUTION

If the Permittee disagrees with any disapproval, modification, or other decision or directive made by the Secretary pursuant to provisions of the Permit, the Permittee shall follow the dispute resolution procedures outlined in Permit Conditions I.M.1. and I.M.2.

I.M.1. The Permittee shall notify the Secretary in writing, in accordance with Permit Condition I.H., of any disagreement(s) and the basis for it within fifteen (15) calendar days of the Secretary mailing or delivering its disapproval, modification, decision, or directive. The notice shall set forth specific points of the disagreement, the position the Permittee maintains should be adopted as consistent with the requirements of this Permit, the basis for the Permittee’s
position, and all matters the Permittee considers necessary for the Secretary’s determination. The Permittee and the Secretary shall then have an additional thirty (30) calendar days from the Secretary’s receipt of the Permittee’s notice to attempt to resolve the dispute. If agreement is reached, the resolution will be reduced to writing by the Secretary and shall become part of this Permit. If the parties are unable to reach agreement within this 30-day period, the Secretary shall issue its final decision on the dispute, in writing. The Permittee reserves its right to appeal any final order or denial to the Secretary. The Secretary shall notify the Permittee in writing of the final resolution of the dispute, and the reasons for this resolution. The final resolution of such dispute shall be incorporated into and made an enforceable part of this Permit.

I.M.2. The existence of a dispute as described herein and the Secretary’s consideration of such matters placed in dispute shall not excuse, toll, or suspend any obligation or deadline required pursuant to this Permit that is not the subject of dispute, during pendency of the dispute resolution process.

I.N. LAND DISPOSAL RESTRICTIONS

The Permittee shall comply with all regulations implementing the land disposal restrictions required in 40 CFR Part 268, as adopted by KAR 28-31-268. The Permittee also must comply with regulations implementing the land disposal restrictions that are promulgated after the effective date of this permit, pursuant to 40 CFR § 270, and which are more stringent than KAR 28-31-268 as these requirements are self-implementing provisions of HSWA. The Permittee is not subject to the land disposal restrictions if the applicable treatment standard is met, the waste is exempt under 40 CFR § 268.1(c), the waste is subject to a variance, or any other exemption in 40 CFR Part 268 applies.
SECTION II - GENERAL FACILITY CONDITIONS

II.A. DESIGN AND OPERATION OF FACILITY

The Permittee shall design, construct, maintain, and operate the Facility to minimize the possibility of a fire, explosion or any unplanned sudden or non-sudden Release to air, soil, or surface water which could threaten human health or the environment. [40 CFR § 264.31]

This condition includes adherence to operating conditions and procedures, and emergency shutdown procedures specified in the Permit Application and in this Permit.

II.B. DEED REQUIREMENTS

II.B.1. Notice in Deed to Property

Pursuant to K.A.R 28-31-264a(b), the Facility property owner shall record, in a form acceptable to or as provided by the Secretary and in accordance with Kansas law, a notice with the register of deeds in the county where the property is located. The notice shall include the following information:

a. The land has been used to manage hazardous waste;
b. All records regarding permits, closure, or both are available for review at KDHE,

If Post closure is required, the following information and requirements shall also apply:

c. The land use is restricted under 40 CFR Part 264 Subpart G regulations, and;
d. Any other information required by local, state, or federal law.

Upon certification of closure, as specified in 40 CFR § 264.119(b), the Permittee shall meet all recording and certification requirements in 40 CFR § 264.119 and, if applicable, meet the notation requirements in 40 CFR § 264.19(c).

II.B.2. Restrictive Covenant and Easement

Pursuant to K.A.R 28-31-264a(c), as required by the Secretary, the Facility property owner shall file a Restrictive Covenant and/or Easement, in a form acceptable to or as provided by the Secretary, with the register of deeds in the county where the property is located. The Restrictive Covenant shall specify the uses that may be made of the property and shall include all requirements of K.A.R. 28-31-264a(c)(1). Any Easements shall meet the requirements of K.A.R. 28-31-264a(c)(2). Within thirty (30) days of the Secretary requiring the Permittee
to record a Restrictive Covenant and/or Easement, the Permittee shall submit to the Secretary a copy of the recorded instrument with the notarized signature of the applicant and the seal of the register of deeds indicating the Restrictive Covenant and/or Easement has been recorded.

II.B.3. Hazardous Waste Imports

The Permittee shall notify the Secretary in writing at least four weeks in advance of the date the Permittee expects to receive hazardous waste from a foreign source, as required by 40 CFR § 264.12(a). Notice of subsequent shipments of the same waste from the same foreign source during the same calendar year is not required.

The Permittee shall follow the requirements for importers of hazardous waste in 40 CFR Part 262, Subparts F and H, if the Permittee acts as the hazardous waste importer.

II.B.4. Hazardous Waste from Off-Site Sources

When the Permittee is to receive hazardous waste from an off-site source (except where the Permittee is also the generator) he must inform the generator in writing that he has the appropriate permits and will accept the waste the generator is shipping. The Permittee must keep a copy of this written notice as part of the operating record. [40 CFR § 264.12(b)]

II.B.5. Transferring Ownership or Operation

In accordance with Permit Condition I.E.14, before transferring ownership or operation of the Facility, the owner or operator must notify the new owner or operator in writing of the requirements of K.A.R. 28-31-124a(b), 40 CFR Parts 264 and 270, and this Permit. [40 CFR § 264.12(c)]

II.C. GENERAL WASTE ANALYSIS

The Permittee shall follow the waste analysis procedures required by 40 CFR § 264.13, as described in the Waste Analysis Plan (WAP), Section 3 of the approved Permit Application. All laboratory analysis shall be conducted in accordance with Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Publication SW-846, or equivalent methods approved by the Secretary. At a minimum, the Permittee shall maintain proper functioning instruments, use approved sampling and analytical methods, verify the validity of sampling and analytical procedures, and perform correct calculations for nonreactive hazardous wastes. If the Permittee uses a contract laboratory to perform the analyses, then the Permittee shall inform the laboratory in writing that it must operate under the waste analysis conditions set forth in this Permit. A copy of the written notification between the Permittee and its contract laboratory must be maintained at the Facility. All
analytical data provided to comply with conditions of this Permit shall be performed by a laboratory certified for the analysis by the Secretary.

II.D. SECURITY

If applicable, the Permittee shall comply with the security provisions of 40 CFR § 264.14 and, where specified, the Security Procedures in Section 6.3 of the Permit Application.

II.E. GENERAL INSPECTION REQUIREMENTS

The Permittee shall follow the inspection schedules set out in Section 6.10 and Attachments 6A-1 through 6A-9 of the Permit Application. The Permittee shall remedy any deterioration or malfunction discovered by an inspection as required by 40 CFR § 264.15(c). Records of inspection shall be kept as required by 40 CFR § 264.15(d).

II.E.1. Inspection for Malfunctions and Deterioration

The Permittee shall inspect the Facility as required by 40 CFR § 264.15 and the inspection schedules set out in Section 6.10 and Attachments 6A-1 through 6A-9 of the Permit Application, for malfunctions and deterioration, operator errors, and discharges which may be causing or may lead to: (1) Release to the environment, or (2) a threat to human health.

II.E.2. Schedule of Inspections

The Permittee shall follow the written inspection schedules, set out in Section 6.10 and Attachments 6A-1 through 6A-9 of the Permit Application for the inspection of monitoring and remediation equipment, safety and emergency equipment, security devices, and operating, remediation, and structural equipment that are for the purpose of preventing, detecting, or responding to environmental or human health hazards and for compliance with 40 CFR § 264.15. The Permittee shall keep this schedule at the Facility.

II.E.3. Records of Inspections

The Permittee shall record inspections required by Permit Condition II.E.2. in an inspection log or summary. The log or summary shall be kept for at least three (3) years from the date of inspection. At a minimum, the items to be inspected must include those identified in 40 CFR § 264.15, as applicable, and in the inspection plans contained in Section 6.10 and Attachments 6A-1 through 6A-9 of the Permit Application. The logs must include the date and time of the inspection, the name of the inspector, a notation of the observations made, and the date and nature of any repairs or other remedial actions.
II.E.4. Remedial Action Resulting from Inspections

The Permittee shall remedy any observed deterioration or malfunction of equipment or structures to ensure that the problem does not lead to an environmental or human health hazard. Where a hazard is imminent or has already occurred, remedial action must be taken immediately. [40 CFR § 264.15(d)]

II.F. PERSONNEL TRAINING

The Permittee shall conduct personnel training as required by 40 CFR § 264.16. This training shall be in accordance with Section 8 of Permit Application. The Permittee shall maintain at the Facility the training documents and records required by 40 CFR § 264.16(d) for the amount of time required by 40 CFR § 264.16(e).

II.G. LOCATION STANDARDS

The Facility is not located within the 100-year flood-plain, thus no permit conditions are required with respect to location standards in 40 CFR § 264.18(b)(1).

In addition, the Facility is located in Neosho County, Kansas, which is not listed in Appendix VI of 40 CFR § 264. Therefore, no demonstration for the seismic standards of 264.18(a) is required.

II.H. PREPAREDNESS AND PREVENTION

II.H.1. Required Equipment

At a minimum, the Permittee shall maintain at the Facility the safety and emergency equipment set forth in Section 7 of the Permit Application, as required by 40 CFR § 264.32.

II.H.2. Testing and Maintenance of Equipment

The Permittee shall test and maintain the equipment specified in Permit Condition II.H.1., as required to assure its proper operation in time of emergency. [40 CFR § 264.33]

II.H.3. Access to Communications or Alarm System

The Permittee shall maintain immediate access to the communications or alarm system, as required by 40 CFR § 264.34 and Section 6.12 of the Permit Application.
II.H.4. **Arrangements with Local Authorities**

The Permittee shall make and maintain arrangements with state and local authorities, as required by 40 CFR § 264.37. If state or local officials refuse to enter into preparedness and prevention arrangements, the Permittee must document the refusal in the operating record and shall notify the Secretary within twenty (20) days of such refusal.

II.I. **RECORDKEEPING AND REPORTING**

In addition to the recordkeeping and reporting requirements specified in this Permit, the Permittee shall do the following:

II.I.1. **Operating Record**

The Permittee shall maintain a written operating record at the Facility, in accordance with 40 CFR § 264.73.

II.I.2. **Availability, Retention, and Disposition of Records**

The Permittee shall comply with the availability, maintenance, retention, and disposition requirements of all records in accordance 40 CFR § 264.74.

II.I.3. **Biennial Report**

The Permittee shall comply with the biennial report requirements of 40 CFR §§ 264.75 and 270.30(l)(9).

II.I.4. **Manifests**

Whenever a shipment of hazardous waste is initiated from the Facility, the Permittee shall comply with the generator requirements in K.A.R. 28-31-4 and 40 CFR § 264.71(c).

II.I.5. **Manifest Discrepancy Report**

If a significant discrepancy in a manifest is discovered, the Permittee must attempt to reconcile the discrepancy. If not resolved within fifteen (15) days, the Permittee must submit a letter report, including a copy of the manifest, to the Secretary. (See 40 CFR § 264.72) [40 CFR § 270.30(l)(7)]

A report must be submitted to the Secretary within fifteen (15) calendar days of receipt of unmanifested hazardous waste. (See 40 CFR § 264.76) [40 CFR § 270.30(l)(8)]

II.J. CONTINGENCY PLAN

II.J.1. Implementation of Plan

The Permittee shall immediately carry out the provisions of Section 7 of the approved Permit Application, whenever there is a fire, explosion, or Release which could threaten human health or the environment.

II.J.2. Copies of Plan

Copies of the contingency plan and all revisions to the plans must be:

II.J.2.a. Maintained at the Facility; and

II.J.2.b. Submitted to all local police departments, fire departments, hospitals, and State and local emergency response teams that may be called upon to provide emergency services. [40 CFR § 264.53]

II.J.3. Amendments to Plan

The Permittee shall review and immediately amend, if necessary, the Contingency Plan, as required by 40 CFR § 264.54. Amendments to the Contingency Plan are subject to the permit modification provisions of 40 CFR §§ 270.41 and 270.42.

II.J.4. Emergency Coordinator

A trained Emergency Coordinator shall be available at all times in case of an emergency, as required by 40 CFR § 264.55. The Emergency Coordinator shall have the authority to commit the resources needed to carry out the contingency plan.

The names, addresses, and telephone numbers of all persons qualified to act as Emergency Coordinators shall be listed in the Contingency Plan. [40 CFR § 264.52(d)]

II.J.5. Emergency Procedures

Whenever there is an imminent or actual emergency, the Permittee shall immediately comply with the requirements of 40 CFR § 264.56.
II.K. GENERAL CLOSURE REQUIREMENTS

II.K.1. Definitions

For purposes of this Section, the definitions of “Final Closure” and “Partial Closure” in 40 CFR § 260.10 shall apply.

II.K.2. Performance Standard

The Permittee shall close the Facility as required by 40 CFR §§ 264.111, 264.112(a) and (b), 264.178, 264.197, and 264.603. Permittee will comply with the KDHE-approved Closure Plan(s) contained in Section 9 of the Permit Application.

II.K.3. Amendment to Closure Plan

The Permittee shall amend the Closure Plan(s) in accordance with 40 CFR § 264.112(c), whenever necessary, or as required by the Secretary. Amendments of the closure plans are subject to the permit modification requirements of 40 CFR § 270.42.

II.K.4. Notification of Closure

The Permittee shall notify the Secretary in writing at least sixty (45) forty-five days prior to the date on which they expect to begin any closures of HWMU’s or final closure of the Facility, as required by 40 CFR § 264.112(d).

II.K.5. Time Allowed for Closure

Within ninety (90) days after receiving the final volume of hazardous waste, the Permittee shall treat or remove from the HWMU(s) or Facility all hazardous waste and shall complete closure activities in accordance with 40 CFR § 264.113 and the applicable Closure Plan for the HWMU(s). A longer period of time may be approved by the Secretary if the Permittee meets the requirements in 40 CFR § 113(a).

II.K.6. Disposal or Decontamination of Equipment, Structures, and Soils

The Permittee shall decontaminate and/or dispose of all contaminated equipment, structures, and soils as required by 40 CFR § 264.114 and the applicable Closure Plan for the HWMU(s).

II.K.7. Certification of Closure
The Permittee and an independent Kansas Professional Engineer shall certify that HWMU’s and/or the Facility have been closed in accordance with the approved Closure Plans, as required by 40 CFR § 264.115. The Permittee shall meet the timing and mailing requirements in 40 CFR § 264.115.

II.K.8. Survey Plat

The Permittee shall submit a survey plat to the local authorities specified in 40 CFR § 264.116 and to the Secretary no later than the submission of certification of closure of the units and the SWMUs identified in Section 10 of the Permit Application, in accordance with 40 CFR § 264.116.

II.L. RESERVED

II.M. FINANCIAL REQUIREMENTS

The Permittee shall maintain adequate financial assurance for closure of the Facility in accordance with, 40 CFR § 264.101, K.A.R. 28-31-264a, and this Permit.

II.M.1. Cost Estimates for Closure

II.M.1.a. The Permittee’s current cost estimate for closure, prepared in accordance with 40 CFR § 264.142(a), are contained in the Closure Cost Estimate, Section 9.5 and Attachment 9-2 of the Permit Application.

II.M.1.b. The Permittee shall adjust the closure cost estimate annually for inflation within sixty (60) days prior to the anniversary date of the establishment of the financial instrument(s) used to comply with 40 CFR § 264.143 and submit them to the Secretary for review and approval. Each cost estimate shall be based on the plan implementation cost, in current dollars, assuming that a third party performs the work.

If using the financial test and corporate guarantee demonstration, the Permittee shall adjust the closure cost estimate for inflation within thirty (30) days after the close of the firm's fiscal year and before submission of updated information to the Secretary.

The adjustment shall be made by either recalculating the maximum cost of closure or by using an inflation factor derived from the most current quarterly Implicit Price Deflator for Gross Domestic Product.
II.M.1.c. The Permittee shall revise the cost estimate in the Permit Application whenever there is a change in the Facility’s Closure Plan as required by 40 CFR § 264.142(c) and Permit Condition II.K. and II.L. This type of revision is subject to the permit modification requirements of 40 CFR §§ 270.41 and 270.42 and Permit Condition I.B.1. A permit modification will not be required for the annual inflation costs referenced in Permit Condition II.M.1.b.

II.M.1.d. The Permittee shall maintain at the Facility the latest adjusted closure cost estimate as required by 40 CFR § 264.142(d) and Permit Condition I.J.5.

II.M.2. Cost Estimate for Corrective Action

II.M.2.a. The Permittee shall prepare and submit a cost estimate for the completion of any corrective action required in order to provide financial assurance for completion of corrective action as required under 40 CFR §§ 264.90(a)(2) and 264.101. Such cost estimate shall be based upon the cost of assessment of all affected media and the design, installation, operation, inspection, monitoring, and maintenance of the corrective action system to meet the requirements of 40 CFR § 264.101 and this Permit to include any treatment system necessary for all affected media. Such cost estimate will include the full cost (100 percent) of corrective action as defined by Permit Condition I.E.5. of this Permit. The cost estimate will also cover the total third-party cost of implementing the corrective action, including any necessary long-term corrective action costs. Third-party costs are described in 40 CFR § 264.142(a)(2) and shall include all direct costs and indirect costs, including contingencies, as described in EPA Directive No. 9476.00-6 (November 1986), Volume III, Chapter 10. The cost estimate shall contain sufficient details to allow it to be evaluated by the Secretary. The Secretary may prescribe the specific form of the cost estimate to be completed by the Permittee. The cost estimate shall not incorporate any salvage value that may be realized from the sale of wastes, Facility structures or equipment, land or other assets associated with the Facility.

The Secretary shall approve the specific type of financial instrument/assurance, the method of calculation, and the term of the financial assurance which the Secretary deems to be protective of public health and the environment.
II.M.2.b. The Permittee shall adjust the corrective action cost estimate for inflation within sixty (60) days prior to the anniversary date of the establishment of the financial instrument(s) used to comply with 40 CFR § 264.101.

If the Secretary approves the Permittee’s use of the financial test and corporate guarantee demonstration, the Permittee shall adjust the corrective action cost estimate for inflation within thirty (30) days after the close of the firm's fiscal year and before submission of updated information to the Secretary.

The adjustment shall be made by either recalculating the maximum cost of corrective action or by using an inflation factor derived from the most current quarterly Implicit Price Deflator for Gross Domestic Product published by the U.S. Department of Commerce in its Survey of Current Business.

II.M.2.c. The Permittee shall revise the corrective action cost estimate whenever there is a change in the Facility’s corrective action as required by 40 CFR § 264.101. This type of revision is subject to the permit modification requirements of 40 CFR §§ 270.41 and 270.42 and Permit Condition I.B.1.

II.M.2.d. The Permittee shall keep at the Facility the latest adjusted corrective action cost estimate as required by Permit Condition I.J.5.

II.M.3. Facility Financial Assurance

The Permittee shall demonstrate continuous compliance by providing documentation of financial assurance, as required by 40 CFR § 264.101 and 40 CFR § 264.143 in at least the amount of the closure and corrective action cost estimates required by Permit Conditions II.M.1 and II.M.2. The mechanism for financial assurance may be one that is described and allowable under 40 CFR §§ 264.140 through 264.151, Subpart H, subject to the Secretary’s discretion. The Permittee shall submit for approval annually and maintain documentation at the Facility demonstrating the Permittee’s financial assurance in accordance with applicable regulations and the approved Cost Estimates. Changes in financial assurance mechanisms and coverage amount must be approved by the Secretary pursuant to 40 CFR §§ 264.101 and 264.143. Financial assurance shall be in compliance with the applicable subparagraphs of K.A.R. 28-31-264a(a).

II.M.4. Liability Requirements
The Permittee shall maintain liability coverage in accordance with 40 CFR § 264.147.

II.M.5. **Incapacity of Owners or Operators, Guarantors, or Financial Institutions**

The Permittee shall comply with 40 CFR § 264.148, whenever necessary.

II.M.6. **Monitoring Fees**

If applicable, the Permittee shall pay the annual monitoring fee in accordance with the current, effective version of K.A.R. 28-31-10.

II.M.7. **Cost Recovery for Clean-up/Corrective Action**

The Permittee shall reimburse KDHE costs as defined herein, pursuant to the terms and conditions of this Permit under 270.32(b)(2) and K.S.A. 65-3453(a)(4) and (6), K.S.A. 65-3455 for all clean-up/corrective action activities performed under this Permit.
SECTION III – CORRECTIVE ACTION FOR SWMUs AND AOCs

The objective of the corrective action program at a hazardous waste management facility is to evaluate the nature and extent of Releases and, if necessary, to implement corrective measures to protect human health and the environment. The Secretary may require corrective action, as specified in the following permit conditions, for any previously or newly identified, known or suspected SWMU, AOC, or Release pursuant to the following:

- 40 CFR § 264.101 which requires that owners and operators of facilities that treat, store, or dispose of hazardous waste must institute corrective action requirements associated with SWMUs as specified in a permit, and that such permit shall include schedules of compliance for corrective action work and assurances of financial responsibility for completing corrective action;
- 40 CFR § 270.32(a) which authorizes the Secretary to establish permit conditions as required by applicable regulations and, on a case by case basis, include conditions for the duration of permits, schedules of compliance, and monitoring; and
- 40 CFR § 270.32(b)(2) which provides for establishment of permit conditions as the Secretary determines are necessary to protect human health and the environment.

All corrective action activities contemplated or performed pursuant to Section III of this Permit shall be conducted subject to the written approval of the Secretary, in accordance with the terms of this Permit, and shall be consistent with the standards, specifications, and schedules approved by the Secretary or as contained in the attachments to this Permit (Attachments). Unless otherwise specified in this Permit, and/or as approved or directed by the Secretary, corrective action activities will be accomplished through implementation of the process steps detailed in Permit Conditions III.H. through III.M. All documents submitted to the Secretary pursuant to this Permit shall be considered draft documents until approved by the Secretary. Upon the Secretary’s approval, the Permittee shall implement the tasks detailed in the subject work plan in accordance with the corresponding implementation schedule.

If the Secretary determines that further actions beyond those provided by Section III of this Permit or changes to Permit conditions are warranted, the Secretary shall modify the Permit conditions in Section III, in accordance with Permit Condition I.B.1.

III.A. CORRECTIVE ACTION REQUIREMENTS

III.A.1. Corrective Action at the Facility

The Permittee shall institute corrective action as necessary to protect human health and the environment for all Releases from any SWMU or AOC at the Facility, regardless of the time the waste was placed or was managed in such unit(s). [40 CFR § 264.101(a)]

III.A.2. Corrective Action beyond the Facility Boundary
The Permittee shall institute corrective action beyond the Facility property boundary, where necessary to protect human health and the environment, unless the Permittee demonstrates to the Secretary’s satisfaction that, despite the Permittee’s best efforts, the Permittee was unable to obtain the necessary permission to undertake such actions. The Permittee is not relieved of responsibility to clean up a Release that has migrated beyond the Facility boundary where access is denied. On-site measures to address such Releases will be determined on a case-by-case basis. Permittee must provide assurances of financial responsibility for such corrective action. [40 CFR § 264.101(c)]

III.A.3. Additional Corrective Action Requirements

In addition to corrective action requirements under Permit Conditions III.A.1. and III.A.2, the Permittee shall institute corrective action in accordance with all terms and conditions established in this Permit, as the Secretary has determined are necessary to protect human health and the environment. [40 CFR § 270.32(b)(2)]

III.B. APPLICABILITY

The Permit conditions of this section apply to:

III.B.1. The SWMUs and AOCs identified by the initial RFA, the Permit Application, any subsequent investigations, or by other means, as listed in Section III.C. and Attachment 4. In addition to the conditions specified in this Permit, all currently known SWMUs and AOCs identified herein shall also be addressed to mitigate potential exposures at the point of closure of operations at SWMUs or AOCs, or in total at the time of closure of the Facility operations, whichever occurs first. Additionally, if new information becomes available to indicate an imminent threat to human health or the environment exists, or off-site contaminant migration is occurring or is likely to occur, the Secretary may direct the Permittee in writing to immediately conduct additional corrective action activities.

III.B.2. Any additional SWMUs or AOCs or Releases discovered from SWMUs or AOCs during the course of groundwater monitoring, field investigations, environmental audits, or other means. As used in this Section of the Permit, the terms "discover", "discovery", or "discovered" refer to the date on which the Permittee or a KDHE representative either: (1) visually observes evidence of a new SWMU/AOC/Release; (2) visually observes evidence of a previously unidentified Release to the environment; or (3) receives information which suggests the presence of a new Release to the environment.
III.C. IDENTIFICATION OF SWMUS AND AOCs

The EPA conducted a RCRA Facility Assessment (RFA) to identify SWMUs and AOCs, and any Releas and/or potential Releas at the Facility in 1989. The RFA report was dated March 31, 1989; however, since that initial RFA report additional SWMUs were identified and others added due to the construction of the five-stage preheater kiln in 1999.

The list in Attachment 4 identifies and provides the current status for all former and new SWMUs and AOCs. This list allows all identified SWMUs and AOCs, regardless of when they were initially identified, to be fully accounted for in this Permit. Attachment 4 also identifies the outstanding, required activities for each SWMU and AOC, as summarized in Sections III.G through III.L.

A map which identifies the location of each SWMU and AOC is shown in Attachment 3.

III.D. DESCRIPTION OF PAST AND/OR ON-GOING GROUNDWATER MONITORING FOR REGULATED UNITS

Although the Facility has multiple landfills and various groundwater monitoring requirements associated with them, none of them are considered regulated units as defined by 40 CFR § 264.90(a). All groundwater monitoring required as part of Corrective Action is contained in the Corrective Measures Implementation Work Plan, Attachment 15. For convenience of reference the Groundwater Monitoring Plan, Appendix C of the CMI Work Plan, has been included as Attachment 6.

III.E. NOTIFICATION AND ASSESSMENT REQUIREMENTS FOR NEWLY IDENTIFIED OR SUSPECTED NEW SWMUS AND AOCs

III.E.1. No later than fifteen (15) calendar days from discovery, the Permittee shall notify the Secretary in writing of any newly-identified or suspected new SWMU or AOC as discovered under Permit Condition III.B.2. The notification shall include, at a minimum, a unique sequential identification number, the location of the newly-identified or suspected new SWMU or AOC in relation to other SWMUs and AOCs, and all available information pertaining to the nature of the Release including, but not limited to, suspected or known wastes, hazardous constituents or pollutants released, media affected, magnitude of Release, and any other relevant information.

III.E.2. The Permittee shall prepare and submit to the Secretary, within thirty (30) calendar days of notification provided per Permit Condition III.E.1., a SWMU and AOC Preliminary Assessment Report (PAR) for each SWMU and AOC identified under Permit Condition III.B.2. At a minimum, the PAR shall provide the following information as applicable:
a. Unique sequential identification for the SWMU or AOC;
b. Location of unit(s) in relation to SWMUs or AOCs on a topographic map of appropriate scale such as required under 40 CFR § 270.14(b)(19);
c. Designation of type and function of unit(s);
d. General dimensions, capacities and structural description of unit(s) and supplying any available plans/drawings;
e. Period during which the unit(s) was/were operated;
f. Past and present operating practices;
g. Previous uses of the area occupied by the SWMU or AOC;
h. Amounts and specifications of waste managed;
i. Drainage areas and/or drainage patterns near the SWMU or AOC;
j. Physical and chemical properties of all wastes, including any available data on hazardous constituents in the wastes, that have been managed at/in the unit(s) to the extent available; and,
k. All available information pertaining to any Release from such unit(s), including results of any sampling and analysis conducted, such as groundwater, soil, air, surface water, and/or sediment.
l. Recommendations, if any, for additional sampling/data collection, investigation, and/or interim measure activities.

III.E.3. Based on the information presented in the PAR for each SWMU and AOC identified under Permit Condition III.B.2., the Secretary shall determine the need for and timing of confirmatory sampling, investigation, and/or interim measures for each newly-identified or suspected SWMU and AOC. If the Secretary determines that such additional corrective action-related activities are necessary, the Permittee shall be required to prepare and implement a work plan as outlined in Permit Condition III.H., III.I., and/or III.J. The Secretary will notify the Permittee in writing of the final determination as to the status of the newly-identified or suspected SWMU and AOC and any specific corrective action requirements.

III.F. NOTIFICATION REQUIREMENTS FOR NEWLY-DISCOVERED RELEASERS FROM PREVIOUSLY IDENTIFIED SWMUS AND AOCS.

III.F.1. Within fifteen (15) calendar days from discovery, or from the time the Permittee should have reasonably become aware of the circumstances, the Permittee shall notify the Secretary in writing of any newly-discovered Releases(s) from previously-identified SWMUs or AOCs, as described in Permit Conditions III.B.1. and III.B.2. The notification shall include, at a minimum, a unique sequential identification number, location of SWMU or AOC, and all available information pertaining to the nature and extent of the Release, including media affected, hazardous constituent(s) or pollutant(s) Released, magnitude of Release, and any other relevant information.
III.F.2. Based on the information presented in the Permittee’s notification, the Secretary shall determine the need for and timing of confirmatory sampling, investigation and/or interim measures for each newly-discovered Release(s) from previously-identified SWMUs and AOCs. If the Secretary determines that such additional corrective action-related activities are necessary, the Permittee shall be required to prepare and implement a plan as outlined in Permit Conditions III.H., III.I. and/or III.J. and the Secretary will notify the Permittee in writing of the final determination as to the status of the newly-discovered Release(s) from previously identified SWMUs and AOCs and any specific corrective action requirements.

III.G. DESCRIPTION OF CURRENT CONDITIONS REPORT

III.G.1. Within ninety (90) calendar days from date of a written request from the Secretary, the Permittee shall submit to the Secretary a Description of Current Conditions (DCC) Report providing background information pertinent to the Facility. The DCC Report shall include information gathered during any previous investigations, inspections, corrective action/interim measure activities, and any other relevant data, to facilitate identification of potential contamination sources and to characterize current Facility conditions. In addition, the DCC Report shall determine if current human exposures and migration of contaminated groundwater are under control. Specifically, the DCC Report must evaluate whether current human exposure to environmental contamination is occurring at unacceptable levels and assess migration of existing groundwater contaminant plumes to verify whether or not the plumes are expanding or adversely affecting nearby surface water bodies.

III.G.2. The DCC Report shall meet the requirements of Attachment 7, Description of Current Conditions Report Scope of Work, unless otherwise directed or approved by the Secretary in writing. The Permittee shall provide sufficient written justification for any omissions or deviations from the minimum requirements of Attachment 7. Such omissions or deviations are subject to the approval of the Secretary.

III.H. CONFIRMATORY SAMPLING (CS)

III.H.1. CS Work Plan

Within forty-five (45) calendar days of the Secretary’s written notification, the Permittee shall prepare and submit a Confirmatory Sampling (CS) Work Plan to the Secretary for each newly-identified or suspected SWMU or AOC per Permit Condition III.E.3., or for each newly-discovered Release from previously-identified SWMUs and AOCs per Permit Condition III.F.2. The CS Work Plan shall include:
a. Schedule(s) of implementation;
b. Sampling and analysis program description of specific actions and parameters necessary to determine if a Release to the environment has occurred, or is occurring, and to determine whether the Release is harmful to human health or the environment;
c. Discussion of DQOs;
d. QAPP to demonstrate the sampling and analysis program is capable of yielding representative samples of all affected or potentially affected environmental media, such as groundwater, surface and subsurface soil, sediment, surface water, and/or air; and
e. Available existing data, with appropriate supporting documentation for the Secretary’s consideration, to partly or wholly satisfy the CS requirement.

III.H.2. CS Approval

The CS Work Plan must be approved by the Secretary, in writing, prior to implementation. The Secretary will specify the start date of CS Work Plan implementation in the written approval letter. The Secretary may approve, deny, or conditionally approve the CS Work Plan consistent with Permit Condition III.U.

III.H.3. CS Implementation

The Permittee shall implement the Confirmatory Sampling in accordance with the approved CS Work Plan.

III.H.4. CS Notification

The Permittee shall provide notification of all CS-related field activities in accordance with Permit Condition III.T.

III.H.5. CS Report

The Permittee shall prepare and submit to the Secretary in accordance with the schedule in the approved CS Work Plan, a CS Report summarizing confirmatory sampling activities and identifying all SWMUs and AOCs where a Release into the environment is confirmed. The CS Report shall include all data, including raw data, and a summary and analysis of the data that supports the above determination. If submission of the CS Report coincides with submission of the RFI Report, then the CS Report and the RFI Report may be combined into one submission.

III.H.6. Additional Activities
Based on the results of the CS Report, the Secretary shall determine the need for further investigation, interim measures, and/or corrective measure activities to address the SWMUs or AOCs covered in the CS Report. If the Secretary determines that such activities are needed, the Permittee shall be required to prepare and implement a plan for such as outlined in Permit Condition III.I., III.J., and/or III.K. If applicable, the Secretary will notify the Permittee of any further corrective action required, including remedial action, monitoring and/or institutional controls related to the specific SWMUs or AOCs being evaluated.

### III.I. RCRA FACILITY INVESTIGATION (RFI)

A previous three-phase RFI was conducted under EPA oversight to evaluate the SWMUs identified in Permit Condition III.C. The RFI reports dated March 30, 2000, January 26, 2006, and July 16, 2007 were approved by EPA, which determined that only SWMUs 1, 16, 17, 23, and 27 required further CA evaluation. The Secretary is accepting the previous RFIs as adequate and is not requiring additional RFIs at this time.

If later required, the Permittee shall conduct an RFI to investigate SWMUs and AOCs, as required by the Secretary, to determine the nature and extent of known and suspected Releases from each SWMU and AOC at the Facility identified in accordance with Permit Condition III.B., and to gather data to facilitate risk management decisions and support development of a Corrective Measures Study (CMS) or Presumptive Remedy Design Concept. The Permittee shall conduct the RFI in accordance with the approved RFI Work Plan, completed per current EPA guidance documents (*RCRA Facility Investigation Guidance, Volumes I through IV*, or equivalent). The RFI Work Plan(s) shall meet the requirements of Attachment 8, RCRA Facility Investigation Scope of Work, unless otherwise directed or approved by the Secretary. The Permittee shall conduct the RFI for each SWMU and AOC, in accordance with the Facility Submission Summary in Section III.V. of this Permit.

#### III.I.1. RFI Work Plan

**III.I.1.a. The Permittee shall prepare and submit to the Secretary, within sixty (60) calendar days of written notification by the Secretary, an RFI Work Plan for those SWMUs and AOCs identified under Permit Condition III.B. or III.C., or as otherwise directed by the Secretary. The RFI Work Plan(s) shall be developed to meet all requirements of Permit Condition III.I. and shall meet the requirements of Attachment 8, RFI Work Plan, unless otherwise directed or approved by the Secretary. Specifically, the RFI Work Plan(s) shall describe in detail all proposed activities and procedures to be conducted and the overall technical and analytical approach to completing all actions necessary to achieve investigation objectives.**
III.I.1.b. The RFI Work Plan(s) shall include schedules of implementation and completion of specific actions necessary to delineate and fully characterize the nature and lateral and vertical extent of contamination for all known and suspected contaminants of concern (COCs) for all affected or potentially affected environmental media at the Site. As a component of delineation/characterization efforts, the RFI is required to also fully assess any and all secondary contamination issues, such as those resulting from mobilization of naturally-occurring elements/substances in the presence of site-related contamination, degradation byproducts, or other secondary issues required by the Secretary.

The Permittee must provide sufficient justification and supporting documentation, for the Secretary’s approval, that a Release is highly unlikely to occur or that it has already been characterized, if a unit (i.e. SWMU, HWMU, AOC or Release) or a media/pathway associated with a unit, such as groundwater, surface water, soil, subsurface gas, or air, is not included in the RFI Work Plan(s). Such deletions of a unit, media or pathway from the investigation must be approved by the Secretary. The Permittee shall provide sufficient written justification for any omissions or deviations from the minimum requirements of Attachment 8. Such omissions or deviations must be approved by the Secretary. In addition, the scope of the RFI Work Plan(s) shall include all investigations necessary to ensure compliance with 40 CFR § 264.101(c).

III.I.1.c. The RFI Work Plan(s) must be approved by the Secretary, in writing, prior to implementation. The Secretary shall specify the start date of the RFI Work Plan schedule in the letter approving the RFI Work Plan(s). The Secretary may approve, deny, or conditionally approve the RFI Work Plan consistent with Permit Condition III.U.

III.I.2. RFI Implementation

III.I.2.a. The Permittee shall implement the RFI(s) in accordance with the approved RFI Work Plan(s) and Attachment 8.

III.I.2.b. The Permittee shall provide notification of all RFI-related field activities in accordance with Permit Condition III.T.

III.I.3. RFI Reporting
III.I.3.a. The Permittee shall prepare and submit to the Secretary Draft and Final RFI Report(s) for the investigations conducted pursuant to the RFI Work Plan(s) submitted under Permit Condition III.I.1. The Draft RFI Report(s) shall be submitted to the Secretary for review in accordance with the schedule in the approved RFI Work Plan(s). The Final RFI Report(s) shall be submitted to the Secretary within thirty (30) calendar days of transmittal of the Secretary’s final comments on the Draft RFI Report. The RFI Report(s) shall include an analysis and summary of all required investigations of SWMUs and AOCs and their results. The summary shall describe the type and extent of contamination at the Facility, including sources and migration pathways, identify all hazardous constituents present in all media, and describe actual or potential receptors. The RFI Report(s) shall also describe the extent of contamination, qualitative and quantitative, in relation to background levels indicative of the area. If the Draft RFI Report is a summary of the initial phase investigatory work, the Report shall include a work plan for the final phase investigatory actions that are required based on the initial findings. Implementation of any final phase work plan, as approved by the Secretary, shall be carried out in accordance with Permit Condition III.I.2. The objective of this requirement shall be to ensure that the investigation data are sufficient in quality and that quality assurance procedures have been followed, and sufficient in quantity to describe the nature and extent of contamination, potential threats to human health and/or the environment, and to support a CMS, if necessary.

III.I.3.b. The Permittee shall prepare and submit to the Secretary, along with the Draft and Final RFI Report(s), screening levels for each of the hazardous constituents reported in Permit Condition III.I.3.a. Screening levels shall be based on the most current version of KDHE’s Risk-Based Standards for Kansas (RSK) Manual, the latest EPA guidance, or as otherwise directed or approved by the Secretary.

III.I.3.c. The Secretary will review the RFI Report(s), including the screening levels described in Permit Condition III.I.3.b., and the Secretary shall notify the Permittee of the need for further investigation if the Secretary determines it is warranted, and inform the Permittee of the need for a CMS to meet the requirements of Permit Condition III.K. and 40 CFR § 264.101. The Secretary will notify the Permittee in the event that no further corrective action will be required, including any remedial action, monitoring and/or institutional controls. Any further investigation required by the Secretary shall be conducted in accordance with a schedule specified by the Secretary and as approved in accordance with Permit Condition III.U.
III.I.3.d. If the time required to conduct the RFI(s) is greater than one-hundred eighty (180) calendar days, the Permittee shall provide the Secretary with quarterly RFI Progress Reports at 90-day intervals, beginning ninety (90) calendar days from the start date specified by the Secretary in the RFI Work Plan approval letter. The Progress Reports shall contain the following information, at a minimum:

i. A description of the portion of the RFI completed;
ii. Summaries of findings;
iii. Summaries of any deviations from the approved RFI Work Plan during the reporting period;
iv. Summaries of any significant contacts with local community public interest groups or other state/local government entities;
v. Summaries of any problems or potential problems encountered during the reporting period;
vi. Actions taken to rectify problems;
vii. Changes in relevant personnel;
viii. Projected work for the next reporting period; and
ix. Copies of daily reports, inspection reports, data, and any other documentation required by the Secretary.

III.I.4. Assessment of Risk

A Human Health Risk Assessment (HHRA) report dated February 17, 2011 was evaluated under previous EPA oversite. The HHRA was conducted to support risk management and remedial decision-making for SWMUs 1, 16, 17, 23, and 27 which were identified as requiring further CA evaluation by the RFIs described in Permit Condition III.I. The Secretary is accepting the previous HHRA as adequate and is not requiring any additional Assessments of Risk at this time.

III.I.4.a. If later required, at a minimum, consistent with Permit Condition III.I.3.b., the Permittee shall assess the potential excess human health risk posed by site-related COCs through direct comparison to the Tier 2 Levels as provided in the most current version of KDHE’s RSK Manual, or as otherwise directed or approved by the Secretary. In addition, the Permittee shall perform a rapid assessment of ecological risk using the EPA Region 6 Ecological Exclusion Criteria Worksheet and Ecological Assessment Checklist, Attachment 9 Ecological Exclusion Screening Scope of Work.

III.I.4.b. Alternatively, as directed or approved by the Secretary, the Permittee shall perform a site-specific quantitative baseline HHRA and screening level ecological risk assessment/baseline ecological risk
assessment (SLERA/BERA), to determine whether and the extent to which corrective action is required and to arrive at cleanup goals for a site. Any site-specific baseline risk assessment, such as HHRA and SLERA/BERA, must be performed consistent with available EPA risk assessment guidance titled *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Parts A-F* (1989, 1991, 2001, 2004, & 2009), and any subsequent revisions or editions; and, *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments – Interim Final* (1997), and any subsequent revisions or editions; or, as otherwise directed and approved by the Secretary.

III.I.4.c. Prior to performing a Site-specific baseline risk assessment, the Permittee shall submit HHRA and SLERA/BERA Work Plans and, upon completion of site-specific risk assessment activities, the Permittee shall submit HHRA and SLERA/BERA reports, for the Secretary’s approval. All work plans and reports are subject to the provisions of Permit Condition III.U.

### III.J. INTERIM MEASURES (IM)

Extensive Interim Corrective Measures have been conducted over the years to address leachate seeps, waste breakouts, and landfill cap repairs at SWMUs 1, 16, and 17. A detailed summary description of previous IM are presented in the approved CMI Work Plan date December 21, 2017 included as Attachment 15. Previous IM at SWMU 16 and 17 resulted in the installation of Interim Recovery Collection (IRC) systems designed to intercept, recover, treat by elementary neutralization, and convey leachate to the cement plant for use as process water or to the Facility’s permitted CKD Monofill, SWMU 26. The IRC systems were included as components of the approved CMI Work Plan to address the required hydraulic control of landfill leachate specified in the *Final Remedy Decision for the Statement of Basis and Response to Comments* dated July 19, 2017.

If the Secretary determines, during the course of any activity initiated in compliance with the permit conditions of Section III of this Permit, that a Release or potential Release from a SWMU or AOC poses a threat to human health or the environment, the Secretary may require the Permittee to perform specific interim measures. Interim measures shall be used whenever necessary to achieve the goal of stabilization, which is to control or abate immediate threats to human health and the environment, and to prevent or minimize the spread of contamination while long-term corrective remedies are being evaluated. Alternatively, subject to the Secretary’s approval, the Permittee may propose interim measures implementation.

III.J.1. IM Work Plan/Design
III.J.1.a. Within thirty (30) calendar days of the Secretary’s written notification, the Permittee shall prepare and submit an IM Work Plan/Design for any SWMU or AOC, as determined necessary by the Secretary, or as proposed by the Permittee and approved by the Secretary for implementation. The IM Work Plan/Design shall meet the requirements of Attachment 10, Interim Measures Scope of Work, unless otherwise directed or approved by the Secretary. Such interim measures may be conducted concurrently with investigations required under the terms of this Permit.

III.J.1.b. The IM Work Plan/Design shall ensure that the interim measures are designed to mitigate any current or potential threat(s) to human health or the environment and are consistent with and integrated into any long-term remedy at the Facility. The IM Work Plan/Design shall include: the interim measures objectives, procedures for implementing the IMs, including any designs, plans, or specifications, and schedules for implementation.

III.J.1.c. The IM Work Plan/Design shall be approved by the Secretary, in writing, prior to implementation. The Secretary shall specify the start date of the IM Work Plan/Design schedule in the letter approving the IM Work Plan/Design. The Secretary may approve, deny, or conditionally approve the RFI Work Plan consistent with Permit Condition III.U.

III.J.1.d. The Permittee shall notify the Secretary within twenty-four (24) hours of becoming aware of the need for IM implementation to mitigate or stabilize any emergency that poses an immediate threat to public health or the environment. In the case of an emergency, the Permittee may initiate interim measures at a SWMU or AOC concurrent with submitting notification to the Secretary. The Secretary may require the Permittee to perform additional mitigative measures, request submission of an IM Work Plan/Design per Permit Condition III.J.1.a., and/or request submission of an IM Report per Permit Condition III.J.3. The Permittee shall comply with the Secretary’s additional requirements according to the timeline set by the Secretary.

III.J.2. IM Implementation

III.J.2.a. The Permittee shall implement the interim measures in accordance with the approved IM Work Plan/Design in Attachment 10.
III.J.2.b. The Permittee shall provide notification of all IM-related field activities in accordance with Permit Condition III.T.

III.J.2.c. Final approval of corrective action required under 40 CFR § 264.101 which is achieved through interim measure implementation shall be in accordance with 40 CFR § 270.41 and Permit Condition 1.B.1. as a permit modification.

III.J.3. IM Reporting

III.J.3.a. If the time required for completion of interim measure implementation is greater than one (1) year, the Permittee shall provide the Secretary with progress reports at intervals specified in the approved IM Work Plan or semi-annually for Permittee-initiated interim measures. The Progress Reports shall contain the following information at a minimum:

i. A description of the portion of the IM completed;
ii. Summaries of findings;
iii. Summaries of any deviations from the IM Work Plan during the reporting period;
iv. Summaries of any problems or potential problems encountered during the reporting period; and
v. Projected work for the next reporting period.

III.J.3.b. The Permittee shall prepare and submit to the Secretary, within ninety (90) calendar days of completion of interim measures conducted under Permit Condition III.J., an IM Report. The IM Report shall contain the following information at a minimum:

i. A description of interim measures implemented;
ii. Summaries of results;
iii. Summaries of all problems encountered;
iv. Summaries of accomplishments and/or effectiveness of IM; and
v. Copies of all relevant laboratory/monitoring data, or other documents required by the Secretary in accordance with Permit Condition I.E.11.

III.J.3.c. The Secretary may require the Permittee to perform additional interim measures and/or corrective action activities to ensure permit requirements are fully met and threats to public health and the environment are adequately addressed.
III.K. CORRECTIVE MEASURES STUDY (CMS)

A Draft CMS Work Plan was originally submitted to EPA on April 1, 2009 with subsequent revisions submitted July 19, 2009 and March 1, 2012. The CMS Work Plan was approved by EPA April 10, 2012. The CMS included remedy design concepts that were evaluated by EPA for inclusion in their final remedy decision. The Secretary is accepting the previously approved 2012 CMS as adequate and is not requiring an additional CMS at this time.

Based on the results of an RFI, as required by the Secretary under Permit Condition III.I.3.c., the Permittee shall conduct a CMS to identify, screen, and develop the alternative(s) for removal, containment, treatment and/or other remediation of the contamination. The Permittee shall conduct the CMS in accordance with Attachment 11, CMS Scope of Work, and per current guidance documents from EPA (RCRA Corrective Action Plan – Final, May 1994, EPA/520-R-94-004), or equivalent as approved by the Secretary. The Secretary may require the Permittee to evaluate as part of the CMS one or more additional potential corrective measures. These corrective measures may include a specific technology or combination of technologies that, in the Secretary’s judgment, achieves protection of human health and the environment.

The Permittee may seek approval from the Secretary for concurrent RFI/CMS. The CMS may be performed concurrently with the RFI process only if the Secretary determines that sufficient investigative details are available to allow concurrent action.

III.K.1. CMS Work Plan

III.K.1.a. The Permittee shall prepare and submit a CMS Work Plan within ninety (90) calendar days of written notification by the Secretary that a CMS Work Plan is required. The CMS Work Plan shall meet the requirements of Attachment 11, CMS Scope of Work, unless otherwise directed or approved by the Secretary.

III.K.1.b. The CMS Work Plan must be approved by the Secretary, in writing, prior to implementation. The Secretary shall specify the start date of the CMS Work Plan schedule in the letter approving the CMS Work Plan. The Secretary may approve, deny, or conditionally approve the CMS Work Plan consistent with Permit Condition III.U.

III.K.1.c. If the Secretary requires a CMS Work Plan, the Permittee must provide sufficient justification and/or documentation for any SWMU or AOC deleted from the CMS Work Plan. Such deletion of a SWMU or AOC is subject to the approval of the Secretary.

III.K.2. CMS Implementation
III.K.2.a. The Permittee shall implement the CMS in accordance with the approved CMS Work Plan, if required, and Attachment 11, CMS Scope of Work.

III.K.2.b. The Permittee shall provide notification of all CMS-related field activities in accordance with Permit Condition III.T.

III.K.2.c. If the Secretary does not require a CMS Work Plan, the Permittee must provide sufficient justification and/or documentation for any SWMU or AOC deleted from CMS Implementation. Such deletion of a SWMU or AOC is subject to the approval of the Secretary.

III.K.3. CMS Reporting

III.K.3.a. The Permittee shall prepare and submit a CMS Report to the Secretary for those SWMUs and AOCs where are located at concentrations exceeding those appropriate for the protection of human health and the environment. The CMS Report shall present all information gathered under the approved CMS Work Plan, if required, and shall be consistent with the most recent version of the EPA guidance document entitled, *RCRA Corrective Action Plan – Final, May 1994*, EPA/520-R-94-004, and the requirements in Attachment 11, CMS Scope of Work. The CMS Report must contain adequate information for the Secretary to select the corrective measure(s) necessary to protect human health and the environment from Releases at or from the Facility.

III.K.3.b. The Permittee shall submit the CMS Report according to the schedule specified in the approved CMS Work Plan, if required, or as specified in the Facility Submission Summary in Section III.V.

III.K.3.c. Where interim measures have been implemented and are anticipated to constitute the final remedy, and subject to the Secretary’s approval, the Permittee may prepare a Focused CMS Report following the general CMS outline in Permit Conditions III.K. Within the Focused CMS, the Permittee shall propose the final corrective remedy for the Facility, a justification of why the proposed corrective actions are protective of human health and the environment, and the proposed criteria adequate for the Secretary to determine when the proposed corrective actions shall be considered complete.
III.K.3.d. The Secretary may approve, deny, or conditionally approve the CMS Report or the Focused CMS Report consistent with Permit Condition III.U.

III.K.4. Presumptive Remedy Design Concept

III.K.4.a. The Permittee may develop a Presumptive Remedy Design Concept without the comparative alternatives analysis element typical of a CMS, with detailed justification for an alternate approach and subject to the Secretary’s approval. All other CMS-related requirements contained in Section III.K. apply to design concept development and implementation.

III.K.4.b. The Secretary may approve, deny, or conditionally approve the Presumptive Remedy Design Concept consistent with Permit Condition III.U.

III.L. CORRECTIVE MEASURES SELECTION AND PERMIT MODIFICATION

In July 2015 the EPA placed on public notice a Statement of Basis describing their proposed final remedy decision for SWMUs 1, 16, 17, 23, and 27 identified in Permit Condition III.I as requiring further CA evaluation. The proposed final remedy required: maintenance and repair of existing landfill caps, hydraulic control of landfill leachate, monitored natural attenuation of groundwater contamination, institutional land use controls, and groundwater and surface water monitoring. In July 2017 EPA issued their Final Statement of Basis and Final Remedy Decision, which is included in Attachment 4.

The Secretary accepts the EPA Final Statement of Basis and Final Remedy Decision and is incorporating it into this Permit as equivalent to the Secretary’s final Corrective Measures Decision and requires the Permittee to continue implementing the EPA selected corrective measures as described in Permit Condition III.M.

The Secretary will select corrective measure(s) that the Secretary determines will: (1) protect human health and the environment; (2) attain media cleanup standards set by the Secretary; (3) control the source(s) of Releases so as to reduce or eliminate, to the maximum extent practicable, further Releases that may pose a threat to human health and the environment; and, (4) meet all appropriate state and federal requirements. Before selecting corrective measures, the Secretary will prepare a Fact Sheet that identifies the preferred corrective measure(s) and provides the reasons for the selection. The Secretary will make a final Corrective Measures Decision after public notice and public review of the Fact Sheet and supporting documents and review of public comments. If necessary, the Secretary will initiate a permit modification pursuant to 40 CFR § 270.41 to require implementation of the preferred corrective measure or measures. Alternatively, this Permit...
may be modified by the Permittee pursuant to 40 CFR § 270.42(c) for the implementation of the KDHE-selected corrective measure(s).

III.L.1. A corrective measures decision shall be selected from the remedial alternatives evaluated in the CMS. It will be based, at a minimum, on protection of human health and the environment, based on specific Site conditions and existing regulations. The selected corrective measures may include any interim measures implemented to date.

III.L.2. The public will be provided an opportunity to review and comment on the Fact Sheet and supporting documents.

III.L.3. Following the public comment period, the Secretary may approve the CMS Report and select a final corrective measure(s) or require the Permittee to revise the CMS Report and/or perform additional CMS activities.

III.L.4. The Secretary will notify the Permittee of the final corrective measure selected by the Secretary in the Corrective Measures Decision and Response to Comments. The notification will include the Secretary’s reasons for corrective measure(s) selection.

III.L.5. Pursuant to 40 CFR § 270.41, a permit modification may be initiated by the Secretary, after recommendation of corrective measures(s), under Permit Condition I.B.1. This modification will serve to incorporate corrective measures and implementation schedules into this Permit. The permit modification shall include a schedule and date for corrective measures measure(s) implementation. Upon the effective date of the permit modification approving the selected corrective measure(s), the Permittee shall implement the approved remedy per the Corrective Measures Implementation schedule. The Permittee shall submit the corrective measures implementation and/or final remedy effectiveness reports annually to the Secretary in accordance with Permit Condition III.M.3.c.

III.L.6. The Permittee shall provide cost estimates and demonstrate financial assurance for completing the Interim Measures approved in accordance with Permit Condition III.J. or the remedy approved in accordance with Permit Condition III.M. and shall meet the timelines for these requirements set out in the compliance schedule(s) in the Facility Submission Summary in Section III.V. Thereafter, the Permittee shall review the remedy cost estimates, adjust the financial assurance instrument, and submit to the Secretary any necessary changes in the cost estimates and adjustments to the financial assurance instrument annually. The mechanism for financial assurance may be one that is described and allowable under 40 CFR §§ 264.140 through 264.151, Subpart H, subject to the Secretary’s discretion. Permittee shall submit the financial
assurance in the form approved by the Secretary in the amount of the approved cost estimate.

III.M. CORRECTIVE MEASURES IMPLEMENTATION

A Previous CMI Work Plan was submitted to EPA on December 21, 2017 and approved with conditions on February 9, 2018. A revised CMI Work Plan to address EPA’s conditional approval was submitted February 26, 2018; however, EPA did not approve the revised CMI Work Plan and on May 15, 2018 EPA modified the Facility’s HSWA Part II Permit to include the originally submitted CMI Work Plan. The Secretary is accepting the EPA approved CMI Work Plan as equivalent to the CMI Work Plan required by Permit Condition III.M. and is incorporating the CMI Work Plan as Attachment 15.

The Facility has implemented the CMI Work Plan and submitted to EPA a CMI Report dated June 27, 2019 documenting completion of all required construction activities and other corrective measures implementation requirements approved in the CMI Work Plan. EPA approved the CMI Report with conditions in an e-mail dated July 1, 2019 and clarified in a follow-up letter dated March 31, 2020 that since the approval of the CMI Report the Facility has been in the operation and maintenance phase of the CMI Work Plan. The Secretary is accepting the EPA approved CMI Report as equivalent to the Corrective Measures Construction Completion (CMCC) Report required by Permit Condition III.M.3.b.

As stated above the Facility is in the operation and maintenance phase of the CMI Work Plan. The requirements set forth in the Groundwater Monitoring Plan (GWMP) and Operations and Maintenance (O&M) Plan, Appendix C and G of the revised CMI Work Plan dated February 26, 2018 shall become conditions of this permit. The O&M Plan and GWMP are both standalone plans and have been included as Attachments 5 and 6 respectively. All requirements that make references to USEPA in the GWMP and O&M Plan shall mean KDHE and all references to the Part II permit shall mean this Permit when the meaning of the substitution is not a contradiction of fact.

If, subsequent to this Permits effective date, the Secretary selects a new or additional final remedy/corrective measure in accordance with the provisions of this Permit, the Permittee shall within sixty (60) calendar days of that selection submit a Corrective Measures Implementation (CMI) Work Plan to implement the selected corrective measure(s). The CMI Work Plan shall meet the requirements of Attachment 12, Corrective Measures Implementation Scope of Work, unless otherwise directed or approved by the Secretary. All CMI-related activities shall be conducted in a manner consistent with available EPA guidance (RCRA Corrective Action Plan, EPA 520-R-94-004 – Final, May 1994.

III.M.1. CMI Work Plan
The CMI Work Plan shall be approved by the Secretary, in writing, prior to implementation. The Secretary shall specify the start date of the CMI Work Plan schedule in the letter approving the CMI Work Plan. The Secretary may approve, deny, or conditionally approve the CMI Work Plan consistent with Permit Condition III.U.

III.M.2. The Permittee shall implement the corrective measures in accordance with the approved CMI Work Plan in Attachment 15. The Permittee shall provide notification of all CMI-related field activities in accordance with Permit Condition III.T. If the Secretary deems it warranted, the Secretary may require the Permittee perform additional corrective action measures to ensure permit requirements are fully met.

III.M.3. CMI Reporting

III.M.3.a. If the time required for completion of corrective measure implementation is greater than one (1) year, the Permittee shall provide the Secretary with progress reports at intervals specified in the approved CMI Work Plan. The Progress Reports shall contain the following information at a minimum:

i. A description of the portion of the corrective measures completed;
ii. Summaries of findings;
iii. Summaries of any deviations from the CMI Work Plan during the reporting period;
iv. Summaries of any problems or potential problems encountered during the reporting period; and
v. Projected work for the next reporting period.

III.M.3.b. The Permittee shall prepare and submit to the Secretary, in accordance with the approved CMI Work Plan schedule, a Corrective Measures Construction Completion (CMCC) Report. The CMCC Report shall contain the following information at a minimum:

i. Description of purpose of the CMCC Report;
ii. Synopsis of the corrective measure(s), design criteria, and certification that the corrective measure(s) was constructed in accordance with the final plans and specifications as contained in the CMI Work Plan;
iii. Explanation and description of any modifications to the Secretary-approved CMI Work Plan and why these were necessary for the project;
iv. Results of any operational testing and/or monitoring, indicating how initial operation of the corrective measure(s) compares to the design criteria;

v. Summary of significant activities that occurred during construction, including a discussion of problems encountered and how they were addressed;

vi. Summary of inspection findings, including copies of key inspection documents in appendices; and,

vii. As-built drawings, process flow diagrams, and photographs depicting the constructed corrective measure(s).

III.M.3.c. The Permittee shall submit a CMI Annual Report to the Secretary, no later than March 1 of each year, of the prior year’s performance of the corrective measures, above, including Institutional Controls (ICs). The CMI Annual Report shall include documentation of all samples and data collected and their analysis, and an evaluation of both the short-term and long-term effectiveness of the corrective measures. The CMI Annual Report shall include any deficiencies or violations of engineering controls (ECs) or ICs determined from the inspection, maintenance, and monitoring required in the Corrective Measures Implementation Work Plan. Based upon the Secretary’s review of the report, the Secretary may require the Permittee to conduct additional investigation, study, and/or work in order to modify an existing corrective measure or to select a new corrective measure or measures. If action is needed to protect human health or the environment from Releases or to prevent or minimize the further spread of contamination while long-term remedies are pursued, the Secretary may require the Permittee to implement Interim Measures pursuant to Permit Condition III.J.

III.M.3.d. Every five (5) years, the Permittee shall submit a report to the Secretary that evaluates the effectiveness and performance of CMI. The Permittee shall submit to the Secretary for review and approval a Five-Year Corrective Measures Performance Evaluation Report. The evaluation shall be consistent with the CERCLA Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P, June 2001, and any subsequent revisions or additions, or as otherwise directed by the Secretary, and include the following:

i. Annual reports required in the CMI Work Plan;

ii. Effectiveness of corrective measures in protecting human health and the environment as described in the final Corrective Measures Decision (CMD);
iii. Effectiveness of ECs and ICs in protecting human health and the environment as described in the CMD;
iv. Results of sampling and analysis to determine the effectiveness and performance of the corrective measures;
v. Any changed circumstances that render the corrective measures, including ECs and ICs, ineffective;
vi. Possible modifications to the corrective measures to provide necessary protection; and
vii. Any other reporting requirements included in the Secretary-approved CMI Work Plan.

Based upon the Secretary’s review of the report, the Secretary may require the Permittee to conduct additional investigation, study, and/or work in order to modify an existing corrective measure or to select a new corrective measure(s). If action is needed to protect human health or the environment from Releases or to prevent or minimize the further spread of contamination while long-term remedies are implemented, the Secretary may require the Permittee to implement Interim Measures pursuant to Permit Condition III.J.

III.M.3.e. The Permittee shall submit a Corrective Measures Completion (CMC) Report to the Secretary within ninety (90) calendar days of the completion of all corrective measures activities required by Permit Condition III.M. for the Facility or for individual SWMUs. The purpose of the CMC Report is to fully document how the corrective measure(s) completion criteria have been satisfied and to justify why the corrective measure(s) and/or monitoring may cease. The CMC Report shall, at a minimum, include the following elements:

i. Purpose;
ii. Synopsis of the corrective measure(s);
iii. CMC Criteria: Describe the process and criteria for determining when corrective measure(s), maintenance and monitoring may cease;
iv. Demonstration that the completion criteria have been met. Include results of testing and/or monitoring, indicating how operation of the corrective measure(s) compares to the completion criteria;
v. Summary of work accomplishments, including performance levels achieved, total treated and/or excavated volumes, nature and volume of wastes generated, and other items required by the Secretary;
vi. Summary of significant activities that occurred during operations. Include a discussion of problems encountered and how they were addressed;

vii. Summary of inspection findings, including copies of key inspection documents in appendices;

viii. Summary of total operation and maintenance costs; and

ix. Determination of whether ECs and/or ICs are required to be maintained.

The Secretary may approve, deny or conditionally approve the CMC Report consistent with Permit Condition III.U.

III.N. CHANGE IN PROPERTY USE

If property use restrictions are included as a part of the Secretary-selected corrective measures, before the property use can be changed, the Permittee shall submit a request for a permit modification, in addition to any necessary revisions or amendments to the restrictive covenant, to include a new risk assessment, as determined necessary by the Secretary, and a CMS, or equivalent, that addresses potential exposures associated with the proposed property use. The Secretary may approve, deny, or conditionally approve the permit modification supporting documentation consistent with Permit Condition III.U. Changes in corrective measures shall be selected in accordance with procedures in Permit Condition III.L. Upon final selection and modification into the Permit, the Permittee shall implement any new corrective measures.

III.O. ADDITIONAL TASKS

If at any time during implementation of corrective action under this Permit the Secretary determines that additional tasks are necessary to accomplish the corrective action required by this Permit or by applicable laws, the Secretary will provide written notification to the Permittee of the requirement for additional tasks to be performed by the Permittee. The Secretary may determine that certain tasks, including, but not limited to, investigatory work or engineering evaluation are necessary in addition to the tasks and deliverables already required under this Permit. The Secretary will specify the basis and reasons for its determination that the additional tasks are necessary and will request submittal of a draft work plan to perform the additional tasks. Within sixty (60) days of the Secretary’s written request, the Permittee shall submit a draft work plan. The Secretary may approve, deny, or conditionally approve the draft work plan consistent with Permit Condition III.U. Upon the Secretary’s approval, the Permittee shall perform the additional work according to the Secretary-approved work plan. The completion of the additional work, as specified in this permit condition, shall be documented by the Permittee in accordance with the approved schedule for the additional work.
III.P. INSTITUTIONAL CONTROL (IC) REQUIREMENTS

Previous IC Plans were submitted as a component of the December 21, 2017 CMI Work Plan approved by EPA on February 9, 2018. A draft Environmental Restrictive Covenant was approved by EPA and KDHE October 9, 2018. The approved Environmental Restrictive Covenant was recorded by the Neosho County Register of Deeds on December 10, 2018. A copy of the Environmental Restrictive Covenant is included in Appendix G of the approved CMI Report dated June 27, 2019.

III.P.1. IC Requirement

If contamination will remain at the Facility at levels that do not allow for unrestricted use and unlimited exposure, the Permittee and any subsequent owners or operators shall implement ICs to ensure protection of human health and the environment by minimizing the potential for exposure to contamination that remains on the Facility property. At a minimum, ICs shall ensure the Facility property is not developed, used, or operated in a manner incompatible with the Secretary-approved corrective measures. Required ICs shall be maintained for the duration of this Permit and any subsequent modifications or renewals, or as otherwise directed by the Secretary or as recorded with the property deed. ICs shall also include Restrictive Covenants and/or Easements required by Permit Condition II.B.2.

III.P.2. IC Guidance

The ICs shall be consistent with available EPA guidance as approved by the Secretary, including but not limited to, Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites, EPA-540-R-09-001, OSWER 9355.0-89, December 2012; Institutional Controls: A Guide to Preparing Institutional Control Implementation and Assurance Plans at Contaminated Sites, EPA-540-R-09-002, OSWER 9200.0-77, December 2012; and, Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, EPA 540-F-00-005, OSWER 9355.0-74FS-P, September 2000.

III.P.3. IC Plan

The Permittee shall propose to the Secretary in a detailed IC Plan the ICs to be implemented if cleanup standards allowing for unrestricted use at the Facility are not attainable. The IC Plan must be submitted within thirty (30) calendar days following the determination that unrestricted use cleanup standards have not been attained, or as otherwise directed by the Secretary.
The IC Plan shall include:

a. Drafts of all proposed IC documents and/or instruments;

b. Specifications and schedule for monitoring, review and reporting on the
effectiveness of the IC(s); and

c. A schedule for the implementation of the IC Plan, and a title search report for
the Facility.

The Secretary will review the IC Plan for approval in accordance with the
procedures in Permit Condition III.U. Upon approval of the IC Plan by the
Secretary, the Permittee shall implement the IC Plan in conformance with the
schedule contained therein.

In accordance with Permit Condition II.B.2. and III.V. the Permittee shall record
all instruments approved by the Secretary with the register of deeds in the county
where the property is located, and shall timely submit to the Secretary a copy of the
recorded instrument with the notarized signature of the applicant and the seal of the
register of deeds indicating the agreement has been recorded.

The requirements for ICs shall be maintained as specified in this Permit and shall
not be terminated until the Secretary has determined that the concentration of
hazardous constituents in the soil and groundwater are at such levels to allow for
unrestricted use. Before ICs are terminated or modified, the Secretary must agree
in writing to any modification or termination of ICs.

III.P.5. IC Implementation

The Permittee, and any subsequent owner or operator, shall implement all ICs
pursuant to Kansas statutes and regulations, to prevent unacceptable exposures to
human health and the environment.

III.Q. CORRECTIVE ACTION SCHEDULE OF COMPLIANCE MODIFICATION

III.Q.1. If at any time the Secretary determines that modification of the corrective action
schedule of compliance is necessary, the Secretary may initiate a modification to
the corrective action schedule of compliance. Modifications that are initiated and
finalized by the Secretary will be in accordance with the applicable provisions of
40 CFR § Part 270.

III.Q.2. The Permittee may also request a permit modification in accordance with 40 CFR
§ Part 270 to change the corrective action schedule of compliance.
III.R. WORK PLAN AND REPORT REQUIREMENTS

III.R.1. All work plans and schedules shall be subject to approval by the Secretary prior to implementation to assure that such work plans and schedules are consistent with the requirements of this Permit and with applicable regulations. Any approved schedule of implementation contained in any work plan, addendum, or additional phases becomes part of the Permit. The Permittee shall revise all submissions and schedules as specified by the Secretary. Upon approval, the Permittee shall implement all work plans and schedules as written and approved.

III.R.2. All work plans and reports shall be submitted in accordance with the approved schedule. Extensions of the due date for submissions may be granted by the Secretary based on the Permittee’s demonstration that sufficient justification for the extension exists.

III.R.3. If the Permittee at any time determines that the corrective action work having been or being performed no longer satisfies the requirements of 40 CFR § 264.101 or this Permit for prior or continuing Releases from SWMUs or AOCs, the Permittee shall submit an amended work plan(s) to the Secretary within ninety (90) calendar days of such determination.

III.R.4. One (1) hard copy of all reports and work plans and a searchable electronic version of the same reports/work plans shall be provided by the Permittee to the Secretary as described in Condition I.H.

III.S. REIMBURSEMENT OF KDHE CORRECTIVE ACTION COSTS

The Permittee shall reimburse KDHE costs as defined herein, pursuant to K.S.A. 65-3453(a)(4), K.S.A. 65-3453(a)(6), K.S.A. 65-3455, and 65-34,175, for all corrective action activities performed under this Permit:

III.S.1. “KDHE costs” shall mean all direct and administrative costs and expenditures incurred by or on behalf of KDHE to conduct or support corrective action activities at the Site including all costs associated with actions necessary to respond to an environmental threat. The term “direct costs” shall include, but is not limited to, employee or contractor time related to oversight, sampling, investigation work, corrective action work, document review and preparation, negotiation and preparation of enforcement documents and actions, internal and external discussions, travel expenses, and public involvement activities; equipment used; and other costs directly associated with, or incurred at or in relation to, the Facility. The term “administrative costs” shall include, but is not limited to, overhead and general administrative expenses.
KDHE costs incurred from the effective date of the Permit until the end of the next calendar quarter shall be billed forty-five (45) days following the end of the calendar quarter. Thereafter, KDHE shall bill the Permittee for all KDHE costs incurred during each calendar quarter forty-five (45) days following the end of the calendar quarter. Unless the Permittee disagrees with the KDHE costs pursuant to III.S.5., payment of the invoice is due upon receipt for which the Permittee shall remit a check for the full amount of those KDHE costs made payable to the Kansas Department of Health and Environment. Failure to pay the total invoice due within thirty (30) days of issuance of the invoice shall be considered a violation of the Permit. An exemplar of the invoice to be used is Attachment 13.

III.S.3. Payment for all KDHE costs assessed to the Permittee shall be made to the attention of the program contact and address noted on the invoice:

Kansas Department of Health and Environment
Bureau of Waste Management
1000 SW Jackson Street, Suite 320
Topeka, KS 66612-1366

A copy of the check and transmittal letter shall be sent to the Secretary as outlined in Permit Condition I.H.

III.S.4. KDHE costs that have been invoiced to the Permittee and that are past due and owing shall be subject to interest if the Secretary initiates a civil action to enforce the cost reimbursement requirements in this Permit. The Secretary shall notify the Permittee in writing of its requirements to pay KDHE’s past-due costs before filing a civil action to enforce any cost reimbursement requirements. Interest shall be calculated pursuant to K.S.A. 16-201 and K.S.A. 16-204, as applicable.

III.S.5. In the event the Permittee disagrees with any cost invoiced under this Permit, the Permittee shall, within fifteen (15) days of receipt of the applicable invoice, send written notice of cost disagreement to the Secretary, in the manner described in Permit Condition I.H., stating the specific terms of the disagreement, and providing copies of relevant information.

III.S.5.a. Within thirty (30) days of receipt of any such notice of cost disagreement from the Permittee, the Secretary and the Permittee shall meet by telephone or in person to attempt to reach agreement on the matter. If the parties cannot reach agreement by consent during this period, the Secretary shall issue a final written decision on the cost disagreement.
III.S.5.b. In the event that the Permittee seeks resolution of cost disagreement concerning an invoice, the date for payment of the invoice shall be extended for a period equal to and running concurrent with the delay resulting from the invocation of the cost disagreement resolution provision. However, such extension does not alter the schedule for performance or completion of any other tasks required by this Permit, including but not limited to timely payment of preceding and subsequent invoices.

III.S.5.c. In the event that the Secretary determines that resolution of cost disagreement was not sought in good faith, the Permittee shall be responsible for all additional KDHE costs incurred as a result of the Permittee invoking resolution of cost disagreement.

III.T. CORRECTIVE ACTION FIELD ACTIVITIES NOTIFICATION

The Permittee shall provide the Secretary at least fourteen (14) calendar days advance written notification before conducting any investigation and/or corrective action, or other ancillary activities related to such measures, whether conducted pursuant to this Permit or to a request, requirement, or order from any other federal, state, or local regulatory authority where the resultant data or information would be used in part or in full to satisfy requirements of this Permit. Failure to provide advance written notification may result in the Secretary rejecting the data obtained or work performed by the Permittee. Once the Permittee is formally notified of web-based form availability, advance written notification shall be provided by the Permittee by completing the KDHE-BWM Hazardous Waste Permitting Section Field Activities Notification Form on the KDHE website for each activity as distinguished by separate field mobilizations. Until the point of such formal notification, or if internet or website access is not available, the Permittee shall submit the KDHE-BWM Hazardous Waste Permitting Section Field Activities Notification Form, Attachment 14, to the Secretary, in the manner described in Permit Condition I.H.

III.U. CORRECTIVE ACTION DOCUMENT SUBMITTAL AND WORK PERFORMANCE REQUIREMENTS

III.U.1. Document Submission and Approval Process

In accordance with Permit Conditions I.H. and as outlined in Permit Condition III.V., the Permittee shall submit identified, required, or requested documents to the Secretary within the timeframes established in this Permit, or as otherwise approved, required, or specified directed by the Secretary. The Secretary shall review the document and send a written letter to the Permittee indicating approval, approval with comment, approval with conditions, denial, or such other designation as the Secretary determines appropriate.
If the Secretary conditionally approves the document, the Permittee will be notified of the conditions. The conditionally approved, modified document shall be the approved document.

If the Secretary denies approval of the document, the Secretary may either: (1) notify the Permittee in writing of the document’s deficiencies and specify a due date for submission of a revised document; or (2) revise the document and notify the Permittee of the revisions, and the revised document shall be the approved document.

If the Secretary requires a written response and/or document revision, the Permittee shall provide such in the form and by the due date specified in the Secretary’s letter.

III.U.2. Inadequate Document Modification - Notice

In the event that the Permittee does not respond to the Secretary’s written request or requirement as described in Section III.U.1., or if the Secretary finds that a document submitted pursuant to this Permit is deficient, the Secretary may issue a notice to the Permittee requesting that the Permittee make specific modifications to any document required by this Permit. The notice will set out the deficiencies in the document or work, describe the necessary modifications to address the deficiencies, and provide a timeframe to correct the deficiencies. Failure to timely revise, correct, or otherwise adequately respond to the Secretary’s notice shall be a violation of this Permit and may subject the Permittee to additional tasks, actions, or penalties.

III.U.3. Work Takeover – Notice

If the Permittee fails to timely revise, correct, or otherwise respond to the Secretary’s written requirement for document modification or work performance, or if the Secretary determines the Permittee either: 1) has ceased implementation of any of the work; 2) is seriously or repeatedly deficient or late in its performance of the work; or 3) is implementing the work in a manner which may cause an endangerment to human health or the environment, the Secretary at its discretion, may assume or arrange for a contractor or contractors to assume the performance of all or any portions of the work, as the Secretary determines necessary. If the Secretary determines that such a work takeover is necessary, the Secretary will send the Permittee a Notice of Work Takeover specifying a date upon which the Secretary may assume or arrange for a contractor or contractors to assume the performance of all or any portions of the work. In the event of work takeover, pursuant to K.S.A. 65-3453(a)(4), K.S.A. 65-3453(a)(6) and 65-34,175, the Permittee shall pay for all costs incurred by the Secretary and by any contractor.
who performs work pursuant to this paragraph. For purposes of this paragraph, “work” shall mean any condition, task, or schedule required by this Permit.

III.U.4. Additional Tasks May Be Required

The Secretary may determine that tasks or conditions may be required in addition to those specified in the approved work plans or associated documents/reports, as identified in Permit Condition III.V. In the event the Secretary makes such a determination, the Secretary will notify the Permittee in writing that additional tasks or conditions are necessary in order to meet the goals and objectives of this Permit, to assess risk in accordance with Permit Condition III.I.4. for any additional contaminant(s) detected, to conform to applicable laws, and/or to protect public health or safety or the environment. If such tasks or conditions are required, they shall be completed as specified by the Secretary and within the timeframes established by the Secretary.

III.U.5. Failure to Comply

Failure to comply with any of the terms and conditions of this Permit shall be considered a violation of this Permit and may subject the Permittee to such administrative actions and penalty provisions as set forth in this Permit or as otherwise authorized by law.

III.V. FACILITY SUBMISSION SUMMARY

The following is a summary of the required Facility submissions/reporting pursuant to Section III of this Permit.

<table>
<thead>
<tr>
<th>SUBMISSION REQUIREMENTS</th>
<th>DUE DATE</th>
<th>PERMIT CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notification of Newly-Identified or Suspected New SWMUs or AOCs</td>
<td>No later than fifteen (15) calendar days from discovery</td>
<td>III.E.1.</td>
</tr>
<tr>
<td>SWMU/AOC Preliminary Assessment Report</td>
<td>Within thirty (30) calendar days of notification per Permit Condition III.E.1.</td>
<td>III.E.2.</td>
</tr>
<tr>
<td>Notification of Newly-Discovered Releases from Previously Identified SWMUs and AOCs</td>
<td>No later than fifteen (15) days from discovery</td>
<td>III.F.1.</td>
</tr>
<tr>
<td>DCC Report</td>
<td>Within ninety (90) calendar days from date of the Secretary’s written request</td>
<td>III.G.1.</td>
</tr>
<tr>
<td>CS Work Plan</td>
<td>Within forty-five (45) calendar days from date of the Secretary’s written request</td>
<td>III.H.1.</td>
</tr>
<tr>
<td>SUBMISSION REQUIREMENTS</td>
<td>DUE DATE</td>
<td>PERMIT CONDITION</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------</td>
<td>------------------</td>
</tr>
<tr>
<td>CS Report</td>
<td>According to the schedule contained in approved CS Work Plan</td>
<td>III.H.5.</td>
</tr>
<tr>
<td>RFI Work Plan</td>
<td>Within sixty (60) calendar days from date of the Secretary’s written request</td>
<td>III.I.1.a.</td>
</tr>
<tr>
<td>RFI Report</td>
<td>According to schedule contained in approved RFI Work Plan and/or any RFI Work Plan addenda</td>
<td>III.I.3.a.</td>
</tr>
<tr>
<td>Quantitative Baseline HHRA and SLERA/BERA Work Plan(s)</td>
<td>As directed or approved by the Secretary</td>
<td>III.I.4.c.</td>
</tr>
<tr>
<td>Quantitative Baseline HHRA and SLERA/BERA Reports</td>
<td>As directed or approved by the Secretary</td>
<td>III.I.4.c.</td>
</tr>
<tr>
<td>IM Work Plan/Design</td>
<td>Within thirty (30) calendar days from date of the Secretary’s written request</td>
<td>III.J.1.a.</td>
</tr>
<tr>
<td>IM Report</td>
<td>Within ninety (90) calendar days of IM completion</td>
<td>III.J.3.b.</td>
</tr>
<tr>
<td>CMS Scope of Work</td>
<td>Within ninety (90) calendar days from date of the Secretary’s written request</td>
<td>III.K.</td>
</tr>
<tr>
<td>CMS Report</td>
<td>Within ninety (90) calendar days from date of the Secretary’s written request</td>
<td>III.K.5.</td>
</tr>
<tr>
<td>CMI Work Plan</td>
<td>Within sixty (60) calendar days of the Secretary’s selection of final remedy/corrective measure</td>
<td>III.M.</td>
</tr>
<tr>
<td>CMCC Report</td>
<td>According to schedule contained in approved CMI Work Plan</td>
<td>III.M.3.b.</td>
</tr>
<tr>
<td>CMI Annual Report</td>
<td>No later than March 1 of each year reporting on prior year’s effectiveness and performance of corrective measures</td>
<td>III.M.3.c.</td>
</tr>
<tr>
<td>CMC Report</td>
<td>Within ninety (90) calendar days of the completion of all corrective measures activities for the Facility or for individual SWMUs</td>
<td>III.M.3.e.</td>
</tr>
<tr>
<td>IC Plan</td>
<td>Within thirty (30) calendar days from date of the Secretary’s written request</td>
<td>III.P.3</td>
</tr>
<tr>
<td>Cost Estimate for Corrective Action Work</td>
<td>Within thirty (30) calendar days after the Permit effectiveness date. For Additional Work, within thirty (30) calendar days after the Secretary has approved a new work plan</td>
<td>II.M.2.a. III.L.6</td>
</tr>
<tr>
<td>Adjustment of the estimated cost of the work</td>
<td>Annually within sixty (60) days prior to the anniversary date of the Secretary’s initial approval of such estimated cost of the work,</td>
<td>II.M.2.b. III.L.6</td>
</tr>
<tr>
<td>SUBMISSION REQUIREMENTS</td>
<td>DUE DATE</td>
<td>PERMIT CONDITION</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>or within thirty (30) days after fiscal year</td>
<td>or within thirty (30) days after fiscal year close if financial test and</td>
<td></td>
</tr>
<tr>
<td>close if financial test and corporate</td>
<td>corporate guarantee demonstration used.</td>
<td></td>
</tr>
<tr>
<td>Guarantee demonstration used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Assurance for Completing the Work</td>
<td>Within thirty (30) days after the Secretary has approved the initial and</td>
<td>II.M.3.</td>
</tr>
<tr>
<td></td>
<td>subsequent Estimated Cost of Work</td>
<td>III.L.6</td>
</tr>
<tr>
<td>Quarterly Progress Reports</td>
<td>As approved or as otherwise directed by the Secretary</td>
<td>III.I.3.d.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>III.J.3.a.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>III.M.3.a.</td>
</tr>
</tbody>
</table>
SECTION IV - STORAGE IN CONTAINERS

IV.A. DESCRIPTION OF STORAGE FACILITIES

The Permittee is authorized to operate six (6) individual hazardous waste container storage areas referred to as: the; SWDF Container Storage Building, SWDF Surge Building, SWDF Container Feed Area, North LWDF Unloading Area, South LWDF Unloading Area, and the BWDF Storage Area. All container storage areas, except for the BWDF Storage Area, are designed to store both liquids and solids and have concrete secondary containment systems capable of containing 10% of each area’s total permitted storage capacity listed in Permit Condition IV.D. The BWDF Storage Area is permitted to store wastes that do not contain free liquids and therefore secondary containment is not required. The volume of the largest container stored in any of the container storage areas shall not exceed the net secondary containment volume calculated in the approved Permit Application for each area. Subject to the requirements of Permit Condition IV.B., the Permittee may store hazardous waste generated on-site and off-site in storage areas covered by this Permit.

The Permittee is authorized for storage of hazardous waste in containers, as defined in Section 4 of the approved Permit Application and Section IV.C of this Permit. Approved hazardous waste storage containers will be maintained in the hazardous waste storage areas described in Section 4 of the approved Permit Application. The Permittee is prohibited from storing hazardous waste in containers for more than ninety (90) days at any area other than the six storage areas described here and in the approved Permit Application.

IV.B. PERMITTED AND PROHIBITED WASTE

The Permittee is allowed to store the hazardous wastes identified in Attachment 2 of this Permit in the container storage areas described in Section IV.A of the Permit and Section 4 of the approved Permit Application, subject to the terms of this Permit. The Permittee is prohibited from the storage of hazardous wastes that are not identified in Attachment 2.

IV.C. OPERATION AND MAINTENANCE

The Permittee shall operate and maintain the container storage facilities in accordance with 40 CFR § 264, Subpart I and the specifications and design criteria contained in the approved Permit Application.
IV.D. CONTAINER STORAGE FACILITY CAPACITIES

<table>
<thead>
<tr>
<th>Storage Area</th>
<th>Storage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWDF Container Storage Building</td>
<td>Maximum of 111,636 total gallons</td>
</tr>
<tr>
<td>SWDF Surge Building</td>
<td>Maximum of 40,320 total gallons</td>
</tr>
<tr>
<td>SWDF Container Feed Area</td>
<td>Maximum of 11,508 total gallons</td>
</tr>
<tr>
<td>North LWDF Unloading Area</td>
<td>Maximum of 5,700 total gallons (Bulk LWDF or BWDF Containers only)</td>
</tr>
<tr>
<td>South LWDF Unloading Area</td>
<td>Maximum of 5,700 total gallons (Bulk LWDF or BWDF Containers only)</td>
</tr>
<tr>
<td>BWDF Storage Area</td>
<td>Maximum of 22,000 total gallons (Approximately 4 Truck Trailers)</td>
</tr>
</tbody>
</table>

TOTAL CONTAINER STORAGE CAPACITY 196,864 U.S. Gallons

No palletized container unit stored in any of the above storage areas may be stacked in greater than two tiers. Various sized containers, as described in Section 4 of the approved Permit Application, may be used provided the conditions of 40 CFR § 264, Subpart I and all other provisions of this Permit are met. The volume of the largest container or portable tank of any kind stored in any of the container storage areas shall not exceed the net secondary containment volume calculated in the approved Permit Application for each area or the maximum “pile” size allowed by the National Fire Protection Agency for the type of waste being stored in each area.

IV.E. CONDITION OF CONTAINERS

If a container holding hazardous waste is not in good condition (e.g., severe rusting, apparent structural defects) or if it begins to leak, the Permittee shall transfer the hazardous waste from such container to a container that is in good condition or otherwise manage the waste in compliance with the conditions of this Permit. [40 CFR § 264.171]

IV.F. COMPATIBILITY OF WASTE WITH CONTAINERS

The Permittee shall use a container made of or lined with materials which will not react with, and are otherwise compatible with, the hazardous waste to be stored so that the ability of the container to contain the waste is not impaired. [40 CFR § 264.172]
IV.G. MANAGEMENT OF CONTAINERS

IV.G.1. The Permittee shall keep all containers closed during storage, except when it is necessary to add or remove waste, and shall not open, handle, or store containers in a manner which may rupture the container or cause it to leak. [40 CFR § 264.173]

IV.G.2. The Permittee shall comply with all the applicable requirements of 40 CFR § 264, Subpart CC in accordance with Permit Condition VII and Section 4.2.4.6 of the approved Permit Application.

IV.H. INSPECTION SCHEDULES AND PROCEDURES

The Permittee shall inspect the container storage areas weekly, in accordance with the Inspection Schedules contained in Attachment 6A of the approved Permit Application, to detect leaking containers and the deterioration of containers and containment systems caused by corrosion and other factors. [40 CFR § 264.174]

IV.I. CONTAINMENT SYSTEMS

IV.I.1. The Permittee shall maintain the containment system in accordance with the plans and specifications contained in Section 4 of the approved Permit Application. [40 CFR § 264.175]

IV.I.2. The Permittee shall remove spilled or leaked waste and accumulated precipitation from the secondary containment system within (24) hours or in as timely a manner as possible. [40 CFR § 264.175(d)]

IV.J. SPECIAL CONTAINER PROVISIONS FOR IGNITABLE OR REACTIVE WASTE

IV.J.1. The Permittee shall not locate containers holding ignitable or reactive waste within fifteen (15) meters (50 feet) of the facility’s property line. [40 CFR § 264.176]

IV.J.2. The Permittee shall take precautions to prevent accidental ignition or reaction of ignitable or reactive waste and follow the procedures specified in Section 6.11 of the approved Permit Application. [40 CFR §§ 264.17(a) and 264.176]
IV.K. SPECIAL CONTAINER PROVISIONS FOR INCOMPATIBLE WASTE

IV.K.1. The Permittee shall not place incompatible wastes, or incompatible wastes and materials, in the same container unless 40 CFR § 264.17(b) is complied with. [40 CFR § 264.177(a)]

IV.K.2. The Permittee shall not place hazardous waste in an unwashed container that previously held an incompatible waste or material. [40 CFR § 264.177(b)]

IV.K.3. The Permittee shall not place containers of incompatible wastes within the same secondary containment area unless precautions are taken to prevent the accidental mixing of incompatible waste should a container leak, spill, or otherwise release its contents. [40 CFR § 264.177(c)]

IV.L. RECORDKEEPING

The Permittee shall place the results of all waste analyses, trial tests, and any other documentation showing compliance with the requirements of 40 CFR §§ 264.17(c) and 264.177 in the facility operating record. [40 CFR § 264.73]

IV.M. CLOSURE

At closure of a container storage area, the Permittee shall remove all hazardous waste and hazardous waste residues from the containment systems, in accordance with the procedures in the Closure Plan - Section 9 of the approved Permit Application, and Section II.K. of this Permit. [40 CFR § 264.178]
SECTION V – STORAGE IN TANKS

V.A. DESCRIPTION OF TANK SYSTEM

There are two distinct and separate tank systems which manage hazardous waste and deliver it to the pyroprocessing system at the facility; the Liquid Waste Derived Fuel (LWDF) tank system and the Bulk Waste Derived Fuel (BWDF) tank system. The primary function of both tank systems is to store Waste Derived Fuel (WDF) before it is used in the pyroprocessing system; however, the tanks are also permitted to allow treatment due to the incidental blending of WDF.

The LWDF tank system has a total of five (5) 38,000 gallon aboveground tanks located in two separate containment areas that are adjacent to each other; these areas are referred to as the West LWDF Storage Tank Area and the East LWDF Storage Tank Area. The West LWDF area contains two (2) tanks and the East LWDF area contains three (3) tanks. All LWDF tanks are situated within metal buildings that have concrete secondary containment structures designed to contain 100% of the volume of the largest tank within the structure plus the potential rainfall generated from a 25 year 24 hour storm event. The floor of each containment area is sloped to a sump where a pump is used to remove accumulated precipitation. Each tank is equipped with either a mechanical or electronic level measuring device, which is connected to a high level alarm that will alert employees to prevent overflowing the tanks. All tanks are vented to the facility’s pyroprocessing system, thermal oxidizer, or carbon adsorption system, and each tank is also equipped with an emergency pressure release vent.

In addition to the storage tank areas there are three distinct bulk container unloading areas referred to as the Rail Car Unloading Station, the North LWDF Unloading Area, and the South LWDF Unloading Area. The Rail Car Unloading Station is located adjacent to and north of the West LWDF Storage Tank Area while the North and South Truck unloading Areas are located adjacent to and south of both storage tank areas. All three unloading stations have adequate secondary containment to contain 100% of the largest rail car or tanker truck to be unloaded, and each of the truck unloading stations have adequate secondary containment to allow the unloading areas to be used for bulk container storage as described in Section V of this permit.

The BWDF tank system consist of one (1) 300 cubic yard aboveground storage tank/silo positioned above two (2) 15 cubic foot metering kettles with associated piping, an air emissions dust collection baghouse mounted atop the tank/silo, a concrete pad where trucks are parked while unloading, and an equipment pad where compressors and blowers that provided the motive air for the conveyance of BWDF to the pyroprocessing system are located. The entire system with the exception of the unloading area is contained within a metal building. The BWDF system is not permitted to store or manage wastes that contain free liquids and therefore secondary containment for the tank and truck unloading area is not provided.
V.B. PERMITTED AND PROHIBITED WASTE

V.B.1. The Permittee is allowed to store the hazardous wastes identified in Attachment 2 of this permit in the LWDF and BWDF tank systems identified in Section V.A. of the Permit and Section 4 of the approved Permit Application, subject to the terms of this Permit.

V.B.2. The Permittee is prohibited from processing corrosive waste that exhibits a pH of less than or equal to 2, and those wastes that are not identified in Attachment 2 of this Permit.

V.B.3 The Permittee is prohibited from storing waste in the BWDF tank system that contain free liquids, as determined by EPA test method 9095 the paint filter test, and wastes that either exhibit or carry the waste code D003 for the characteristic of reactivity.

V.C. OPERATION AND MAINTENANCE

The Permittee shall operate and maintain the tank storage systems in accordance with 40 CFR § 264, subpart J and the specifications and design criteria contained in the approved Permit Application.

V.D. TANK SYSTEM STORAGE CAPACITIES

The Permittee shall limit the tank storage systems to the capacities listed in the table below.

<table>
<thead>
<tr>
<th>Tank System</th>
<th>Tank Number</th>
<th>Capacity (Gallons)</th>
<th>Dimensions</th>
<th>Total Tank System Capacity (Gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>West LWDF Tank System</td>
<td>1</td>
<td>38,000</td>
<td>14 ft (Dia) x 33 ft</td>
<td>76,000</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>38,000</td>
<td>14 ft (Dia) x 33 ft</td>
<td></td>
</tr>
<tr>
<td>East LWDF Tank System</td>
<td>3</td>
<td>38,000</td>
<td>14 ft (Dia) x 33 ft</td>
<td>114,000</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>38,000</td>
<td>14 ft (Dia) x 33 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>38,000</td>
<td>14 ft (Dia) x 33 ft</td>
<td></td>
</tr>
<tr>
<td>BWDF Tank System</td>
<td>6</td>
<td>300 (cubic yards)</td>
<td>14 ft (Dia) x 40 ft</td>
<td>300 cubic yards</td>
</tr>
</tbody>
</table>

TOTAL LWDF TANK STORAGE CAPACITY 190,000 U.S. Gallons
TOTAL BWDF TANK STORAGE CAPACITY 300 Cubic yards
V.E. OPERATING REQUIREMENTS

V.E.1. The Permittee shall not place hazardous waste in a tank system if it could cause the tank, its ancillary equipment, or containment system to rupture, leak, corrode, or otherwise fail. [40 CFR § 264.194(a)]

V.E.2. The Permittee shall prevent spills and overflows from the tank or containment systems using the methods described in the approved Permit Application. [40 CFR § 264.194(b)]

V.E.3. The Permittee shall comply with all the applicable requirements of 40 CFR § 264, Subpart BB and CC in accordance with Permit Condition VII and Section 4.2.4.6 of the approved Permit Application.

V.F. RESPONSE TO LEAKS OR SPILLS

In the event of a leak or a spill from the tank system, from a secondary containment system, or if a system becomes unfit for continued use, the Permittee shall remove the system from service immediately and complete the following actions (40 CFR § 264.196(a)-(f)):

V.F.1. Stop the flow of hazardous waste into the system and inspect the system to determine the cause of the Release.

V.F.2. Remove waste and accumulated precipitation from the system within 24 hours of the detection of the leak, as is necessary, to prevent further Release and to allow inspection and repair of the system. If the Permittee finds that it will be impossible to meet this time period, the Permittee shall notify the Secretary and demonstrate that a longer time period is required.

If the collected material is a RCRA hazardous waste, it must be managed in accordance with all applicable requirements of 40 CFR § Parts 262-264 and 268.

V.F.3. Contain visible Releases to the environment. The Permittee shall immediately conduct a visual inspection of all Releases to the environment and based on that inspection: (1) prevent further migration of the leak or spill to soils or surface water and (2) remove and properly dispose of any visible contamination of the soil or surface water.

V.F.4. Close the system in accordance with the Closure Plan, contained in the approved Permit Application, unless the following actions are taken:

V.F.4.a. For a Release caused by a spill that has not damaged the integrity of the system, the Permittee shall remove the released waste and make
any necessary repairs to fully restore the integrity of the system before returning the tank system to service.

V.F.4.b. For a Release caused by a leak from the primary tank system to the secondary containment system, the Permittee shall repair the primary system prior to returning it to service.

V.F.4.c. For a Release to the environment caused by a leak from the portion of the tank system component that is not readily available for visual inspection, the Permittee shall provide secondary containment that meets the requirements of 40 CFR § 264.193 before the component can be returned to service.

V.F.4.d. If the Permittee replaces a component of the tank system for any reason, that component must satisfy the requirements for new tank systems or components in 40 CFR § 264.192 and 40 CFR § 264.193.

V.F.5. For all major repairs to eliminate leaks or restore the integrity of the tank system, the Permittee must obtain a certification by an independent, qualified, registered professional engineer that the repaired system is capable of handling hazardous wastes without Release for the intended life of the system before returning the system to service. Examples of major repairs are installation of an internal liner, repair of a ruptured tank, or repair or replacement of a secondary containment vault.

V.G. INSPECTION SCHEDULES AND PROCEDURES

V.G.1. The Permittee shall inspect the tank systems, in accordance with the Inspection Schedules contained in Attachment 6A of the approved Permit Application and shall complete the items in Permit Conditions V.G.2. and V.G.3. as part of those inspections.

V.G.2. The Permittee shall inspect the overfill controls, in accordance with the inspection schedule provided in the approved Permit Application.

V.G.3. The Permittee shall inspect the following components of the tank system once each operating day [40 CFR § 264.195(b)]:

V.G.3.a. Above ground portions of the tank system to detect corrosion or Releases of waste;

V.G.3.b. Data gathered from monitoring and leak detection equipment (e.g., pressure or temperature gauges, monitoring wells) to ensure that the tank system is being operated according to its design;
V.G.3.c. Construction materials and the area immediately surrounding the externally accessible portion of the tank system, including the secondary containment system, to detect erosion or signs of Releases of hazardous waste (e.g., wet spots, dead vegetation).

V.G.4. The Permittee shall document compliance with Permit Condition V.G. and place this documentation in the facility operating record. [40 CFR § 264.195(d)]

V.H. RECORD KEEPING AND REPORTING

V.H.1. The Permittee shall report to the Secretary, within 24 hours of detection, whenever a leak or spill occurs from the tank system or secondary containment system to the environment. [40 CFR § 264.196(d)(1)] A leak or spill of one pound or less of hazardous waste, that is immediately contained and cleaned-up, need not be reported. [40 CFR § 264.196(d)(2)] Releases that are contained within a secondary containment system need not be reported. If the Permittee has reported the Release pursuant to 40 CFR Part 302, this report satisfies the requirements of this Permit condition. [40 CFR § 264.196(d)(1)]

V.H.2. Within 30 days of detecting a Release to the environment from the tank system or secondary containment system, the Permittee shall report the following information to the Secretary [40 CFR § 264.196(d)(3)]:

V.H.2.a. Likely route of migration of the Release;

V.H.2.b. Characteristics of the surrounding soil (including soil composition, geology, hydrogeology, and climate);

V.H.2.c. Results of any monitoring or sampling conducted in connection with the Release. If the Permittee finds it will be impossible to meet this time period, the Permittee shall provide the Secretary with a schedule of when the results will be available. This schedule must be provided before the required 30-day submittal period expires;

V.H.2.d. Proximity of down gradient drinking water, surface water, and populated areas; and

V.H.2.e. Description of response actions taken or planned.

V.H.3. The Permittee shall submit to the Secretary all certifications of major repairs to correct leaks within seven days from returning the tank system to use. [40 CFR § 264.196(f)]
V.H.4. The Permittee shall obtain, and keep on file at the facility, the written statements by those persons required to certify the design and installation of the tank system. [40 CFR § 264.192(g)]

V.H.5. The Permittee shall keep on file at the facility the written assessment of the tank system’s integrity.

V.I.  CLOSURE AND POST-CLOSURE CARE

V.I.1. At closure of the tank system(s), the Permittee shall follow the procedures in the Closure Plan - Section 9 of the approved Permit Application, and Section II.K. of this permit. [40 CFR § 264.197(a)]

V.I.2. If the Permittee demonstrates that not all contaminated soils can be practically removed or decontaminated, in accordance with the Closure Plan, then the Permittee shall close the tank system and perform post-closure care following 40 CFR § 264.197(b) and (c).

V.J.  SPECIAL TANK PROVISIONS FOR IGNITABLE OR REACTIVE WASTES

V.J.1. The Permittee shall not place ignitable or reactive waste in the tank system or in the secondary containment system, unless the waste is treated, rendered, or mixed before or immediately after placement in the tank system, so that: (a) the resulting waste, mixture, or dissolved material no longer meets the definition of ignitable or reactive waste in 40 CFR §§ 261.21 or 261.23 and the precautions in 40 CFR § 264.17(b) are complied with; or (b) the waste is managed in such a way that it is protected from any materials or conditions which may cause it to ignite or react; or (c) the tank system is used solely for emergencies. [40 CFR § 264.198(a)]

V.J.2. The Permittee shall comply with the requirements for the maintenance of protective distances between the waste management area and any public ways, streets, alleys, or an adjoining property line that can be built upon, as required in Tables 2-1 through 2-67 of the National Fire Protection Association's "Flammable and Combustible Liquids Code" (1977 or 1981). [40 CFR § 264.198(b)]
SECTION VI – MICELLANEOUS SUBPART X UNITS

VI.A. DESCRIPTION OF MICELLANEOUS UNITS

In addition to the container and tank storage units described elsewhere in this permit, the Permittee also conducts bulk container cleanout activities that may utilize mechanical agitators and vacuum trucks to remove waste that cannot be removed by pumping alone. The mechanical agitators, vacuum truck, and the overall process of bulk container manual cleanout is considered hazardous waste processing and shall be regulated pursuant to 40 CFR § 264 Subpart X requirements.

As part of the LWDF unloading procedures for bulk containers including rail cars and transport trucks, the facility uses mechanical agitator units located at each of the unloading stations to mix up and suspend settled solids to allow the containers to be emptied as fully as possible via pumping. The agitators are constructed mostly of steel and are raised and lowered into the container to be agitated using a hoist. The agitators have a collapsed diameter small enough so that they will fit through the hatch of railcars and tanker trucks, and an overall length of approximately 12 foot. An integrated lid on the agitation unit closes and seals the vehicle’s opening to minimize emissions of volatile organics. Once inside the container to be agitated, the impellers of the agitation unit are rotated forcing the liquid into the settled solids, re-entraining them in the liquid. After the agitation unit has run for a period of time, the LWDF with the entrained solids is pumped out of the container. When not in use, the agitators are stored in dedicated closed containers. The agitator container lid consists of two sections that seal around the agitator shaft and the top of the storage container. The agitators’ storage container is inspected weekly and drained of waste that may have dripped off the unit while in storage, maintaining it in a RCRA-empty status in compliance with 40 CFR § 261.7.

In addition to the standard method of agitating and pumping to remove waste from bulk containers, the facility also performs manual bulk container clean out activities to remove non-pumpable solids, referred to as the heel. Manual cleaning methods of rail cars and tanker trucks requires manned entry of the containers and utilization of a vacuum truck to remove solids that are scraped or otherwise dislodged with high pressure water spray from the containers inside walls by the worker. All workers that enter rail cars and tanker truck containers are trained in confined space enter and follow applicable Mine Safety and Health Administration (MSHA) requirements.

The Permittee is not authorized for storage of hazardous waste in the agitators’ storage container or the vacuum truck; therefore, the capacity of these container units do not add to the total permitted storage capacity of the facility.

VI.B. DESIGN AND OPERATION
The agitators, vacuum truck, and the overall process of bulk container manual cleanout shall be designed and operated in accordance with the requirements of this section and Section 4 of the approved Permit Application.

VI.B.1. The Permittee shall conduct bulk container manual cleanout operations in a manner to prevent Releases to the subsurface environment or groundwater as required by 40 CFR § 264.601(a).

VI.B.2. The Permittee shall conduct bulk container manual cleanout operations in a manner to prevent Releases to surface water, wetlands or to the soil as required by 40 CFR § 264.601(b).

VI.B.3. The Permittee shall conduct bulk container manual cleanout operations in a manner to prevent Releases to the air as required by 40 CFR § 264.601(c).

VI.B.4. The Permittee shall only operate the vacuum truck within the secondary containment structure of the North or South LWDF Unloading Area when managing RCRA hazardous waste. [40 CFR § 264.175]

VI.B.5. The Permittee shall ensure that the vacuum truck is equipped and operated with a closed-vent system and control device in accordance with the requirements of Section VII. of this Permit when waste derived fuel or other organic solvent is used as a suspension medium in the vacuum truck, or when waste derived fuel or other organic solvent is used to dislodge and clean solids from the inside of bulk containers. [40 CFR § 264.601(c)]

VI.B.6. The Permittee shall ensure that the vacuum truck suction hose is properly grounded before each use. [40 CFR § 264.198(a)(2)]

VI.B.7. The Permittee shall manage each of the agitator storage containers in accordance with the applicable requirements of 40 CFR § 264, Subpart CC as required by Section VII of this Permit.[40 CFR § 264.179]

VI.C. PERMITTED WASTE IDENTIFICATION

The Permittee is permitted to treat only those wastes identified in Attachment 2 of this permit, except for the prohibition described in Section VI.D. below.
VI.D. SPECIAL PROVISIONS FOR REACTIVE OR INCOMPATIBLE WASTE

The Permittee shall not treat, place, or process any waste with a miscellaneous unit that exhibits the characteristics of a reactive waste, as defined in 40 CFR § 261.23. However, wastes that carry the D003 waste code but do not exhibit the characteristics of a reactive waste may be processed with a miscellaneous unit provided the facility’s Waste Analysis Plan is followed to determine the waste is compatible with the waste it is to be mixed with. Also, the Permittee shall not concurrently place incompatible waste in a miscellaneous unit unless that placement constitutes controlled treatment of the waste. The Permittee shall not treat a waste in a unit if an incompatible waste has been previously treated in the unit, unless a compatible material has been processed through the unit or it has been cleaned since the incompatible waste was processed. The Permittee shall follow the Waste Analysis Plan’s compatibility procedures to ensure that the waste stream collected in the vacuum truck is compatible with any organic solvent that may be used in the cleaning process.

VI.E. GENERAL INSPECTION REQUIREMENTS

The Permittee shall inspect and repair each miscellaneous unit, and keep records of these activities, in accordance with the facility’s inspection plan located in Section 6.18 of the approved Permit Application.

VI.E.1. The Permittee shall inspect each of the agitator storage containers at least once weekly for the presence of leaks and the accumulation of waste. All accumulated waste shall be removed within 24 hours of detection. [40 CFR § 264.174]

VI.E.2. The Permittee shall inspect the vacuum truck connecting and suction hoses for the presence of damage before each use. [40 CFR § 264.195(f)]

VI.G. RESPONSE TO LEAKS OR SPILLS

In the event of a leak or a spill from the agitator storage containers, or the vacuum truck and its ancillary equipment, the Permittee shall remove the system from service immediately and complete the following actions [40 CFR § 264.196(a), (b), and (e)]:

VI.G.1. Stop the flow of hazardous waste into and out of the unit and inspect the unit to determine the cause of the Release.
VI.G.2. Remove waste from the unit within 24 hours of the detection of the spill or leak, as is necessary, to prevent further Release and to allow inspection and repair of the unit. If the Permittee finds that it will be impossible to meet this time period, the Permittee shall notify the Secretary and demonstrate that a longer time period is required.

If the collected material is a RCRA hazardous waste, it must be managed in accordance with all applicable requirements of 40 CFR Parts 262-264 and 268. If the collected material is discharged through a point source to U.S. waters or to a POTW, or Released to the environment, it is subject to all other state and/or federal requirements.

VI.G.3. Close the units in accordance with the Closure Plan, contained in the approved Permit Application, unless the following actions are taken:

VI.G.3.a. For a Release caused by a spill that has not damaged the integrity of the agitator storage containers, or the vacuum truck and its ancillary equipment, the Permittee shall remove the released waste and make any necessary repairs before returning it to service.

VI.G.3.b. For a Release caused by a leak from either the agitator storage containers, or the vacuum truck and its ancillary equipment to the secondary containment system, the Permittee shall remove the released waste and make any necessary repairs to fully restore the integrity of the unit before returning the unit to service.

VI.H. RECORD KEEPING AND REPORTING

VI.H.1. The Permittee shall report to the Secretary, within 24 hours of detection, whenever a leak or spill occurs from the bulk container cleanout process or from secondary containment system to the environment. [40 CFR § 264.196(d)(1)] A leak or spill of one pound or less of hazardous waste, that is immediately contained and cleaned-up, need not be reported. [40 CFR § 264.196(d)(2)] Releases that are contained within the secondary containment system need not be reported, unless the secondary containment cracks. If the Permittee has reported the Release pursuant to 40 CFR Part 302, this report satisfies the requirements of this Permit condition. [40 CFR § 264.196(d)(1)]
VI.H.2. Within 30 days of detecting a Release to the environment from either the agitator storage containers, the vacuum truck and its ancillary equipment, or the secondary containment system, the Permittee shall report the following information to the Secretary [40 CFR § 264.196(d)(3)]:

VI.H.2.a. Likely route of migration of the Release;

VI.H.2.b. Characteristics of the surrounding soil (including soil composition, geology, hydrogeology, and climate);

VI.H.2.c. Results of any monitoring or sampling conducted in connection with the Release. If the Permittee finds it will be impossible to meet this time period, the Permittee shall provide the Secretary with a schedule of when the results will be available. This schedule must be provided before the required 30-day submittal period expires;

VI.H.2.d. Proximity of down gradient drinking water, surface water, and populated areas; and

VI.H.2.e. Description of response actions taken or planned.

VI.H.3 The Permittee shall place the results of all waste analyses and trial tests (and any other documentation showing compliance with the requirements of 40 CFR §§ 264.17(b) and 264.177) in the facility operating record. [40 CFR § 264.73]

VI.I. PERSONNEL TRAINING

The Permittee shall require all persons who enter bulk containers, as part of the bulk container manual cleanout operations, to be trained in confined space entry before conducting such operations as required by 40 CFR § 264.16. This training shall be documented and the records of the training kept in accordance with Section 8 of the approved Permit Application.
VI.J. AIR EMISSIONS STANDARDS

The closed vent system and enclosed combustion control device requirements of 40 CFR § 264.1087 have been identified as applicable requirements for controlling air emissions from the vacuum truck used in the bulk container manual cleanout operations, when waste derived fuel or other organic solvent is used as a suspension medium in the vacuum truck or when waste derived fuel or other organic solvent is used to dislodge and clean solids from the inside of bulk containers. [40 CFR § 264.601(c)]

VI.J.1. The Permittee shall control air emissions from the vacuum truck using a closed-vent system and control device to capture and treat air emissions directly from the vacuum trucks exhaust, in accordance with the requirements of Section VII. of the Permit. [40 CFR § 264.601(c)]

VI.J.2. The Permittee shall comply with all the applicable requirements of 40 CFR 264, Subpart CC in accordance with the approved Permit Application and Section VII of the Permit. [40 CFR § 264.601(c)]

VI.K. CLOSURE AND POST-CLOSURE

At closure, the Permittee shall remove all hazardous waste and hazardous waste residues from the containment system. During closure the Permittee shall follow the procedures outlined in the Closure Plan - Section 9 of the approved Permit Application, and Section II.K. of this permit. [40 CFR § 264.197(a)]
SECTION VII - AIR EMISSION STANDARDS

VII.A. AIR EMISSION STANDARDS APPLICABILITY

Air emissions from equipment leaks, tanks and containers are regulated under 40 CFR 264 Subparts BB, and CC; however, each of these subparts contain provisions that allow a facility that is also subject to regulation under 40 CFR §§ Parts 60, 61, or 63 to determine and demonstrate compliance with the Subpart BB, and CC standards by documenting compliance pursuant to the relevant provisions of the regulations at 40 CFR §§ Parts 60, 61, or 63.

In addition to this RCRA permit, the Permittee has also been issued a Clean Air Act (CAA) Title V Class I Operating Permit from the Kansas Department of Health and Environment, Bureau of Air and Radiation. Under the Title V Permit Ash Grove is subject to 40 CFR § Part 63 Subpart DD requirements for hazardous air pollutants from off-site waste and recovery operations. In accordance with 40 CFR §§ 264.1030(e), 264.1064(m), and 264.1089(j) Ash Grove has elected to document compliance with Subparts AA, BB, and CC by documenting compliance with 40 CFR § Part 63 Subpart DD.

All documentation of compliance under 40 CFR § Part 63 Subpart DD shall be kept with or made readily available for KDHE review with the facility’s operating record. The Permittee shall be subject to 40 CFR §§ 264 Subparts AA, BB, and CC at all times due to the nature of the hazardous waste managed, as described in the approved Permit Application. If at any time the Permittee is no longer subject to 40 CFR § Part 63, Subpart DD requirements, the Permittee shall continue to comply with 40 CFR § Part 63, Subpart DD requirements and document compliance with those requirements in the Facility Operating Record until this Permit is modified to include the applicable requirements of 40 CFR §§ Part 264 subparts AA, BB, and CC.

Within thirty (30) days from the time the Permittee is no longer subject to 40 CFR § Part 63, Subpart DD requirements, the Permittee shall submit a Class 1 permit modification notifying the Secretary of their intent to comply with the applicable provisions of 40 CFR §§ 264 subparts AA, BB, and CC.

VII.B. AIR EMISSION STANDARDS FOR EQUIPMENT LEAKS (SUBPART BB)

RESERVED

VII.C STANDARDS FOR CLOSED-VENT SYSTEMS AND CONTROL DEVICES

RESERVED

VII.D. AIR EMISSION STANDARDS FOR TANKS AND CONTAINERS (SUBPART CC)

RESERVED
ATTACHMENT 1

DEFINITIONS
ATTACHMENT 1

DEFINITIONS

For purposes of this Permit, as provided under Permit Condition I.D., terms used herein shall have the same meaning as those in 40 CFR Parts 124, 260, 261, 264, 266, 268, and 270, as applicable, and as adopted by the Secretary, unless this Permit specifically provides otherwise; where terms are not defined in the regulations or the Permit, the meaning associated with such terms shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term.

“Ancillary equipment” means any device including, but not limited to, such devices as piping, fittings, flanges, valves, and pumps that is used to distribute, meter, or control the flow of hazardous waste from its point of generation to a storage or treatment tank(s), between hazardous waste storage and treatment tanks to a point of disposal Facility, or to a point of shipment for disposal off-Site.

“Annually” means one time per calendar year such that at least eleven (11) months and no more than thirteen (13) months have elapsed since the last annual event.

“Area of Concern” or “AOC” means any area of the Facility under the control or ownership of the owners or operators where a Release to the environment has occurred, is suspected to have occurred, or may occur, regardless of the frequency or duration of the Release.

“BWM” means the Bureau of Waste Management within the KDHE – Division of Environment.

“Closure Plan” means the closure plan set forth in Section 9 of the Permit Application, and any subsequent Secretary-approved revisions or modifications to the Closure Plan.

“Contingency Plan” means the contingency plan discussed in Section 7 of the Permit Application, and any subsequent Secretary-approved revisions or modifications to the Contingency Plan.

“Daily” means once each calendar day, unless expressly stated to be a working day.

“Data Quality Objectives (DQOs)” means performance and acceptance criteria that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions. Unless otherwise approved by Secretary, the DQOs shall be prepared consistent with EPA Guidance documents; Guidance on Systematic Planning Using the Data Quality Objectives Process EPA QA/G-4, EPA/240/B-06/001, February 2006; Guidance for Developing Quality Systems for Environmental Programs EPA QA/G-1, EPA/240/R-008, November 2002; and any subsequent revisions or editions.

“Day” or “Days” means a calendar day(s) unless otherwise specified.
“Engineering Controls” means any mechanism used to contain, isolate, or stabilize contamination that ensures the effectiveness of a remedial action and acts as a physical barrier between the contamination and contact with humans or the environment.

“EPA” means the United States Environmental Protection Agency.

“Facility” includes the Permittee’s property located at, 1801 North Santa Fe Street, Chanute, Kansas, including all contiguous land, and structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of hazardous waste. In addition, for the purpose of implementing corrective action under 40 CFR 264.101, “Facility” also means all contiguous property under the control of the owner/operator.

“Fact Sheet” means a document that meets the requirements of K.A.R. 28-31-124d, that includes the Secretary’s or EPA’s proposed corrective measures decision, and that is substantially consistent with EPA guidance on “Statement of Basis” in EPA/540/G-91/011.

“Hazardous Constituent” means any constituent identified in Appendix VIII of 40 CFR Part 261 where analytical methods exist or any constituent identified in Appendix IX to 40 CFR Part 264.

“Hazardous Waste” means any solid waste as defined in K.S.A. 65-3402(a), or 42 U.S.C. 6903 (27) and 40 CFR 261.2, which also meets the definition of a hazardous waste in K.S.A. 65-3430(e)(1), or any of the criteria of a hazardous waste as listed in 42 U.S.C. 6903(5) and 40 CFR 261.3. The term “hazardous waste” includes “hazardous constituent” as defined above.

“HSWA” means the Hazardous and Solid Waste Amendments of 1984.

“In gas/vapor service” means that the piece of equipment contains or contacts a hazardous waste stream that is in the gaseous state at operating conditions.

“In heavy liquid service” means that the piece of equipment is not in gas/vapor service or in light liquid service.

“In light liquid service” means that the piece of the equipment contains or contacts a waste stream where the vapor pressure of one or more of the organic components in the stream is greater than 0.3 kilopascals (kPa) at 20 degree C, the total concentration of the pure organic components having a vapor pressure greater than 0.3 kilopascals (kPa) at 20 degree C is equal to or greater than 20 percent by weight, and the fluid is a liquid at operating conditions.

“Inspection Schedule” means the inspection schedule set forth in Section 6 of the Permit Application, and any subsequent Secretary-approved revision or modification to the Inspection Schedule.

“Institutional Controls” means administrative and/or legal mechanisms that help limit exposure to humans from contamination and/or protect the integrity of the remedy.
“Interim Measures” means those actions taken to immediately control or abate threats or potential threats to human health or the environment from releases or potential releases of hazardous waste, hazardous constituents, or pollutants, which can be initiated before implementation of the final corrective measures for a facility, or in an emergency situation, for an operating facility only.

“KDHE” means the Kansas Department of Health and Environment.

“Long Term Monitoring” or “LTM” means the collection of samples on an annual or semiannual basis from the monitoring wells associated with SWMUs and AOCs. The purpose of LTM is to demonstrate that contaminant concentrations are not increasing or are decreasing. If LTM shows contaminant concentrations are increasing, the Secretary may evaluate whether changes to the corrective measure or a new corrective measure is necessary.

“Monitored Natural Attenuation” or “MNA” means the collection of samples on an annual or semiannual basis from monitoring wells associated with SWMUs and AOCs. The purpose of MNA is to demonstrate that contaminant concentrations are decreasing due to one or more natural processes in the subsurface. If MNA shows no decreases in contaminant concentrations or that they are increasing, the Secretary may evaluate whether changes to the corrective measure or a new corrective measure is necessary.

“Monthly” means twelve (12) times per year (once per calendar month) such that at least fifteen (15) days and no more than forty-five (45) days have elapsed since the last monthly event.

“PDF format” means the Adobe Portable Document Format developed by Adobe Systems Incorporated. The Permittee may use any other electronic format as agreed upon between the Permittee and KDHE. Reference herein to an “electronic copy” refers to PDF format, or in an alternative searchable electronic format as otherwise agreed to by the Secretary.

“Permit Application” means the approved Permit Application originally submitted 1/20/2020, as modified by subsequent amendments and including the Part A and Part B permit applications, dated 4/9/2021, and 5/10/2021, respectively, any Appendices, Tables, or other Attachments, and any subsequent revisions or modifications, approved by the Secretary.

“Quarterly” means four times per calendar year such that at least two (2) months and no more than four (4) months have elapsed since the last quarterly event.


“RCRA Corrective Action Plan” means the document of the same name dated May 1994 and given the OSWER Directive Number 9902.3-2A and EPA Document Number 520-R-94-004, and any subsequent revisions or editions.
“RCRA Facility Investigation Guidance” means the document of the same name dated May 1989 and given the OSWER Directive Number 9502.00-6D and the EPA Document Number 530/SW-89-031, and any subsequent revisions or editions.

“Release” means any spilling, leaking, pouring, emitting, emptying, discharging, injecting, pumping, escaping, leaching, dumping, or disposing of hazardous wastes, hazardous constituents, and/or pollutants, into the environment, including the abandonment or discarding of barrels, containers, and other closed receptacles containing hazardous wastes, hazardous constituents, and/or pollutants.

“RSK Manual” means the KDHE Risk-Based Standards for Kansas Manual – 5th Version (October 2010), and any subsequent updates/revisions.

“Secretary” means the Secretary of the Kansas Department of Health and Environment (KDHE), or a designee or authorized representative of KDHE. Any reference to “KDHE” may also mean the “Secretary”.

“Semi-Annually” means two times per calendar year such that at least five (5) months and no more than seven (7) months have elapsed since the last semi-annual event.

“Site” means the Facility, in addition to all areas and media to which hazardous constituents, hazardous wastes, releases and/or any other contamination or pollution that originated at the Facility, have been released and/or have migrated.

“Solid Waste Management Unit” or “SWMU” means any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released.

“Standard Operating Procedure” or “SOP” means a document that establishes or prescribes methods to be followed in the operation of hazardous waste storage, treatment and disposal activities. All SOPs must be signed by a responsible corporate officer and include the certification in 40 CFR 270.11(d)(1). The responsible corporate officer shall be as defined in 40 CFR 270.11(a).

“Stabilization” means actions to control or abate threats to human health and/or the environment from releases at RCRA facilities, and/or actions to prevent or minimize the further spread of contamination while long-term remedies are pursued.

“Waste Analysis Plan” or “WAP” means the waste analysis plan set forth in the Permit Application, and any subsequent Secretary-approved revisions or modifications to the Waste Analysis Plan.

“Weekly” means fifty-two (52) times per calendar year such that no fewer than five (5) days and no more than ten (10) days have elapsed since the last weekly event.
“Work day” means a day other than a Saturday, Sunday or State of Kansas holiday. In computing any period of time under this Permit where the last day would fall on a Saturday, Sunday or holiday recognized by the State of Kansas, the period shall run until the end of the next Working Day.
ATTACHMENT 2

PERMITTED WASTE CODES
ATTACHMENT 2

PERMITTED WASTE CODES

The Ash Grove Cement Company Facility may accept for storage and treatment the following RCRA waste codes identified in Tables A-I, A-II, A-III A-IV, and A-V, as defined in 40 CFR 261 Subparts C and D, subject to the terms of this Permit.

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<th>TABLE A-I</th>
<th>Permitted Characteristic Waste Codes</th>
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ATTACHMENT 3

SWMUs AND AOCs Location Map

Page 1: Active SWMUs – Site Location Map
Page 2: SWMU 1 – Paraffin Waste Disposal Landfill
Page 3: SWMU 16 – Industrial Waste Landfill
Page 4: SWMU 17 – CKD Landfill
Page 5: SWMU 23 – Inactive Kiln Dust Landfill

***The SWMUs shown in Attachment 3 are those that have remaining Corrective Action O&M obligations and have not obtained NFA Status. The location of SWMUs that have received NFA status can be found in the Permit Renewal Application Figure 10-1.
Active SWMUs – Site Location Map
SWMU 1 – Paraffin Waste Disposal Landfill
SWMU 23 – Inactive Kiln Dust Landfill

Legend
- Alluvial Monitoring Well
- Sediment Sample
- Surface Water/Sediment Sample
- Drainage Ditch
- Surface Water Feature
- Solid Waste Management Unit (SWMU) Area
- CMI Annual Sample Locations
- SI2MW-1e Wells Gauged Only During Annual CMI Sampling Events

Notes:
1) All locations are approximate.
2) Monitoring Well SI2SW-3 was substituted for SI2MW-4 for annual sampling as SI2MW-4 was not accessible.

2020 CORRECTIVE MEASURES IMPLEMENTATION
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 23 - Inactive Kiln Dust Landfill

DRAFT Ash Grove Cement Company
EPA I.D. #KSD031203318
Attachment 3 – SWMUs & AOCs Location Map
ATTACHMENT 4

SWMU & AOC DESCRIPTIONS AND SELECTED CORRECTIVE MEASURES

1. Solid Waste Management Unit (SWMUs) & Areas of Concern (AOCs) Descriptions

2. Selected Corrective Measures

3. Final Statement of Basis and Final Remedy Decision July 2017
### Solid Waste Management Units (SWMUs) & Areas of Concern (AOCs) (pg. 1 of 5)

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<th>Size / Capacity</th>
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<th>Waste Description</th>
<th>Quantity</th>
<th>Type</th>
<th>Status</th>
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<td>1</td>
<td>Inactive Paraffin - Waste Disposal Landfill</td>
<td>2-4 acres</td>
<td>One-time disposal in 1959</td>
<td>Acid filter sludge</td>
<td>Greater than 200 tons</td>
<td>Landfill</td>
<td>Post closure CA O&amp;M</td>
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<td>2</td>
<td>Active Satellite Waste Accumulation Point - Primary Crusher</td>
<td>55 gallons</td>
<td>September 1988 to Present</td>
<td>Stoddard solvent and kerosene</td>
<td>Closed drum</td>
<td>No further action</td>
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<td>3</td>
<td>Active Satellite Waste Accumulation Point - Shop and Storeroom</td>
<td>110 gallons</td>
<td>September 1988 to Present</td>
<td>Stoddard solvent and kerosene</td>
<td>Two (2) closed drums</td>
<td>No further action</td>
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<td>4</td>
<td>Active Satellite Waste Accumulation Point - Control Area</td>
<td>110 gallons</td>
<td>September 1988 to Present</td>
<td>Stoddard solvent and kerosene oil</td>
<td>Two (2) closed drums</td>
<td>No further action</td>
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<td>Inactive Satellite Waste Accumulation Point - Electric Substation</td>
<td>55 gallons</td>
<td>September 1988 to August 1993</td>
<td>Stoddard solvent, kerosene, paint solvents</td>
<td>One (1) 55-gallon drum that was used to accumulate wastes has been removed</td>
<td>No further action</td>
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<td>Active Satellite Waste Accumulation Point - Laboratory</td>
<td>3 gallons</td>
<td>1988 to Present</td>
<td>Kerosene</td>
<td>Closed stainless steel container</td>
<td>No further action</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Active Satellite Waste Accumulation Point - Pack House</td>
<td>140 gallons</td>
<td>1988 to Present</td>
<td>Kerosene oil, soiled rags</td>
<td>Three (3) closed drums</td>
<td>No further action</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Active Central Hazardous Materials Area/Tank</td>
<td>500 gallons</td>
<td>1988 to Present</td>
<td>Waste oil</td>
<td>Portable tank</td>
<td>No further action</td>
<td></td>
</tr>
</tbody>
</table>
### Solid Waste Management Units (SWMUs) & Areas of Concern (AOCs) (pg. 2 of 5)

<table>
<thead>
<tr>
<th>SWMU #</th>
<th>Name</th>
<th>Size / Capacity</th>
<th>Operating Period</th>
<th>Waste Description</th>
<th>Quantity</th>
<th>Type</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Intentionally left blank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Active Liquid Waste-Derived Fuel (LWDF) Storage Tanks</td>
<td>190,000 gallons (38,000 gallons each)</td>
<td>West Tanks (2): 1986 to Present, East Tanks (3): 1998 to Present</td>
<td>Liquid WDF</td>
<td></td>
<td></td>
<td>No further action</td>
</tr>
<tr>
<td>11</td>
<td>Active Liquid Waste-Derived Fuel (LWDF) Feed Lines</td>
<td>One (1) nominal 3&quot; diameter and one (1) nominal 2&quot; diameter</td>
<td>1986 to Present</td>
<td>Liquid WDF</td>
<td></td>
<td>Mild steel piping</td>
<td>No further action</td>
</tr>
<tr>
<td>12</td>
<td>Active Liquid Waste-Derived Fuel (LWDF) Rail Unloading Area</td>
<td>Dimensions: 4' x 20' x 4&quot;</td>
<td>1989 to Present</td>
<td>Liquid WDF</td>
<td></td>
<td>Concrete sump</td>
<td>No further action</td>
</tr>
<tr>
<td>13</td>
<td>Active Liquid Waste-Derived Fuel (LWDF) Truck Unloading Pad</td>
<td>14' x 50' each</td>
<td>North Pad: 1988 to Present, South Pad: 1998 to Present</td>
<td>Liquid WDF</td>
<td></td>
<td>Two (2) reinforced, portland cement concrete pads</td>
<td>No further action</td>
</tr>
<tr>
<td>14</td>
<td>Active Sump Drums</td>
<td>110 gallons</td>
<td>1988 to Present</td>
<td>Liquid WDF and WDF sludges</td>
<td>Two (2) closed drums</td>
<td></td>
<td>No further action</td>
</tr>
<tr>
<td>15</td>
<td>Active Repair Shop Parts Washers</td>
<td>30 gallons</td>
<td>Unknown to Present</td>
<td>Stoddard solvent</td>
<td>Four (4) closed tanks</td>
<td></td>
<td>No further action</td>
</tr>
<tr>
<td>16</td>
<td>Closed Industrial Waste Landfill</td>
<td>500,000 square feet x 10 to 30 feet thick</td>
<td>Unknown to October 1994</td>
<td>Paper, wood, steel, cement, rubber, fabric, asbestos, cement kiln dust</td>
<td>In excess of 56,000 tons</td>
<td>Landfill</td>
<td>Post closure CA O&amp;M</td>
</tr>
<tr>
<td>17</td>
<td>Closed Cement Kiln Dust (CKD) Landfill (North of haul road)</td>
<td>56 acres x 33 feet thick</td>
<td>1979 to July, 1999</td>
<td>CKD</td>
<td>2,000,000 tons</td>
<td>Landfill</td>
<td>Post closure CA O&amp;M</td>
</tr>
</tbody>
</table>
## Solid Waste Management Units (SWMUs) & Areas of Concern (AOCs) (pg. 3 of 5)

<table>
<thead>
<tr>
<th>SWMU #</th>
<th>Name</th>
<th>Size / Capacity</th>
<th>Operating Period</th>
<th>Waste Description</th>
<th>Quantity</th>
<th>Type</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Closed Cement Kiln Dust Landfill (South of haul road)</td>
<td>14.5 Acres x 23 feet thick</td>
<td>1964-1979</td>
<td>CKD</td>
<td>272,000 tons</td>
<td>Landfill</td>
<td>Post-closure CA O&amp;M</td>
</tr>
<tr>
<td>17</td>
<td>Elementary Neutralization Unit for Treatment of High pH Leachate</td>
<td>142 inch diameter x 120.5 inch height</td>
<td>1997 to Present</td>
<td>Leachate from CKD landfill</td>
<td>7,000 gallons</td>
<td>Tank</td>
<td>Active part of CA O&amp;M</td>
</tr>
<tr>
<td>18</td>
<td>Former Refractory Disposal Area</td>
<td>No longer exists</td>
<td>Approximately 1980 to 1988</td>
<td>Refractory brick</td>
<td>No longer exists. The area of this SWMU has been removed to a depth of approximately 38 feet during normal quarry operations to obtain limestone for cement manufacture.</td>
<td>No further action</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Closed No. 1 and No. 2 Cement Kilns</td>
<td>450 feet long x 12 feet in diameter</td>
<td>1986 to 2001</td>
<td>Liquid and containerized WDF</td>
<td>14.2 tons per hour of WDF</td>
<td>Pyroprocessing unit</td>
<td>No further action</td>
</tr>
<tr>
<td>20</td>
<td>Active SWDF Surge Building</td>
<td>48' x 80'</td>
<td>1990 to Present</td>
<td>Containerized WDF</td>
<td>40,320 gallons (nominal)</td>
<td>Concrete floor and steel building</td>
<td>No further action</td>
</tr>
<tr>
<td>21</td>
<td>Active SWDF Storage Building</td>
<td>150' x 100'</td>
<td>June, 1993 to Present</td>
<td>Containerized WDF</td>
<td>111,636 gallons</td>
<td>Concrete floor and steel building</td>
<td>No further action</td>
</tr>
</tbody>
</table>
### Solid Waste Management Units (SWMUs) & Areas of Concern (AOCs) (pg. 4 of 5)

<table>
<thead>
<tr>
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<th>Size / Capacity</th>
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<th>Waste Description</th>
<th>Quantity</th>
<th>Type</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Active Industrial Waste Landfill</td>
<td>700,000 square feet by 20 feet</td>
<td>October, 1994 to Present</td>
<td>Non-combustible and non-putrescible Plant wastes (e.g., steel, cement, clinker)</td>
<td>110,000 tons</td>
<td>Landfill</td>
<td>Active</td>
</tr>
<tr>
<td>23</td>
<td>Inactive CKD Fill Area</td>
<td>293,000 square feet by 3-4 feet</td>
<td>One-time disposal 1975</td>
<td>Cement kiln dust (CKD)</td>
<td>Approximately 35,000 tons</td>
<td>Landfill</td>
<td>Post closure CA O&amp;M</td>
</tr>
<tr>
<td>24</td>
<td>Inactive Ruan Waste Transfer Area</td>
<td>1.4 Acres</td>
<td>May 1989 to May 1996</td>
<td>Containerized solid waste-derived fuel (SWDF)</td>
<td></td>
<td></td>
<td>No further action</td>
</tr>
<tr>
<td>25</td>
<td>Active CKD Staging Area</td>
<td>175 feet x 125 feet</td>
<td>November, 1997 to July, 1999</td>
<td>Cement Kiln Dust (CKD)</td>
<td></td>
<td></td>
<td>No further action</td>
</tr>
<tr>
<td>26</td>
<td>Active CKD Monofill</td>
<td>22 Acres</td>
<td>April, 1999 to present</td>
<td>Cement Kiln Dust (CKD) Slurry</td>
<td></td>
<td></td>
<td>Active</td>
</tr>
<tr>
<td>27</td>
<td>Shot Rock Stockpile Area</td>
<td>60 feet x 25 feet</td>
<td>Pre-1970 to present</td>
<td>Shot rock and rock fines stained with black oily substance</td>
<td></td>
<td></td>
<td>No further action</td>
</tr>
</tbody>
</table>
### Solid Waste Management Units (SWMUs) & Areas of Concern (AOCs) (pg. 5 of 5)

<table>
<thead>
<tr>
<th>SWMU #</th>
<th>Name</th>
<th>Size / Capacity</th>
<th>Operating Period</th>
<th>Waste Description</th>
<th>Quantity</th>
<th>Type</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>Cement Kiln Including the Preheater/precalkiner Tower</td>
<td>Kiln diameter: 16’, kiln length: 180’</td>
<td>2001 to Present</td>
<td>Containerized solid waste-derived fuel (SWDF)</td>
<td>14.2 tons per hour of WDF</td>
<td>Concrete pad</td>
<td>Active</td>
</tr>
<tr>
<td>29</td>
<td>SWDF Container Feed Area</td>
<td>11,509 gallons</td>
<td>2006 to Present</td>
<td>Containerized solid waste-derived fuel (SWDF)</td>
<td>45’ by 21’ concrete pad</td>
<td>Containerized solid waste-derived fuel (SWDF)</td>
<td>Active</td>
</tr>
<tr>
<td>30</td>
<td>BWDF Storage Tank</td>
<td>300 cubic yards</td>
<td>2008 to Present</td>
<td>Solid WDF</td>
<td>One (1) 14’ diameter x 57’ high steel aboveground storage tank</td>
<td>Aboveground storage tank</td>
<td>Active</td>
</tr>
<tr>
<td>31</td>
<td>BWDF Container Storage Area</td>
<td>22,000 gallons</td>
<td>Future</td>
<td>Solid WDF</td>
<td>Concrete pad</td>
<td>Concrete pad</td>
<td>Active</td>
</tr>
<tr>
<td></td>
<td>AOC A</td>
<td>Clinker Storage Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No further action</td>
</tr>
<tr>
<td></td>
<td>AOC B</td>
<td>Lubricant Storage Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No further action</td>
</tr>
<tr>
<td></td>
<td>AOC C</td>
<td>General Storage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No further action</td>
</tr>
<tr>
<td></td>
<td>AOC D</td>
<td>Muriatic Acid Storage Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No further action</td>
</tr>
</tbody>
</table>
Selected Corrective Measures Remedy

The Secretary has accepted the EPA Final Statement of Basis and Final Remedy Decision July 2017 as the Secretary’s Final Corrective Measures Decision, which is included below. As required by the Corrective Measures Decision the Facility has successfully implemented the approved CMI Work Plan, Attachment 15 of this permit, and is now required to operate and maintain SWMU 1, 16, 17, and 23 in accordance with the Operations and Maintenance Plan and Groundwater Monitoring Plan, Attachments 5 and 6 to this permit.
INTRODUCTION

This Final Statement of Basis and Final Remedy Decision is issued by the U.S. Environmental Protection Agency Region 7 (EPA), as part of its responsibilities under the Resource Conservation and Recovery Act (RCRA). This Final Statement of Basis and Final Remedy Decision describes the final remedy selected for the Ash Grove Cement Company facility located at 1801 North Santa Fe Street, Chanute, Kansas 66720 (Facility).

SUMMARY OF FINAL REMEDY

The EPA hereby selects the following tasks as the final remedy for the Ash Grove Cement Facility:

- maintenance of existing landfill caps,
- hydraulic control of landfill leachate,
- monitored natural attenuation of groundwater contamination,
- land use controls, and
- groundwater/surface water monitoring.
Site-wide – Groundwater monitoring will be required at the solid waste management units (SWMUs) to evaluate the effectiveness of remedies in protecting or restoring groundwater to health-based groundwater goals derived for the Facility in the site-specific Human Health Risk Assessment (HHRA). Further, any site-related groundwater contamination in excess of federal Maximum Contaminant Levels promulgated under the federal Safe Drinking Water Act must be contained within the Facility property boundaries. Institutional controls will be required to prevent exposure to contamination in the SWMUs and ensure the exposure assumptions in the HHRA remain valid and protective. The Facility will be required to submit a Corrective Measures Implementation Plan (CMIP) for EPA review and approval that details how all proposed corrective action elements will be completed.

SWMU #1, Paraffin Waste Disposal Landfill – The Permittee shall upgrade cover with minimal disruption to cover any exposed waste to allow vegetation to prevent erosion, and maintain an upgraded soil cover over the waste disposed in SWMU #1. That cover shall have sufficient thickness to minimize infiltration and support vegetation planted to prevent erosion of the soil and the underlying waste by providing moisture retention and sufficient medium for vegetation to grow and thrive. The Permittee shall submit for approval a Corrective Measures Implementation Work Plan (CMI Work Plan) to EPA and KDHE. The CMI Work Plan shall include a provision for the Permittee to inspect the cover yearly looking for erosion or portions of the cover where vegetation has died. The CMI Work Plan shall include (1) an annual down gradient groundwater sample, (2) an annual soil/sediment sample from directly around the SWMU, and (3) an annual standing surface water sample from directly around the SWMU, if there is any standing surface water. Such samples shall be analyzed for pH, VOCs, SVOCs, and the metals of potential concern detected in the Corrective Measures Study [which are aluminum, arsenic, chromium, cadmium, cobalt, iron, lead, manganese, vanadium, nickel, strontium, benzene, 2 methylnaphthalene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene]. Should an EPA Statistically Significant Increase (SSI) in results occur that is over the Safe Drinking Water Act Maximum Contaminant Level (MCL) or industrial soil or water Regional Screening Level (RSL) or other standard as defined in the CMI Work Plan, or should the pH reading be less than 5 or higher than 9, the Permittee shall submit a plan to EPA and KDHE to alleviate the problem, and implement the plan after obtaining EPA and KDHE approval. The Permittee shall define the SSI protocol in the CMI Work Plan. Should the Permittee find that minor amounts vegetation has died or there is minor erosion, the Permittee shall replace and/or reseed the vegetation and/or replace eroded soil and submit a report to EPA and KDHE documenting such within 60 days of discovery of the minor erosion/dead vegetation. Should the Permittee find that significant amounts vegetation has died or there is significant erosion, the Permittee shall submit a plan to EPA and KDHE for approval to alleviate the problem. The Permittee shall also put in place land use controls to prevent possible future exposures. Such land use controls may be property use restrictions, fence, etc. and shall be approved by EPA and KDHE. The parcel of land containing SWMU 1 shall carry a deed notice stating that waste paraffin is buried on the property.

SWMU #16, Industrial Waste Landfill – The Industrial Waste Landfill has been closed and capped with a compacted clay cover according to the closure plan submitted to the Kansas Department of Health and Environment (KDHE), and Ash Grove has conducted several modifications and repairs to the landfill to capture leachate and prevent impacts to surface water. The Permittee shall maintain the existing low permeability clay cover layer over the waste in SWMU #16, the overlying soil cover layer, and the vegetative cover in order to promote run-off, minimize run-on, and prevent erosion of the covers and underlying waste. The Permittee shall maintain the existing leachate collection system at SWMU #16 in order to collect, contain and dispose all leachate at the perimeter of the landfill. That system will be expanded or supplemented as necessary to address any new expressions of leachate. The Permittee shall design, install and maintain all necessary features and appurtenances to prevent trespass, livestock or any other activity to damage the cover system over the waste in SWMU #16. The Permittee shall design and implement a monitored natural attenuation work plan to remediate groundwater contamination emanating from waste disposed in SWMU #16. That work plan must be developed consistent with OSWER Directive 9200.4, "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites," and "Monitored Natural Attenuation of Inorganic Contaminants in Ground Water" volumes 1 and 2 (EPA/540/R-99/009 and EPA/600/R-07/140, respectively).
SWMU #17, North CKD Landfill – The Permittee shall maintain the existing low permeability clay cover layer, the overlying soil cover layer and the vegetative cover in order to promote run-on, minimize run-on and prevent erosion of the covers and underlying waste. The Permittee shall maintain the existing leachate collection system in order to collect, contain and dispose all leachate at the perimeter of the landfill. That system shall be expanded or supplemented as necessary to address any new expressions of leachate. The Permittee shall design, install and maintain all necessary features and appurtenances to prevent trespass, livestock or any other activity to damage the soil cover layer over the waste.

SWMU #17, South CKD Landfill – The Permittee shall design, install and maintain a low permeability cover over the waste in this portion of SWMU #17. The Permittee shall design, install and maintain a layer of soil over the low permeability cover sufficient to protect the low permeability cover from infiltration and frost and to support and maintain vegetation planted to prevent erosion of the layer of soil and the underlying low permeability cover by providing moisture retention and sufficient medium for vegetation to grow and thrive. The Permittee shall plant and maintain vegetation in the soil layer overlying the low permeability cover of a type that will prevent erosion of the layer of soil and the underlying low permeability cover and will not damage the underlying low permeability cover's integrity. The Permittee shall design, install and maintain all necessary features and appurtenances to the low permeability cover to control and prevent damage to the cover from run-on and run-off of precipitation and flooding. The Permittee shall maintain the existing leachate collection system in order to collect, contain, and dispose all leachate at the perimeter of the landfill. That system will be expanded or supplemented as necessary to address any new expressions of leachate. The Permittee shall design, install and maintain all necessary features and appurtenances to prevent trespass, livestock or any other activity from damaging the low permeability cover over the waste in the southern portion of SWMU #17.

SWMU #23, Inactive Kiln Dust Landfill – The Permittee shall maintain the in-place native soil cover over the waste disposed in SWMU #23 to ensure that cover shall have sufficient thickness to support and maintain vegetation planted to prevent erosion of the soil and the underlying waste by providing moisture retention and sufficient medium for vegetation to grow and thrive. The Permittee shall submit for approval a Corrective Measures Implementation Work Plan (CMI Work Plan) to EPA and KDHE. The CMI Work Plan shall include a provision for the Permittee to inspect the cover yearly looking for erosion and/or portions of the cover where vegetation has died. The CMI Work Plan shall include (1) an annual down gradient groundwater sample, (2) an annual soil/sediment sample from directly around the SWMU, and (3) an annual standing surface water sample from directly around the SWMU, if there is any standing surface water. Such samples shall be analyzed for pH and the metals of potential concern detected in the Corrective Measures Study [which are aluminum, arsenic, chromium, cadmium, cobalt, iron, lead, manganese, and vanadium]. Should an EPA Statistically Significant Increase (SSI) in results occur that is over the Safe Drinking Water Act Maximum Contaminant Level (MCL) or industrial soil or water Regional Screening Level (RSL) or other standard as defined in the CMI Work Plan, or should the pH reading be less than 5 or higher than 9, the Permittee shall submit a plan to EPA and KDHE to alleviate the problem, and implement the plan after obtaining EPA and KDHE approval. The Permittee shall define the SSI protocol in the CMI Work Plan. Should the Permittee find that minor amounts vegetation has died or there is minor erosion, the Permittee shall replace and/or reseed the vegetation and/or replace eroded soil and submit a report to EPA and KDHE documenting such within 60 days of discovery of the minor erosion/dead vegetation. Should the Permittee find that significant amounts vegetation has died or there is significant erosion, the Permittee shall submit a plan to EPA and KDHE for approval to alleviate the problem. The Permittee shall also put in place land use controls to prevent possible future exposures. Such land use controls may be property use restrictions, fence, etc. and shall be approved by EPA and
KDHE. The parcel of land containing SWMU 23 shall carry a deed noting that cement kiln dust is buried on the property.

**SWMU #27, Shot Rock Stockpile Area** – This area has been addressed by interim cleanup measures, and no further action is required for the Shot Rock Stockpile Area.

**FINAL HSWA PERMIT MODIFICATIONS**

These HSWA Permit modifications are identified below. For ease of review, the highlighted yellow text identifies added, deleted, and/or modified HSWA Permit:

***-********** Start of Permit Modifications**********-***

**II.C.4.d. Continuance of Part II upon State Authorization**

For those portions of the HSWA conditions in Part II for which KDHE has received hazardous waste program authorization under 40 CFR Part 271, in the event that the KDHE receives hazardous waste program authorization under 40 C.F.R. Part 271 for any or all of the HSWA conditions in Part II after the effective date of Part II and if the Permittee submits a timely and complete application under applicable State law and regulations, the affected HSWA conditions of Part II shall continue in force beyond the expiration date of Part II, but only until the effective date of the KDHE’s issuance or denial of a complete RCRA Hazardous Waste Permit.

**II.G. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE EPA**

a. Failure to submit the information required by Part II, or falsification of any submitted information, is subject to enforcement and/or termination of Part II.

b. The Permittee shall ensure that all plans, reports, notifications, and other submissions to the Director required by Part II to be submitted to the EPA are signed and certified in accordance with 40 C.F.R. §§270.11 and 270.30(k).

c. Extensions of the due dates specified in Part II may be granted by the Director in accordance with the permit modification procedures set forth in 40 C.F.R. §270.42.

d. Unless otherwise specified, two (2) copies of plans, reports, notifications or other submissions required by Part II to be submitted to the EPA shall be sent by certified mail, delivery service or hand delivered to:
e. In addition, one (1) copy of these plans, reports, notifications or other submissions shall be submitted to:

Kansas Department of Health and Environment Division of Environment
Bureau of Waste Management
Hazardous Waste Permit Section
Attn: Mostafa Kamal
Attn: Miles Stotts, Chief
Curtis State Office Building 1000 SW Jackson St.,
Suite 320 410
Topeka, Kansas 66612-1366

f. EPA may designate a new recipient in writing to the Permittee without a permit modification.

III.B. IDENTIFICATION OF SWMUS, AOCS, OPERABLE UNITS

The EPA has conducted a RCRA Facility Assessment (RFA) to identify releases or potential releases from any SWMU at the facility. The RFA identified the following SWMUs at the facility:

- SWMU #1 Paraffin Waste Disposal Landfill
- SWMU #2 Satellite Waste Accumulation Point (SWAP): Primary Crusher
- SWMU #3 SWAP: Shop and Storeroom
- SWMU #4 SWAP: Control Area [removed]
- SWMU #5 SWAP: Electrical Substation
- SWMU #6 SWAP: Laboratory
- SWMU #7 SWAP: Rail Loading Area
- SWMU #8 Central Hazardous Materials Storage Area/Tank
- SWMU #9 Rainwater Storage Tank for Chem-Fuel Secondary Containment Area
- SWMU #10 Chem-Fuel Tank Area and Secondary Containment
- SWMU #11 Chem-Fuel Lines
SWMU #12  Chem-Fuel Rail Unloading Area
SWMU #13  Chem-Fuel Truck Unloading Area
SWMU #14  Chem-Fuel Sump Drums
SWMU #15  Parts Washers (4) [removed]
SWMU #16  Industrial Waste Landfill, Permit No. 177 [now closed]
SWMU #17  Kiln Dust Landfill, Permit No. 345 [now closed]
SWMU #18  Former Waste Refractory Brick Disposal Area [area removed to mine limestone]

The RFA also identified the following areas of concern ("AOCs"):

AOC A  Clinker Storage Area
AOC B  Lubricant Storage Area
AOC C  General Storage
AOC D  Muriatic Acid Storage Area

Subsequent to the RFA, several other SWMUs were identified:

SWMU #19 No. 1 and No. 2 Cement Kilns [removed]
SWMU #20 Container Storage (Surge) Building
SWMU #21 Solid Waste Derived Fuel Storage Building
SWMU #22 New Industrial Waste Landfill [KDHE Solid Waste Permit No. 653]
SWMU #23 Inactive Kiln Dust Fill Area
SWMU #24 Ruan Waste Transferring Area
SWMU #25 Cement Kiln Dust (CKD) Staging Area
SWMU #26 Future CKD Monofill [now active, KDHE Solid Waste Permit No. 759]
SWMU #27 Shot Rock Stockpile [removed]

A SWMU and AOC location map is attached as Figure 2.

III.L.2. Corrective Measures Selected to Date

The EPA has selected corrective measures to protect human health and the environment and to remediate releases of hazardous waste and hazardous constituents. The EPA's corrective measures decision is included as Permit Attachment 8. The corrective measures are:

III.L.2.a. Engineering Controls

i. The Permittee shall within 10 days of notice from the EPA make a Class I permit modification to include such other SWMUs and AOCs as the EPA may designate in this permit condition.

ii. The following engineering controls are to be provided for SWMU #1- Paraffin Waste Landfill:

(1) The Permittee shall upgrade cover with minimal disruption to cover any exposed waste to allow vegetation to prevent erosion, and maintain an upgraded soil cover over the waste disposed in SWMU #1. That cover shall have sufficient thickness to minimize infiltration and support vegetation planted to prevent erosion of the soil and the underlying waste by
providing moisture retention and sufficient medium for vegetation to grow and thrive. The Permittee shall submit for approval a Corrective Measures Implementation Work Plan (CMI Work Plan) to EPA and KDHE. The CMI Work Plan shall include a provision for the Permittee to inspect the cover yearly looking for erosion or portions of the cover where vegetation has died. The CMI Work Plan shall include (1) an annual down gradient groundwater sample, (2) an annual soil/sediment sample from directly around the SWMU, and (3) an annual standing surface water sample from directly around the SWMU, if there is any standing surface water. Such samples shall be analyzed for pH, VOCs, SVOCs, and the metals of potential concern detected in the Corrective Measures Study [which are aluminum, arsenic, chromium, cadmium, cobalt, iron, lead, manganese, vanadium, nickel, strontium, benzene, 2 methylnapthalene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene]. Should an EPA Statistically Significant Increase (SSI) in results occur that is over the Safe Drinking Water Act Maximum Contaminant Level (MCL) or industrial soil or water Regional Screening Level (RSL) or other standard as defined in the CMI Work Plan, or should the pH reading be less than 5 or higher than 9, the Permittee shall submit a plan to EPA and KDHE to alleviate the problem, and implement the plan after obtaining EPA and KDHE approval. The Permittee shall define the SSI protocol in the CMI Work Plan. Should the Permittee find that minor amounts vegetation has died or there is minor erosion, the Permittee shall replace and/or reseed the vegetation and/or replace eroded soil and submit a report to EPA and KDHE documenting such within 60 days of discovery of the minor erosion/dead vegetation. Should the Permittee find that significant amounts vegetation has died or there is significant erosion, the Permittee shall submit a plan to EPA and KDHE for approval to alleviate the problem. The Permittee shall also put in place land use controls to prevent possible future exposures. Such land use controls may be property use restrictions, fence, etc. and shall be approved by EPA and KDHE. The parcel of land containing SWMU 1 shall carry a deed notice stating that waste paraffin is buried on the property.

iii. The following engineering controls are to be provided for SWMU #16 - Industrial Waste Landfill:

1. The Permittee shall maintain the existing low permeability clay cover layer over the waste in SWMU #16, the overlying soil cover layer, and the vegetative cover in order to promote run-off, minimize run-on, and prevent erosion of the covers and underlying waste.

2. The Permittee shall maintain the existing leachate collection system at SWMU #16 in order to collect, contain and dispose all leachate at the perimeter of the landfill. That system will be expanded or supplemented as necessary to address any new expressions of leachate.

3. The Permittee shall design, install and maintain all necessary features and appurtenances to prevent trespass, livestock or any other activity to damage the cover system over the waste in SWMU #16.

4. The Permittee shall design and implement a monitored natural attenuation work plan to remediate groundwater contamination emanating from waste disposed in SWMU #16. That work plan must be developed consistent with OSWER Directive 9200.4, "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites," and "Monitored Natural Attenuation of Inorganic Contaminants in Ground
iv. The following engineering controls are to be provided for the portion of SWMU #17 - Industrial Waste Landfill located north of the quarry haul road:

1. The Permittee shall maintain the existing low permeability clay cover layer, the overlying soil cover layer and the vegetative cover in order to promote run-off, minimize run-on and prevent erosion of the covers and underlying waste.

2. The Permittee shall maintain the existing leachate collection system in order to collect, contain and dispose all leachate at the perimeter of the landfill. That system shall be expanded or supplemented as necessary to address any new expressions of leachate.

3. The Permittee shall design, install and maintain all necessary features and appurtenances to prevent trespass, livestock or any other activity to damage the soil cover layer over the waste.

v. The following engineering controls are to be provided for the portion of SWMU #17 - Industrial Waste Landfill located south of the quarry haul road:

1. The Permittee shall design, install and maintain a low permeability cover over the waste in this portion of SWMU #17.

2. The Permittee shall design, install and maintain a layer of soil over the low permeability cover sufficient to protect the low permeability cover from infiltration and frost and to support and maintain vegetation planted to prevent erosion of the layer of soil and the underlying low permeability cover by providing moisture retention and sufficient medium for vegetation to grow and thrive.

3. The Permittee shall plant and maintain vegetation in the soil layer overlying the low permeability cover of a type that will prevent erosion of the layer of soil and the underlying low permeability cover and will not damage the underlying low permeability cover's integrity.

4. The Permittee shall design, install and maintain all necessary features and appurtenances to the low permeability cover to control and prevent damage to the cover from run-on and run-off of precipitation and flooding.

5. The Permittee shall maintain the existing leachate collection system in order to collect, contain, and dispose all leachate at the perimeter of the landfill. That system will be expanded or supplemented as necessary to address any new expressions of leachate.

6. The Permittee shall design, install and maintain all necessary features and appurtenances to prevent trespass, livestock or any other activity from damaging the

Water" volumes 1 and 2 (EPA/540/R-99/009 and EPA/600/R-07/140, respectively).
low permeability cover over the waste in the southern portion of SWMU #17.

vi. The following engineering controls are to be provided for SWMU#23 - Inactive Kiln Dust Landfill:

(1) The Permittee shall maintain the in-place native soil cover over the waste disposed in SWMU #23 to ensure that cover shall have sufficient thickness to support and maintain vegetation planted to prevent erosion of the soil and the underlying waste by providing moisture retention and sufficient medium for vegetation to grow and thrive. The Permittee shall submit for approval a Corrective Measures Implementation Work Plan (CMI Work Plan) to EPA and KDHE. The CMI Work Plan shall include a provision for the Permittee to inspect the cover yearly looking for erosion and/or portions of the cover where vegetation has died. The CMI Work Plan shall include (1) an annual down gradient groundwater sample, (2) an annual soil/sediment sample from directly around the SWMU, and (3) an annual standing surface water sample from directly around the SWMU, if there is any standing surface water. Such samples shall be analyzed for pH and the metals of potential concern detected in the Corrective Measures Study [which are aluminum, arsenic, chromium, cadmium, cobalt, iron, lead, manganese, and vanadium]. Should an EPA Statistically Significant Increase (SSI) in results occur that is over the Safe Drinking Water Act Maximum Contaminant Level (MCL) or industrial soil or water Regional Screening Level (RSL) or other standard as defined in the CMI Work Plan, or should the pH reading be less than 5 or higher than 9, the Permittee shall submit a plan to EPA and KDHE to alleviate the problem, and implement the plan after obtaining EPA and KDHE approval. The Permittee shall define the SSI protocol in the CMI Work Plan. Should the Permittee find that minor amounts vegetation has died or there is minor erosion, the Permittee shall replace and/or reseed the vegetation and/or replace eroded soil and submit a report to EPA and KDHE documenting such within 60 days of discovery of the minor erosion/dead vegetation. Should the Permittee find that significant amounts vegetation has died or there is significant erosion, the Permittee shall submit a plan to EPA and KDHE for approval to alleviate the problem. The Permittee shall also put in place land use controls to prevent possible future exposures. Such land use controls may be property use restrictions, fence, etc. and shall be approved by EPA and KDHE. The parcel of land containing SWMU 23 shall carry a deed notice stating that cement kiln dust is buried on the property.

III.L.2.b. Work Practices

The Permittee shall not conduct any activity in any SWMU or AOC that would result in exposure of workers, visitors or other persons to hazardous waste or hazardous constituents located at the SWMU or AOC or released from the SWMU or AOC unless such exposure to the hazardous waste or hazardous constituents will not result either in a risk of cancer greater than 1 x 10^-6 or a non-cancer hazard index greater than 1.

III.L.2.c. Institutional Controls

The following institutional controls (ICs) are established by this Permit to ensure the effectiveness of the engineering controls and to prevent use of the facility that would cause exposure to hazardous waste or hazardous constituents which would adversely affect human health and the environment as follows:

i. ICs for low permeability covers, soil layer and other associated
features and appurtenances in Permit Condition III.L.3: The Permittee shall not nor shall the Permittee allow others to use, construct or engage any activity which could damage or interfere with the low permeability cover, soil layer and other associated features and appurtenances in Permit Condition III.L.3.

ii. ICs for on-site groundwater: The Permittee shall not use, construct or install any drinking water wells within areas of groundwater contamination at the Facility. The Permittee shall not use, construct or install any other supply wells that may influence the migration of groundwater contamination without written approval from the EPA and/or KDHE.

iii. ICs for facility use: The Permittee shall not use any portion of the Facility property for any use other than industrial or commercial use, and child care facilities shall be prohibited.

iv. ICs for soil in SWMUs 1, 16, 17 and 23, and any newly-identified SWMUs, AOCs or releases pursuant to Permit Condition III.C: The Permittee shall not excavate or remove any surface or subsurface soil, sediments or solid wastes except for excavation or removal in conformance with a KDHE- and/or EPA-approved Corrective Measures Implementation Work Plan. The Permittee shall maintain and update, as necessary, a Corrective Measures Implementation Work Plan for (a) testing and proper management of any contaminated environmental media that may be encountered in those SWMUs, AOCs or releases at the Facility; and (b) ensuring that construction workers, maintenance workers and Facility employees will be required to have training appropriate for their level of exposure prior to engaging in any such activities that may involve contact with contaminated environmental media at the Facility.

v. Exceptions to the activity and use limitations set forth in the foregoing paragraph include minor excavations necessary to install, maintain or repair utility poles, fence posts, sidewalks, paving and other comparable activities, as well as minor excavations necessary to maintain or repair existing underground utilities and minor excavations in connection with landscaping activities. Further, the requirements in the foregoing paragraph do not preclude the Permittee from taking such interim or emergency measures as necessary to abate or contain releases.

vi. The Permittee shall not construct, repair or alter the Facility in any fashion that would damage or interfere with the corrective measures without approval from the Director and in accordance with an amended Corrective Measures Implementation Plan.

vii. Notwithstanding the foregoing activity and use restrictions, the Permittee may submit a permit modification request, with appropriate technical and other supporting information, that one or more of the foregoing activity and use restrictions should be modified or terminated. Such request shall be made in accordance with Permit Condition II.C.2.

### III.L.2.d. Monitoring and Performance Evaluation

The Permittee shall monitor the effectiveness and performance of the corrective measures and determine any failures of the corrective measures. The results of this monitoring and evaluation shall be presented to the EPA in the annual report required by Permit Condition III.N.3.
a. The Permittee shall submit two copies of a groundwater monitoring plan for
SWMUs 1, 16, 17 (north and south) and 23 to the Director within 90 days of the effective date of
this Permit. The groundwater monitoring plan shall include:

i. Design Plans and Specifications

ii. Operation and Maintenance

iii. Cost Estimate

iv. Sampling and Analysis Plan

v. Quality Assurance Project Plan

vi. Data Management

vii. Recordkeeping Plan

viii. Waste Management Plan

ix. Project Schedule, including provisions for 30 calendar days written
   advance notice of any fieldwork.

b. The Director will review and approve the groundwater monitoring plan
   in accordance with the procedures set forth in Permit Condition III.T.

c. The Permittee shall immediately implement the groundwater monitoring
   plan upon its approval, conducting all activities in accordance with the schedule therein.

d. The Permittee shall complete a class 1 permit modification within 30 days
   of approval of the groundwater monitoring plan to include the approved plan as Permit
   Attachment 9.

III.M. CORRECTIVE ACTION MEDIA CLEANUP STANDARDS

Groundwater monitoring will be required at the solid waste management units (SWMUs) to
evaluate the effectiveness of the remedies in protecting or restoring groundwater to health-based
groundwater goals derived for the Facility in the site-specific Human Health Risk Assessment
(HHRA). Further, any site-related groundwater contamination in excess of federal Maximum
Contaminant Levels promulgated under the federal Safe Drinking Water Act must be contained
within the Facility property boundaries.

III.N.4. Corrective Measures Implementation Five-year Review

a. The Permittee shall submit a report that evaluates the corrective
   measures effectiveness and performance every five (5) years to the
Director. The Permittee shall submit the report to the Director beginning on August 8, 2010 the fifth anniversary of EPA approval of the initial Corrective Measures Implementation Report. The evaluation shall be consistent with the CERCLA Comprehensive Five-Year Review Guidance. The review shall evaluate and report on:

i. Annual reports required in Permit Condition Error! Reference source not found.

ii. Effectiveness of corrective measures in protecting human health and the environment as planned in the statement of basis.

iii. Effectiveness of ECs and ICs in protecting human health and the environment as planned in the statement of basis.

iv. Results of sampling and analysis to determine the effectiveness and performance of the corrective measures.

v. Any changed circumstances that render the corrective measure, including ECs and ICs, ineffective.

vi. Possible modifications to the corrective measures to provide necessary protection.

vii. Any other reporting requirements included in the EPA approved CMI Work Plan.

FACILITY BACKGROUND

The Ash Grove Cement Company facility (Ash Grove) is located within the northern limit of the City of Chanute, Kansas in northwestern Neosho County. The entire Ash Grove property encompasses approximately 2,851 acres and consists of current quarry operations, locations of past and future quarrying activities, cement manufacturing areas, several active and historical waste landfills and a hazardous waste management facility. The Facility has been producing cement since 1907 and has been owned by Ash Grove since its initial construction. The Facility has a current production capacity of about 1,500,000 tons of cement.

Ash Grove has replaced a portion of the fossil fuel used in the cement kilns with waste-derived fuel to reduce energy costs since 1988. Ash Grove submitted the initial application for a RCRA permit to store and manage a variety of hazardous and non-hazardous wastes for use as waste-derived fuel in 1986. Ash Grove amended its RCRA permit application to include boiler and industrial furnace (BIF) requirements for the cement kiln pyro-processing systems in 1992. The EPA and KDHE jointly issued a RCRA permit for management of hazardous waste at the Facility in 1996 and reissued the permit in 2010. The permit required Ash Grove to address corrective action for all releases of hazardous waste or hazardous constituents from any current or former SWMUs and other Areas of Concern (AOCs). Ash Grove has
completed an RFI to characterize the nature and extent of contamination at facility SWMUs, assessments of the risk posed to human health and ecological receptors by the contamination, and a Corrective Measures Study (CMS) to evaluate potential cleanup options.

**SWMU #1, Paraffin Waste Disposal Landfill** - The Paraffin Waste Disposal Landfill is located about 4.5 miles southwest of the concrete plant near the intersection of West 21st Street and the Southern Kansas and Oklahoma Railroad line. Waste acid sludge was generated during paraffin-based petroleum manufacturing by the Warwick Wax Company. The acid sludge was reportedly produced by passing waste sulfuric acid through a clay filter, introducing acid, wax and oil in the clay filter medium. The resulting sludge was placed in an unlined shale pit on Ash Grove’s property. The landfill covers about 5.5 acres, with the waste varying in thickness from zero to about 15 feet.

**SWMU #16, Industrial Waste Landfill** – The Industrial Waste Landfill was permitted by KDHE, covers about 11.5 acres, and was used for disposal of solid waste generated on-site from at least the 1970s until closure in 1995. Materials known to have been placed in the landfill include paper, wood, steel, cement, rubber, fabric, asbestos and cement kiln dust (CKD).

Closure of the landfill was completed under KDHE oversight in 1995, and consisted of capping with two feet of clay and one foot of topsoil, seeding the cover, sloping the cover to promote runoff and filing a restrictive covenant with Neosho County. In 1998, leachate was discovered to be seeping from an area west of the landfill drain outlet structure. Temporary measures were implemented to prevent the leachate leaving the facility and landfill cap repairs were completed in 1999. Those repairs included excavating impacted ditch sediments, relining the drainage ditch, upgrading the cap along the toe of the landfill and improvement of landfill subsurface drainage features. Later in 1999, the EPA required the subsurface drainage system be removed, riprap-lined surface drainage channels be constructed and a leachate collection system be installed at the toe of the landfill. Additional leachate outbreaks were discovered and repaired in 2003 and 2005. The facility completed an investigation in 2006 to better understand the causes of the leachate outbreaks, and a comprehensive plan to mitigate seeps of leachate along the southwestern corner of the landfill was developed. That project was completed in 2008 and included construction of a collection trench, addition of a French drain in the drainage ditch at the western end of the collection trench, a system of sumps and pumps to direct the leachate to a treatment system and regrading drainage to minimize ponding of water.

**SWMU #17, Kiln Dust Landfill** – The Kiln Dust Landfill, the northern portion of which was permitted by KDHE, consists of two separate disposal areas divided by the Facility’s quarry haul road. Both areas have been used solely for disposal of cement kiln dust. The portion south of the haul road covers about 24 acres and has been inactive since the early 1970s. The portion north of the haul road covers about 64 acres and was closed in 1999. The thickness of cement kiln dust waste in both portions is 20 to 30 feet. Constituents of concern include arsenic, cobalt and manganese.

Various stabilization and landfill closure activities were performed on the north portion of the SWMU #17 by Ash Grove between 1996 and 2014. In 1996, a leachate collection trench, recovery sumps and treatment system were constructed to capture leachate seeps along the northeastern toe of the landfill. Closure of the north portion of the landfill was completed under KDHE oversight from 1997 to 2000, and consisted of construction of a composite barrier cover system, installation of a toe drain collection system, construction of two stormwater retention ponds and drainage ditches and revegetation of the area. Most recently, Ash Grove observed distressed vegetation on the north side of the landfill indicating an outbreak of leachate in the subsurface. Ash Grove completed test pits to identify the subsurface feature allowing expression of the leachate and implemented interim measures to control the leachate.
Stabilization measures completed at the southern portion of the Kiln Dust Landfill between 1999 and 2001 included: construction of an earthen barrier to prevent leachate and contaminated stormwater from leaving the Facility; excavation of the perimeter ditch; construction of a clay barrier in the ditch; repair of the existing cap along the northern toe of the southern portion of the landfill; installation of stormwater diversion berms; construction of east and west leachate collection trenches; construction of a leachate treatment system and revegetation of the area. In 2008, the west leachate collection trench was extended and lining was added to one of the drainage ditches to minimize surface water infiltration. In 2014, routine inspection identified stressed vegetation and stained soil at two locations on the north side of the landfill. Ash Grove conducted test trenching, identified the subsurface feature that was allowing the leachate outbreak, and installed a compacted clay barrier trench to prevent further outbreaks.

**SWMU #22, New Industrial Waste Landfill** – The New Industrial Waste Landfill operates under current KDHE solid waste permit No. 653, and was constructed to meet modern landfill design standards. Since construction in 1994, the landfill has accepted non-flammable and non-putrescible industrial wastes, including coal mill rejects, off-spec cement, baghouse dust, boards, trash and etc. Non-friable asbestos wastes have been disposed in specific areas of the landfill with KDHE’s approval. No known releases have occurred at SWMU #22.

**SWMU #23, Inactive Kiln Dust Landfill** – The Inactive Kiln Dust Landfill was a one-time disposal area for cement kiln dust. The CKD was placed in the area in 1975 at the request of the City of Chanute to fill a low-lying area. The landfill is located east of the Ash Grove plant and west of the railroad tracks. The waste covers about 7 acres.

**SWMU #27, Shot Rock Stockpile Area** – In October 2001, Ash Grove workers uncovered a dark oily stained area beneath the northwestern portion of the Shot Rock Stockpile. The affected area of shot rock measured about 60 feet by 25 feet by three feet high. The origin of the oily material is uncertain but may be related to the historical practice of draining gear lubrication oil from the adjacent crusher building and vehicles. Sampling did not identify contaminants of concern in the oily debris.

Ash Grove gradually utilized the oily shot rock in the cement manufacturing process until the material was entirely cleaned up by February 2004.

**PUBLIC PARTICIPATION**

The public comment period was held from July 15 to August 28, 2015. A public notice announcing the availability of the Proposed Statement of Basis, the proposed remedy, the proposed hazardous waste permit modification, and the associated administrative record was published in the Chanute Tribune on July 15, 2015. The Proposed Statement of Basis, the proposed remedy, the proposed hazardous waste permit modification, and the associated administrative record were available throughout the public comment period at the Chanute Public Library, 111 North Lincoln Street, Chanute, Kansas 66720; KDHE Bureau of Waste Management, 100 SW Jackson Street, Suite 320, Topeka, Kansas, 66612; and EPA Region 7 Records Center, 11201 Renner Boulevard, Lenexa, Kansas 66219. A public availability meeting was held in the Alliance Room of the Chanute Memorial Building located at 101 South Lincoln Avenue, Chanute, Kansas 66720 between 5 pm and 7 pm on July 29, 2015.

**PUBLIC COMMENTS AND THE AGENCY’S RESPONSE**
The only comments received during the public comment period were from Ash Grove Cement Company. Ash Grove Cement Company’s comments were dated August 25, 2015. Essentially, Ash Grove Cement Company wanted clarification on landfill cover and monitoring requirements for solid waste management units 1 and 23 at the Ash Grove Cement Company Facility.

Below is the United States Environmental Protection Agency Region 7’s response to comments/clarification on landfill cover and monitoring requirements for solid waste management units 1 and 23 at the Ash Grove Cement Company Facility:

The Permittee shall upgrade cover with minimal disruption to cover any exposed waste to allow vegetation to prevent erosion, and maintain an upgraded soil cover over the waste disposed in SWMU #1. That cover shall have sufficient thickness to minimize infiltration and support vegetation planted to prevent erosion of the soil and the underlying waste by providing moisture retention and sufficient medium for vegetation to grow and thrive. The Permittee shall submit for approval a Corrective Measures Implementation Work Plan (CMI Work Plan) to EPA and KDHE. The CMI Work Plan shall include a provision for the Permittee to inspect the cover yearly looking for erosion or portions of the cover where vegetation has died. The CMI Work Plan shall include (1) an annual down gradient groundwater sample, (2) an annual soil/sediment sample from directly around the SWMU, and (3) an annual standing surface water sample from directly around the SWMU, if there is any standing surface water. Such samples shall be analyzed for pH, VOCs, SVOCs, and the metals of potential concern detected in the Corrective Measures Study [which are aluminum, arsenic, chromium, cadmium, cobalt, iron, lead, manganese, vanadium, nickel, strontium, benzene, 2 methylnaphthalene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene]. Should an EPA Statistically Significant Increase (SSI) in results occur that is over the Safe Drinking Water Act Maximum Contaminant Level (MCL) or industrial soil or water Regional Screening Level (RSL) or other standard as defined in the CMI Work Plan, or should the pH reading be less than 5 or higher than 9, the Permittee shall submit a plan to EPA and KDHE to alleviate the problem, and implement the plan after obtaining EPA and KDHE approval. The Permittee shall define the SSI protocol in the CMI Work Plan. Should the Permittee find that minor amounts vegetation has died or there is minor erosion, the Permittee shall replace and/or reseed the vegetation and/or replace eroded soil and submit a report to EPA and KDHE documenting such within 60 days of discovery of the minor erosion/dead vegetation. Should the Permittee find that significant amounts vegetation has died or there is significant erosion, the Permittee shall submit a plan to EPA and KDHE for approval to alleviate the problem. The Permittee shall also put in place land use controls to prevent possible future exposures. Such land use controls may be property use restrictions, fence, etc. and shall be approved by EPA and KDHE. The parcel of land containing SWMU 1 shall carry a deed notice stating that waste paraffin is buried on the property.

The Permittee shall maintain the in-place native soil cover over the waste disposed in SWMU #23 to ensure that cover shall have sufficient thickness to support and maintain vegetation planted to prevent erosion of the soil and the underlying waste by providing moisture retention and sufficient medium for vegetation to grow and thrive. The Permittee shall submit for approval a Corrective Measures Implementation Work Plan (CMI Work Plan) to EPA and KDHE. The CMI Work Plan shall include a provision for the Permittee to inspect the cover yearly looking for erosion and/or portions of the cover where vegetation has died. The CMI Work Plan shall include (1) an annual down gradient groundwater sample, (2) an annual soil/sediment sample from directly around the SWMU, and (3) an annual standing surface water sample from directly around the SWMU, if there is any standing surface water. Such samples shall be analyzed for pH.
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ATTACHMENT 5

OPERATION & MAINTENANCE PLAN
Appendix G

OPERATION AND MAINTENANCE PLAN

Ash Grove Cement Company
Chanute, Kansas

December 21, 2017
OPERATION AND MAINTENANCE PLAN
Ash Grove Cement Company, Chanute, Kansas

Prepared for:
Ash Grove Cement Company

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Our Ref.:
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Date:
December 21, 2017

Bretton C. Overholtzer, P.E.
Principal Engineer

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Senior Project Manager/Principal
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1 INTRODUCTION

This Operation and Maintenance (O&M) Plan has been prepared on behalf of Ash Grove Cement Company (Ash Grove) for the Resource Conservation and Recovery Act (RCRA) Corrective Measures Implementation (CMI) at the Ash Grove Chanute Cement Plant (the Plant, Figure 1). The corrective measures are being implemented as part of the requirements contained in the RCRA Permit (HSWA, Part II), U.S. Environmental Protection Agency (USEPA) ID# KSD031203318 (Permit), as modified and effective July 19, 2017 (USEPA 2017). This document has been prepared consistent with the Final Remedy Decision for the Statement of Basis and Response to Comments, the Corrective Measures Decision, and consistent with the RCRA Corrective Action Plan guidance (USEPA 1994).

This O&M Plan outlines the inspection and maintenance program for maintaining the integrity of the landfill covers and leachate collection systems installed at the Plant and to collect data used in performance monitoring of the implemented corrective measures, as required by the Permit.

1.1 O&M Plan Goals and Objective

The primary goal of the O&M Plan is to prevent uncontrolled exposures to waste and impacted soil, and groundwater and to protect the health of persons at the Plant. To accomplish this goal, the O&M Plan will address the following objectives:

- Maintain the integrity of the completed Corrective Measures
- Establish an inspection and monitoring program to monitor the integrity of the landfill cover and leachate collection systems and evaluate remedy effectiveness
- Provide for timely repair and replacement needed to restore damaged landfill cover and leachate collection systems
- Minimize disturbances of waste
- Provide for record-keeping of inspections and repairs, and reporting to USEPA.
2 PLANT DESCRIPTION

The Ash Grove Cement Company Plant is located within the northern limit of the City of Chanute, Kansas in north-western Neosho County (Figure 1). The entire Ash Grove property occupies approximately 3,600 acres and consists of current quarry operations, locations of past and future quarrying activity, cement manufacturing areas, and a hazardous waste management facility. The Plant mines the majority of raw materials necessary for cement production on site. Portland cement is manufactured by a multi-stage dry pyroprocessing technology, which uses a specific mixture of raw materials to form cement clinker in a large-capacity rotary kiln. The clinker is then ground with a small amount of gypsum and other additives into the various final cement products.

Neighboring properties include tracts of land used for agricultural purposes to the north and west of the Plant. The Plant is bounded by Village Creek to the north and residential and some commercial properties to the south.

2.1 Plant Background

The Plant has been producing cement since 1907 and has been owned by Ash Grove since its initial construction. The Plant was expanded in the 1920s, the 1960s, and again in 2000. The most recent expansion increased the annual plant capacity to approximately 1,500,000 tons of cement. Types of cement manufactured at the Plant include Portland Type I/II, Type IA, Type IP, Type III, and masonry cement.

2.2 RCRA Corrective Measures

After consideration of the Corrective Measures Alternatives evaluated in the Corrective Measures Study (Arcadis 2012), USEPA selected Corrective Measures to be implemented at the Plant. These Corrective Measures for four solid waste management units (SWMUs) were stipulated in the revised RCRA Permit for the Ash Grove Plant (USEPA 2017) and include:

SWMU 1 – Paraffin Waste Landfill

- Upgrade existing cover to prevent exposure to waste, prevent erosion, minimize infiltration of water, and support vegetative growth.
- Perform annual inspections to evaluate erosion and stressed/dead vegetation.
- Perform annual sampling, including:
  - Downgradient groundwater sampling
  - Soil/sediment sampling
  - Surface water sampling, if standing water is observed
- Implement land controls to prevent future exposure, including fencing, access restrictions, and deed notice.
SWMU 16 – Industrial Waste Landfill
- Maintain the existing low-permeability clay cover, overlying soil cover, and established vegetation to promote runoff, minimize run-on, and prevent erosion of the covers and underlying waste.
- Maintain the existing leachate collection system.
- Install controls to prevent trespass, livestock use, or any other activity that could potentially damage the cover system over the waste.
- Implement a monitored natural attenuation program to monitor impacted groundwater at SWMU 16.
- Implement land controls to prevent future exposure, including access restrictions and deed notice.

SWMU 17 North – North Cement Kiln Dust Landfill
- Maintain the existing low-permeability clay cover, overlying soil cover, and established vegetation to promote runoff, minimize run-on, and prevent erosion of the covers and underlying waste.
- Maintain the existing leachate collection system.
- Install controls to prevent trespass, livestock use, or any other activity that could potentially damage the cover system over the waste.
- Implement a monitoring program to monitor groundwater at SWMU 17 North.
- Implement land controls to prevent future exposure, including access restrictions and deed notice.

SWMU 17 South – South Cement Kiln Dust Landfill
- Design, install, and maintain a low-permeability cover over the waste portion of the SWMU.
- Design, install, and maintain an overlying layer of soil cover sufficient to protect the low-permeability cover from infiltration, prevent erosion, and support and maintain vegetation.
- Plant and maintain vegetation in the soil layer to prevent erosion of the soil and underlying low-permeability cover.
- Maintain the existing leachate collection system.
- Install controls to prevent trespass, livestock use, or any other activity that could potentially damage the cover system over the waste.
- Implement a monitoring program to monitor groundwater at SWMU 17 South.
- Implement land controls to prevent future exposure, including access restrictions and deed notice.

SWMU 23 – Inactive Kiln Dust Landfill
- Maintain the in-place native soil cover to minimize infiltration and promote vegetative growth
- Perform annual inspections to evaluate erosion and stressed/dead vegetation
- Perform annual sampling, including:
  o Downgradient groundwater sampling
OPERATION AND MAINTENANCE PLAN
Ash Grove Cement Company, Chanute, Kansas

- Soil/sediment sampling
- Surface water sampling, if standing water is observed.
  - Implement land controls to prevent future exposure, including fencing, access restrictions, and deed notice.
3 O&M ACTIVITIES

This section presents a summary of the roles and responsibilities of the Ash Grove project team, a description of the routine inspections required by the corrective measures, a presentation of contingency measures for unplanned events, and a description of maintenance activities that may be required to maintain protectiveness of the implemented corrective measures and ensure proper system operations.

3.1 Hazard Summary

Remedial Action Objectives were developed in the Corrective Measures Study (Arcadis 2012) for the SWMUs at the Ash Grove facility. These include:

- Mitigate exposure to constituents of concern (COCs) in soil, waste, groundwater, sediment, and surface water to achieve an individual excess lifetime cancer risk no greater than $1 \times 10^{-5}$ and a non-cancer hazard quotient less than 1.
- Use Environmental Use Controls to limit land use at SWMUs to non-residential uses, and prohibit the installation of potable water wells in the immediate vicinity of the SWMUs.
- Prevent ingestion and dermal contact (hypothetical future site excavation workers) with on-site soil, waste, and groundwater exceeding the risk-based Corrective Action Objective Goals (CAOGs) for the identified COCs developed for a hypothetical future site excavation worker exposure scenario.
- Prevent ingestion and dermal contact (hypothetical future youth trespasser) with on-site sediment and surface water exceeding the risk-based CAOGs for the identified COCs developed for a hypothetical future youth trespasser exposure scenario.

For O&M activities, worker exposure to landfill waste and leachate are the primary exposure pathways for environmental risk. All work will be performed using the protocols contained in the Health and Safety Plan developed for Corrective Measures Implementation, and Ash Grove’s safety program.

3.2 O&M Personnel Roles and Responsibilities

Ash Grove will employ or designate a Project Manager and O&M Inspector to implement the O&M Plan at the Plant. The responsibilities are identified below.

3.2.1 Project Manager

The responsibilities of the Project Manager are as follows:

- Implement the O&M Plan
- Be familiar with Plant conditions and landfill cover systems installed at the Plant
- Evaluate work orders to determine if work will intrude into metals-impacted soils or capped areas
- Oversee implementation of USEPA-approved work plans for any intrusive work
- Receive and submit all notices, comments, documents, reports, approvals, decisions, and other communications to and from USEPA on behalf of Ash Grove
• Submit O&M Plan and all subsequent reports, including the Annual Report, Five-Year Review Reports, and intrusive work summary reports

• Sign-off on Annual Reports, Five-Year Review Reports, and intrusive work summary reports

• Ensure that issues pertaining to O&M are brought to the attention of Ash Grove as appropriate, including requests for ongoing appropriations of funds and notification in the event that any exposures occur at the Plant.

3.2.2 O&M Inspector

The O&M Inspector will be an individual having experience with the landfill cover systems installed at the Plant and experience with the leachate collection systems.

The responsibilities of the O&M Inspector are as follows:

• Conduct routine and unplanned (emergency) inspections and five-year reviews

• Provide recommendations for needed landfill cover repairs

• Assist in the preparation of the Annual Reports and Five-Year Review Reports

• Assist in the preparation of Completion Reports for intrusive activities and landfill cover repairs.

3.3 Inspection Schedule

Landfill covers and the leachate collection systems will be regularly inspected and documented, using the forms included in Attachment 1. The copies of the inspection forms will be maintained in the project files at the Chanute Plant.

The table below summarizes the frequency of inspections conducted as part of the corrective measures:

<table>
<thead>
<tr>
<th>Inspection</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill Covers and Fencing</td>
<td>Annually</td>
</tr>
<tr>
<td>Leachate Collection Systems (SWMUs 16, 17N and 17S)</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Storage Tank Integrity</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Review of Institutional Controls</td>
<td>Annually</td>
</tr>
<tr>
<td>Inspect leachate collection piping for fouling and need for acid cleaning</td>
<td>As needed, based on performance observations</td>
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</tbody>
</table>

3.4 Routine Inspections

The landfill cover systems will be inspected annually. Inspections will be conducted after a recent mowing during growing season by an individual knowledgeable with the specific cover systems. The landfill cover inspection will consist of a walking survey of the entire landfill cover system (e.g., capped area, surface
water drainage features, fenced perimeter) and, where present, the leachate collection system infrastructure (sumps, access cleanouts, treatment building) to document observations on the inspection form (see Attachment 1) and in photographs. Each inspection will include a general evaluation on the landfill cover effectiveness. If the inspector believes the landfill cover is not performing effectively as intended, appropriate corrective actions will be implemented.

3.4.1 Landfill Covers
The O&M Inspector will inspect the landfill covers on SWMUs 1, 16, 17, and 23 for any signs of damage, failure, or disturbance, including the following:

- Slope failure or slope instability
- Cracks or rills larger than two inches wide or that penetrate through the landfill cover
- Animal holes
- Seepage or ponding
- Erosional damage or sloughing of edge materials
- Excessive or uneven settlement.

The inspection form will note and photograph the locations and dimensions of the damage (e.g., area, crack width, crack length).

3.4.2 Surface Water Drainage
The O&M Inspector will evaluate surface water drainage and areas that channel surface water runoff at the Plant (e.g., ditches, slope edges). Each inspection will ensure that the drainage system remains free of damage and obstructions, is providing adequate runoff, and does not exhibit excessive erosion.

3.4.3 Vegetation
The O&M Inspector will inspect the landfill cover vegetation to evaluate whether there is stressed or missing vegetation and whether deep-root plants are present that could penetrate the landfill cover. The inspection will also determine if dry grass is present that poses a fire hazard.

3.4.4 Leachate Collection System
A series of sumps, drainage trenches, pumps, and collection piping are used at SWMUs 16, 17 North, and 17 South to collect and accumulate landfill leachate for treatment (as necessary) and eventual re-use as process water or cement kiln dust (CKD) landfill makeup water. The configuration of the leachate collection system sumps, trenches, and trench piping are shown on the figures contained in Attachment 2.

The leachate sumps and appurtenant devices will be inspected at least quarterly, and the results of the inspection documented on the Leachate Collection System Inspection Form included in Attachment 1. The O&M Inspector will inspect the leachate collection system for any signs of damage, failure, or disturbance, including an evaluation of:
OPERATION AND MAINTENANCE PLAN
Ash Grove Cement Company, Chanute, Kansas

- Pump operation
- Corroded or stuck valves
- Visible and accessible cleanouts
- Electrical connections accessible, operational, and not corroded.

3.4.5 Leachate Storage Tanks

The leachate storage tanks at SWMUs 16 and 17 will be inspected at least quarterly, and the results of the inspection documented on the Leachate Storage Tank Inspection Form included in Attachment 1.

RCRA regulations require daily inspections for tanks storing hazardous waste (liquids with a pH greater than or equal to 12.5). For the past several years, the leachate collected from the landfill leachate collection systems have been consistently below 12.5; therefore, quarterly tank inspection is appropriate. Although not anticipated, if the leachate pH rises to equal to or greater than 12.5, the inspection frequency will be re-evaluated.

The O&M Inspector will inspect the leachate storage tanks for any signs of damage, failure, or disturbance, including an evaluation of:

- Visible leaks or wet areas
- Condition and operation of appurtenances (e.g., valves, connections, interior piping)
- Condition of seams and any welds
- Structural integrity of the foundation
- Anchor bolts in areas where required
- Condition of the tank to confirm that it is hydraulically sound and not leaking.

3.4.6 Perimeter Fence

The O&M Inspector will inspect the perimeter fence (where present) to identify any damage or a need to replace posted signs.

3.5 Reporting and Follow-up

The inspection findings will be documented on the inspection forms (Attachment 1) and summarized in the Annual Report. The Annual Report will be submitted to USEPA as required by the Permit.

If the O&M Inspector believes the landfill cover or leachate collection system is not performing effectively as intended, appropriate Corrective Actions will be implemented. Ash Grove is responsible for follow-up review to ensure that identified repairs are completed on schedule, and will sign off on the completion blocks of the inspection reports.
3.6 Inspection for Unplanned Events

Immediate and appropriate action will be taken to prevent, abate, or minimize an emergency related to any action or occurrence such as a fire, earthquake, explosion, or human exposure to hazardous substances caused by a release or threatened release of hazardous substances at the Plant. Ash Grove will notify USEPA of any such occurrence. The need for action will be identified by inspecting the landfill cover after an unplanned event that has the potential to impact the landfill cover integrity or based on a report of damage observed by persons at the Plant. Inspection observations will be documented on the inspection forms, as appropriate (Attachment 1).

Ash Grove will take appropriate action in consultation with USEPA and the O&M Inspector, and in accordance with the applicable provisions of the Permit. A report describing the events that occurred, and response measures taken will be submitted to USEPA as part of the Annual Report.

3.6.1 Earthquake

The closest faults to the Plant are the Meers fault in southwest Oklahoma and the New Madrid fault in southeast Missouri. These faults are approximately 260 miles and 320 miles, respectively, from the Plant. The probability of an earthquake registering greater than 5.0 on the Richter scale and occurring in the next 100 years within 100 miles of the Plant is less than one percent (USGS, 2017). In the event of an earthquake event of 5.0 or greater on the Richter scale, the O&M Inspector will visually inspect the landfill cover system for signs of damage as soon as it is safe and practical to do so and will document his/her observations on the form included in Attachment 1.

3.6.2 Floods or Major Storms

In the event of a flood or major storm the O&M Inspector will inspect the landfill cover system within 30 days of the event to ensure its integrity. The inspector will document his/her observations on the form included in Attachment 1. For the purpose of this O&M Plan, a major storm is defined as a storm with greater than 6 inches of precipitation or more over a 24-hour period (25-year, 24-hour storm event, NOAA 2017).

3.6.3 Fire

In the event of a surface fire on or near the landfill cover, the O&M Inspector will inspect the landfill covers and leachate collection systems and document his/her observations on the form included in Attachment 1, as soon as it is safe and practical to do so.

3.7 Maintenance and Repair

3.7.1 Landfill Covers

Typical maintenance will include backfilling of animal burrows with clean soil, removal of burrowing animals, filling or regrading of depressions, and revegetation or mulching of eroded areas.
For areas where the landfill cover damage or disturbance appears to be continuous or excessive, Ash Grove will notify USEPA as specified in Section 7. Examples of such problems include slope stability issues, excessive erosion, and significant cracks or rills that have the potential to affect landfill cover function.

3.7.2 Surface Water Drainage

Typical maintenance will include removal of debris, silt, or other obstructions from the surface water drainage system. If the O&M Inspector identifies excessive erosion, inadequate runoff capacity, or other significant damage, Ash Grove will notify USEPA as specified in Section 7.

3.7.3 Vegetation

Maintenance will include removal of deep-root species that penetrate the landfill cover, and seeding, watering, and mulching over barren or poorly vegetated area. Reseeding should take place in accordance with the specifications included in the CMI Technical Specification and should be timed for the season that will optimize establishment of vegetation.

Periodic mowing will take place as needed after the rainy season, in the summer, and late fall to ensure that the vegetation does not grow taller than 36 inches. If the O&M Inspector identifies areas that are persistently poorly vegetated, such that the landfill cover integrity is affected, Ash Grove will notify USEPA as specified in Section 7.

3.7.4 Leachate Collection System Maintenance

Typical maintenance activities include repair to sump pumps and piping, repair to minor erosion around sump vaults, and periodic repair and replacement of piping.

Acid treatment or mechanical jetting may be used to clean the collection system piping and restore the flow capacity of the systems.

Any acid treatment or mechanical jetting will be performed under a Work Plan developed specifically for that activity. The following general pipeline acid treatment procedures have been previously implemented at the Plant:

- Take the leachate collection system out of service. Follow all plant lock-out/tag-out procedures.
- Disconnect piping at sump and at the treatment building and connect two temporary surge tanks to each end. Connect temporary in-line transfer pump.
- Wearing the appropriate personal protective equipment (PPE), mix acid or appropriate cleaning agent in one of the surge tanks.
- Using the temporary pump, transfer acid solution through the piping to the second surge tank.
- Circulate acid within the piping between the surge tanks, checking pH of the treatment solution. Add acid solution as necessary to maintain target pH of 2.5 to 3.0.
- Continue acid circulation until completion of the cleaning process (determined based on field observations)
• Upon completion of acid treatment, add a buffered neutralizer to the acid circulation tank. Circulate water from the leachate collection sump through the acid circulation tank until the pH is acceptable for process water or CKD landfill makeup water (6.5 to 9 standard units)
• Remove temporary treatment equipment, reconnect system, and restore all valves to their normal operating positions
• Following the appropriate Plant lock-out/tag-out procedures, place the leachate collection system into operation.

3.7.5 Security and Perimeter Fence Inspections

If the O&M Inspector identifies fence damage, Ash Grove will notify USEPA as specified in Section 7 and will repair the fence.

3.8 Review of Institutional Controls

Once per calendar year, Ash Grove will review the institutional controls and engineering controls implemented as part of the RCRA Corrective Measures. The Environmental Use Control Annual Review Form (included in Attachment 1) will be completed and stored in the project files at the Chanute Plant. The Environmental Use Control Annual Review Form will be included with the Annual Report.

The institutional control review will include an assessment of:

• Unauthorized property use or unauthorized well drilling
• Unauthorized construction or excavation
• Plant security measures in place
• Unauthorized agricultural activities
• Surrounding land use.
4 OPERATIONS PLAN FOR LEACHATE COLLECTION

This section presents an overview of the leachate collection system and summarizes the operational data that will be collected to monitor the system performance.

4.1 Overview of the Leachate Collection System

Leachate-impacted groundwater is pumped from the collection trenches and French drain sump into one of five storage tanks, located at SWMU 16, 17 North and 17 South. The contents of these tanks are collected in a common tank prior to being pumped to the tank in the plant for eventual reuse in the cement manufacturing process or are pumped to the active CKD monofill. These collection systems operate as a continuous process.

For the past several years, all pH measurements have been below 12.5. Ash Grove has made a hazardous waste determination that the effluent of this continuous process is not a hazardous waste and therefore, pre-treatment is not necessary. If future determinations indicate that the pH of the collected leachate is equal to or above 12.5, and therefore considered characteristically hazardous under RCRA, then Ash Grove will re-evaluate and adjust the storage tank inspection frequency and pre-treatment options.

4.2 Data Requirements for the Leachate Collection System

The following operational data will be collected by Ash Grove and maintained in the Plant files. Impacted water usage will be summarized to USEPA as part of the Annual Report. Maintenance records will be maintained electronically at the Chanute Plant in the Computerized Maintenance Management System (CMMS) database.

<table>
<thead>
<tr>
<th>Operational Parameter</th>
<th>Frequency of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Quantity of leachate/monofill 0759 water used for process water in the cement plant.</td>
<td>Collected from flow meters to the cement process.</td>
</tr>
<tr>
<td>• Maintenance records for sump pumps and tanks</td>
<td>Ongoing – as repair and maintenance activities occur</td>
</tr>
</tbody>
</table>
5 FIVE-YEAR REVIEW

Five-year reviews will be conducted to evaluate on-going remedy effectiveness. The purpose of the review is to determine whether the remedy: (a) remains protective of human health and the environment; (b) is functioning as designed; and (c) is maintained appropriately by O&M activities.

Ash Grove will prepare and submit a report that summarizes all findings, conclusions, and recommendations. Ash Grove is responsible for responding to recommendations made in the Five-Year Review Report and any additional requirements identified by USEPA. The USEPA requirements may include additional investigations, monitoring, and/or mitigation.

Ash Grove is responsible for follow-up review to ensure that identified repairs are completed on schedule, and will sign off on the completion report.
6 INTRUSIVE WORK ACTIVITIES

Intrusive activities that disturb the waste under the landfill cover will be conducted with a USEPA-approved Work Plan and site-specific Health and Safety Plan. Examples of these activities include excavation, grading, removal, trenching, filling, and earth movement.

In the event of such work, Ash Grove will complete the following:

- Notify USEPA of the type, cause, location, and date of any disturbances to the landfill cover that could affect the ability of the landfill cover to contain the underlying impacted material.

- Before any proposed modifications/disruptions of the landfill cover, provide USEPA with written notification as specified in Section 7. The written notice will include a detailed description of the work to be done, and will include a figure showing the location of the proposed work and the reasons for the modifications/disruption. The written notice will include a draft Work Plan for USEPA comment and approval.

- Notification to USEPA after completion of modifications/repairs to the landfill cover in an intrusive work summary report that describes all intrusive work and that certifies that the landfill cover was restored to specified design requirements.
7 REPORTING AND RECORDKEEPING

This section describes the notification, reporting and recordkeeping requirements of the implemented Corrective Measures at the Plant.

7.1 USEPA Notification Requirements

Ash Grove will notify USEPA in writing as follows:

- Within 90 days of damage that remains unrepaired following a routine inspection or inspection for a Five-year review
- Within 7 days of an unplanned event that impacts or threatens to impact the integrity of the landfill cover
- At least 90 days after completion of intrusive work activities that affected the integrity of the landfill cover or other work activities related to surface water drainage systems, vegetation, and/or fencing
- An Annual Report will be submitted to USEPA by March 1 for the period covering the previous year

If appropriate, notifications should include a proposed schedule for completing required repairs and maintenance.

7.2 Annual Report

The Annual Report will be submitted to USEPA no later than March 1 of each year, summarize the findings of routine inspections, and will document completions, delays, or failures to repair any items identified as needing repairs. The Annual Report will include the following content, as appropriate:

- Results of the visual inspections and any supporting data.
- Description of:
  - Actions taken during the reporting period, including any repairs to the landfill cover that were identified and carried out
  - Any significant changes in Plant conditions and usage
  - Any additional on-site construction or other information that may relate to the landfill covers or impact cover integrity or function
- Description of actions planned or expected to be undertaken in the next year that will impact the landfill covers
- Conclusions regarding the ongoing effectiveness of the landfill covers
- Description of any maintenance or repairs identified as needed during the inspection
- Recommendations for O&M Plan modifications
- Copies of signed inspection forms completed during the reporting period
- Copies of all field logs completed during the reporting period
• Photographs depicting site conditions with brief identifying captions or descriptions. Photographs will document inspection findings and demonstrate stability and/or failure of the landfill covers

• Copies of any data generated during groundwater sampling or system operation and any significant findings from the data.

7.3 Reporting of Intrusive Work

Work activities that put employees in contact with waste will be documented in a summary report. The report will include the following information:

• Dates work was performed
• Work locations with figures and/or construction drawings
• Work activities performed, including restoration of landfill cover systems
• Work practices taken to prevent potential exposures
• Variance or modifications (if any) of the approved Work Plan
• Summary of finished site conditions.

7.4 Five-Year Review Reports

The first Five-Year Review Report for the Plant will be completed five years from the date that USEPA approves the Corrective Measures Implementation Report. The Five-Year Review Report will summarize the remedy effectiveness within the reporting period. The Report will identify any incidents or problems with the implemented Corrective Measures, and will evaluate system performance, effectiveness, and protectiveness. The Five-Year Review Report will include a technical assessment and evaluation of the on-going protectiveness of the remedy. As required by the RCRA Permit, the review will evaluate and report on:

• Summary of Annual Reports required by the Permit
• Effectiveness of the corrective measures in protecting human health and the environment as planned in the Statement of Basis
• Effectiveness of institutional controls and engineering controls in protecting human health and the environment as planned in the Statement of Basis
• Results of sampling and analysis to determine the effectiveness and performance of the Corrective Measures
• Any changed circumstances that render the Corrective Measures, including institutional controls and engineering controls ineffective
• Possible modifications to the Corrective Measures to provide necessary protection

The Five-Year Review Report will state conclusions and make recommendations for any changes needed to maintain remedy protectiveness.
8 INSPECTION TRAINING

Ash Grove will provide training necessary for plant personnel to safely, efficiently, and effectively inspect, operate and maintain the landfill leachate collection systems and landfill covers. On-the-job training will be conducted as the opportunities for instruction arise by the Ash Grove Environmental Manager and/or their designee.
9 PLANT ACCESS

Upon request, Plant access for USEPA representatives and O&M personnel will be arranged and provided by the Plant Manager, Environmental Manager, or other Ash Grove personnel. The Plant is an active industrial facility and all Ash Grove security, safety and traffic procedures and requirements must be followed at all times.
10 VARIANCE FROM, OR MODIFICATION OF O&M PLAN

Ash Grove may seek a written variance and/or modification of the O&M Plan at any time during the life cycle of the Corrective Action remedies. "Variance" refers to possible release from specific individual O&M Plan requirements for a limited period, while "modification" refers to permanent revision of specific individual O&M Plan requirements. When long-term performance of the selected Corrective Action remedies has been confirmed by USEPA, Ash Grove may request approval from USEPA to modify the requirements of the O&M Plan.
11 REFERENCES


Ash Grove Cement Plant Location

Legend

- Solid Waste Management (SWMU) Area
- Ash Grove Approximate Property Boundary

Site Location Map

SOURCE: ESRI, DIGITALGLOBE, GEODEVE, EARTHSTAR GEOGRAPHICS, CNES/ARIANESPACE, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
### SECTION I: PROPERTY INFORMATION

**PROJECT NAME:**
Ash Grove Chanute Cement Plant

**REVIEW DATE:**

**PROPERTY OWNER(S):**
Ash Grove Cement Company

**CITY:**
Chanute

**COUNTY:**
Neosho

**PROJECT ADDRESS:**
1801 Santa Fe

**PHONE NUMBER:**

**SOLID WASTE MANAGEMENT UNIT:**
1 ☐ 16 ☐ 17N ☐ 17S ☐ 23 ☐

**REVIEW FREQUENCY:**
Annual ☐ Other ☐

**PROTECTIVE COVER ON-PROPERTY?**
YES ☐ or NO ☐

### SECTION II: VERIFICATION OF RESTRICTIONS

**Has the protective cover retained its functional integrity?**
Yes ☐ No ☐ N/A ☐

**Is the protective cover free of erosion, cracks or other evidence of degradation?**
Yes ☐ No ☐ N/A ☐

**Have water wells been drilled, constructed, or used on the property for unauthorized purposes?**
Yes ☐ No ☐ N/A ☐

**Has unauthorized construction or excavation occurred?**
Yes ☐ No ☐ N/A ☐

**Is vegetation present and kept in acceptable condition?**
Yes ☐ No ☐ N/A ☐

**Are site security measures in place and in working condition?**
Yes ☐ No ☐ N/A ☐

**Site security measures include (mark all that apply) Other ☐ Signs ☐ Fences ☐ Gates ☐**

**Is the property used for non-residential purposes only?**
Yes ☐ No ☐ N/A ☐

**Is the property being used for unauthorized agricultural activities as defined by the Institutional Controls?**
Yes ☐ No ☐ N/A ☐

**Land use type: (mark all that apply) Residential ☐ Recreational ☐ Agricultural ☐ Commercial ☐ Industrial ☐ Vacant ☐**

**Surrounding land use type: (mark all that apply) Residential ☐ Recreational ☐ Agricultural ☐ Commercial ☐ Industrial ☐ Vacant ☐**

**Is the Deed Restriction recorded at the county register of deeds? (For first review only, provide a copy of the recorded Deed Restriction)**
Yes ☐ No ☐ N/A ☐

**Does the name of the property owner on file at EPA match the owner listed on the deed?**
Yes ☐ No ☐ N/A ☐

**Has property ownership changed?**
Yes ☐ No ☐ If yes, the new property owner is:

**Is the property being leased?**
Yes ☐ No ☐ If yes, the lessee is:

**REMARKS (DESCRIBE ANY ADDITIONAL RESTRICTIONS FOR THE PROPERTY, IF ANY, IN THE REMARKS AREA)**

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G:/Aproject/Ash Grove/Chanute IC Inspection Form.docx
### SECTION III: CURRENT PROPERTY DESCRIPTION

**DESCRIBE THE CURRENT CONDITION AND USE(S) OF THE PROPERTY**

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**DESCRIBE ANY IMPROVEMENTS INCLUDING NEW STRUCTURES MADE TO THE PROPERTY SINCE THE PREVIOUS REVIEW.**

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
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</tbody>
</table>

**DESCRIBE ANY NEED FOR REPAIRS TO THE PROTECTIVE STRUCTURE(S), SECURITY MEASURES, MONITORING STATIONS, PERMANENT BENCHMARKS, OR OTHER FEATURES INCLUDE OBSERVATION OF EROSION, CRACKING, WEED CONTROL, SETTLEMENT, SUBSIDENCE, EXCESSIVE BURROWING, ETC.**

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

***PLEASE TAKE PICTURES OF THE PROPERTY AND INCLUDE IN REVIEW FILES***

### SECTION IV: REVIEWER INFORMATION

**REVIEWER NAME:**

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**REVIEW DATE:**

<table>
<thead>
<tr>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**REVIEWER SIGNATURE:**

<table>
<thead>
<tr>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
# General Information

<table>
<thead>
<tr>
<th>Name of Inspector:</th>
<th>Company:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Time:</td>
</tr>
</tbody>
</table>

| SWMU Inspected: | ☐ 16 ☐ 17 North ☐ 16 South ☐ 23 ☐ |

| Weather: | Sunny ☐ Cloudy ☐ Windy ☐ Rainy ☐ Snowy ☐ |
| Temperature: | °F |

| Ground conditions: | Wet ☐ Dry ☐ Snow ☐ |

<table>
<thead>
<tr>
<th>Type of Inspection?</th>
<th>Annual ☐ Quarterly ☐ Monthly ☐ Other ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>If other, explain:</td>
<td></td>
</tr>
</tbody>
</table>

## Cover Inspection

<table>
<thead>
<tr>
<th>Is there any setting, subsidence, or erosion evident?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>If yes, please describe corrective action and dates of completion:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Are there any signs of burrowing animals in the cover system?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>If yes, note area and explain:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Are there any surface disturbances from vehicles or other physical actions?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Is there any precipitation ponding in the disposal cell?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>If yes, note area and explain:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Are there any gullies, washouts or other disturbances caused by water erosion?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>If yes, note area and explain:</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

## Perimeter Berm Inspection (if present)

<table>
<thead>
<tr>
<th>Any signs of erosion, settling, or subsidence?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Any signs of stressed vegetation or no vegetation?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Any breaching of the berms evident?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Do berms appear in good condition?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Any gullies, washouts or other erosional areas?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Are the perimeter berms containing the waste within the landfill boundary?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Any stained soils or discolored water observed?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
</table>

Comments:
### Perimeter Swale Inspection (if present)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any signs of erosion, settling, or subsidence?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any signs of stressed vegetation or no vegetation?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any breaching of the swales evident?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Do swales appear in good condition?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any gullies, washouts or other erosional areas?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Does vegetation impede water flow in the ditches?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are the swales free of dirt and debris?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Removal of accumulated sediment required?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are the perimeter swales conveying water to the sedimentation basin?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any stained soils or discolored water observed?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sedimentation Basin Inspection (if present)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>Any signs of erosion, settling, or subsidence?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any signs of stressed vegetation or no vegetation?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any breaching of the berms evident?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any gullies, washouts or other erosional areas?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Is the basin free of debris?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Does vegetation impede water flow in the ditches?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Removal of accumulated sediment required?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Do ponds appear in good condition?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any erosion at the basin inlet evident?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any erosion at the culvert outlet evident?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Is the culvert free of dirt and debris?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are the outlet structures free of dirt and debris?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any clogging of the culvert pipe evident?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any chips or cracks in culvert evident?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Access Road

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any signs of erosion, settling, or subsidence?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Any gullies, washouts or other erosional areas?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Is the access road in good condition?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are the access roads free of debris?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Is stormwater flowing toward the interior cell from the access road?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
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</tbody>
</table>

### REVIEWER INFORMATION

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<tbody>
<tr>
<td>REVIEWER NAME:</td>
<td></td>
</tr>
<tr>
<td>REVIEW DATE:</td>
<td></td>
</tr>
<tr>
<td>REVIEWER SIGNATURE:</td>
<td></td>
</tr>
<tr>
<td>General Information</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>---</td>
</tr>
<tr>
<td>Name of Inspector:</td>
<td>Company:</td>
</tr>
<tr>
<td>Date:</td>
<td>Time:</td>
</tr>
<tr>
<td>SWMU Inspected:</td>
<td>16 ☐ 17 North ☐ 16 South ☐</td>
</tr>
<tr>
<td>Weather:</td>
<td>Sunny ☐ Cloudy ☐ Windy ☐ Rainy ☐ Snowy ☐</td>
</tr>
<tr>
<td>Temperature:</td>
<td>°F</td>
</tr>
<tr>
<td>Ground conditions:</td>
<td>Wet ☐ Dry ☐ Snow ☐</td>
</tr>
<tr>
<td>Type of Inspection?</td>
<td>Semi-Annual ☐ Quarterly ☐ Monthly ☐ Other ☐</td>
</tr>
<tr>
<td>If other, explain:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leachate Collection Sumps</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any signs of erosion, settling, or subsidence around sump vaults?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are sumps accessible and free of overgrown vegetation?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are protective bollards visible, plumb, and free of damage?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are the sump openings accessible and secure?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are the wells, piping and connectors within the sumps generally free of corrosion and in good operating condition?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Any nearby stained soils or discolored water observed?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leachate Collection Trenches/Toe Drains</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any signs of erosion, settling, or subsidence observed along the collection trench footprint?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Any visible geotextile or exposed trench aggregate observed along the collection trench footprint?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Any signs of stressed vegetation or no vegetation observed along the collection trench footprint?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Any gullies, washouts or other erosional areas?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Any stained soils or discolored water observed?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>
### Collection Piping

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes ☐</th>
<th>No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any signs of erosion, settling, or subsidence observed along the piping corridor?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any signs of stressed vegetation or no vegetation observed along the piping corridor?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any leaks or stained soils or discolored water observed along the piping corridor?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any signs of piping fouling or reduced flow in piping?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
</tbody>
</table>

**Comments:**

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### REVIEWER INFORMATION

**REVIEWER NAME:**

**REVIEW DATE:**

**REVIEWER SIGNATURE:**
# ASH GROVE CEMENT COMPANY
# CHANUTE, KANSAS

## LEACHATE STORAGE TANK INSPECTION FORM

### General Information

<table>
<thead>
<tr>
<th>Name of Inspector:</th>
<th>Company:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Time:</td>
</tr>
</tbody>
</table>

| Tank at SWMU Inspected: | 16 ☐ | 17 North ☐ | 16 South ☐ |

<table>
<thead>
<tr>
<th>Weather:</th>
<th>Sunny ☐</th>
<th>Cloudy ☐</th>
<th>Windy ☐</th>
<th>Rainy ☐</th>
<th>Snowy ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature °F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ground conditions:</th>
<th>Wet ☐</th>
<th>Dry ☐</th>
<th>Snow ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of Inspection?</th>
<th>Semi-Annual ☐</th>
<th>Quarterly ☐</th>
<th>Monthly ☐</th>
<th>Other ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>If other, explain:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Building and Grounds

<table>
<thead>
<tr>
<th>Any signs of erosion, settling, or subsidence along building foundation?</th>
<th>Yes ☐</th>
<th>No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any stored chemicals, drums, or other waste stored along exterior wall?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Is building roof in good repair?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any evidence of rodent or other animal activity?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any gullies, washouts or other erosional areas around building or drive?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any buried pipeline in vicinity of building exposed?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any stained soils or discolored water observed?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
</tbody>
</table>

**Comments:**

### Building Interior

<table>
<thead>
<tr>
<th>Is adequate lighting provided and functioning?</th>
<th>Yes ☐</th>
<th>No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is building interior free of clutter and trash?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Are appropriate safety devices (fire extinguishers, eye wash, spill kits) present, functioning, and not expired?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any evidence of rodent or other animal activity that would negatively affect tank performance?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any wall cracks or structural damage evident?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
<tr>
<td>Any puddles of water or signs of past water leaks observed?</td>
<td>Yes ☐</td>
<td>No ☐</td>
</tr>
</tbody>
</table>

**Comments:**

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G:\project\Ash Grove\Chanute KS\Landfill Inspection Form.docx
<table>
<thead>
<tr>
<th>Leachate Storage Tank</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Do tank surfaces show signs of leakage?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are tanks damaged, rusted, or otherwise deteriorated?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are any connecting bolts or seams damaged?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are any tank supports deteriorated or buckled?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are tank foundations cracked or settled?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Are any level gauges, flow gauges or alarms inoperative?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Is interior piping intact and operational?</td>
<td>Yes ☐ No ☐</td>
</tr>
</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>REVIEWER INFORMATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>REVIEWER NAME:</td>
<td></td>
</tr>
<tr>
<td>REVIEW DATE:</td>
<td></td>
</tr>
<tr>
<td>REVIEWER SIGNATURE:</td>
<td></td>
</tr>
</tbody>
</table>
TOPOGRAPHIC CONTOUR
COLLECTION SUMP
(CONTOUR INTERVAL=2 FT)
DRAINAGE DITCH
BURIED CULVERT
CULVERT
LEACHATE COLLECTION PIPING
TO TREATMENT BUILDING
TREATED WATER TO HAUL ROAD

A6-25-07 CREATE REVISED BID DRAWINGS

RIP-RAP
DRAINAGE CHANNEL
TREATMENT
BUILDING
EXISTING SUMP
N=99480.10
E=107044.50
TO EXISTING PIPELINE
NEW FRENCH CURB
NEW FRENCH CURB
NEW COLLECTION CURB
NEW LEACHATE COLLECTION TRENCH
(205' INSTALLED AT CONSTANT ELEVATION)

NEW FILL AREA INSTALLED TO 942'
NEW COLLECTION SUMP
NEW COLLECTION SUMP

EXPLANATION
- Benchmark Contour
- Section Contours
- Collection Sump
- Drainage Ditch
- Existing Culvert
- New Culvert
- Existing Collector Pumping to Treatment Building
- Treatment Water to Haul Road
- Culvert

NOTES:
MINIMUM YIELD STRENGTH = 35 KSI
MINIMUM WALL THICKNESS = 0.375"
MINIMUM DEPTH TO TOP OF STEEL CASING = 30"
2. ELECTRICAL MARKER TAPE INSTALLED ABOVE ALL BURIED PIPE
SWMU No. 17
NORTH

B. RR. W. AREA,
P. NDID WATER

SOUTH CKB
LANDFILL

P. NDID WATER

NOTE:
1. IMAGE FROM GOOGLE EARTH IMAGERY FROM JANUARY 2015.

LEGEND:
TOPOGRAPHIC ELEVATION CONTOUR
(FEET ABOVE MEAN SEA LEVEL)
PONDED WATER
FENCE LINE
POWER POLES
DRAINAGE DITCH SHOWING FLOW
DIRECTION
TREES
LIMITS / WASTES
INTERM. REC. / DRY TRENCH
NEW INC. LANDFILL C. N.=
STA. 53 + 50
SUMP. = CAT. N. AND DESIGNAT. N
ACCESS R. AD
STORM/ SE DRAINAGE

NOTE:
1. IMAGE FROM GOOGLE EARTH IMAGERY FROM JANUARY 2015.

LEGEND:
TOPOGRAPHIC ELEVATION CONTOUR
(FEET ABOVE MEAN SEA LEVEL)
PONDED WATER
FENCE LINE
POWER POLES
DRAINAGE DITCH SHOWING FLOW
DIRECTION
TREES
LIMITS / WASTES
INTERM. REC. / DRY TRENCH
NEW INC. LANDFILL C. N.=
STA. 53 + 50
SUMP. = CAT. N. AND DESIGNAT. N
ACCESS R. AD
STORM/ SE DRAINAGE
Arcadis U.S., Inc.
Rosehill Office Park 1
8725 Rosehill
Suite 350
Lenexa, Kansas 66215
Tel 913 492 0900
Fax 913 492 0902

www.arcadis.com
ATTACHMENT 6

GROUNDWATER MONITORING PLAN
GROUNDWATER MONITORING PLAN
Ash Grove Cement Company, Chanute, Kansas

Tina M. Lloyd, P.G
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ACRONYMS AND ABBREVIATIONS

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<tr>
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<th>Definition</th>
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<tr>
<td>°C</td>
<td>degrees Celsius</td>
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<tr>
<td>CKD</td>
<td>Cement kiln dust</td>
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<tr>
<td>CMI</td>
<td>Corrective Measures Implementation</td>
</tr>
<tr>
<td>CMS</td>
<td>Corrective Measures Study</td>
</tr>
<tr>
<td>DO</td>
<td>Dissolved oxygen</td>
</tr>
<tr>
<td>DQ</td>
<td>Double Quantification</td>
</tr>
<tr>
<td>ft</td>
<td>Feet</td>
</tr>
<tr>
<td>GPS</td>
<td>global positioning system</td>
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<tr>
<td>GWMP</td>
<td>Groundwater Monitoring Plan</td>
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<tr>
<td>HBG</td>
<td>health-based goal</td>
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<tr>
<td>HHRA</td>
<td>Human Health Risk Assessment</td>
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<tr>
<td>IDW</td>
<td>Investigative-Derived Waste</td>
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<tr>
<td>KDHE</td>
<td>Kansas Department of Health and Environment</td>
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<tr>
<td>LPL</td>
<td>lower prediction limit</td>
</tr>
<tr>
<td>MCL</td>
<td>maximum contaminant level</td>
</tr>
<tr>
<td>ml/min</td>
<td>Milliliters per minute</td>
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<tr>
<td>MNA</td>
<td>monitored natural attenuation</td>
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<tr>
<td>MS/MSD</td>
<td>Matrix spike/matrix spike duplicate</td>
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<tr>
<td>NTU</td>
<td>nephelometric turbidity unit</td>
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<tr>
<td>ORP</td>
<td>Oxidation Reduction Potential</td>
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<tr>
<td>QA/QC</td>
<td>Quality Assurance/Quality Control</td>
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<tr>
<td>QAPP</td>
<td>Quality Assurance Project Plan</td>
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<tr>
<td>RCRA</td>
<td>Resource Conservation and Recovery Act</td>
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<tr>
<td>RFI</td>
<td>RCRA Facility Investigation</td>
</tr>
<tr>
<td>SSI</td>
<td>statistically significant increase</td>
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<tr>
<td>SVOCs</td>
<td>Semi-Volatile Organic Compounds</td>
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<tr>
<td>SWFPR</td>
<td>site-wide false positive rate</td>
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<td>SWMU</td>
<td>Solid waste management unit</td>
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<td>TB</td>
<td>Trip Blank</td>
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<tr>
<td>UPL</td>
<td>upper prediction limit</td>
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<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<td>VOCs</td>
<td>Volatile Organic Compounds</td>
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1 INTRODUCTION

On behalf of Ash Grove Cement Company (Ash Grove), Arcadis U.S., Inc. (Arcadis) has prepared this Groundwater Monitoring Plan (GWMP), as part of the Corrective Measures Implementation (CMI) Work Plan (Work Plan), to be implemented at the Ash Grove Cement Plant in Chanute, Kansas (Figure 1).

Groundwater and other media monitoring is required during the CMI to evaluate the effectiveness of the corrective actions in protecting groundwater and other media to the health-based goals (HBGs) developed in the approved Human Health Risk Assessment (HHRA) (Arcadis 2011). The corrective measures are being implemented as part the requirements contained in the Resources Conservation and Recovery Act (RCRA) Operating Permit (HSWA, Part II), EPA ID# KSD031203318 (Permit), as modified and effective July 19, 2017 (USEPA 2017). This document has been prepared consistent with the Final Remedy Decision for the Statement of Basis and Response to Comments, the Corrective Measures Decision (included in the Permit as Attachment 8). These documents are collectively referred to as the “Permit” through this GWMP.

This GWMP was developed to outline monitoring requirements associated with the (CMI) at the following four solid waste management units (SWMUs) (see Figure 1).

- SWMU 1 – Paraffin Waste Disposal Landfill
- SWMU 16 – Industrial Waste Landfill
- SWMU 17 – Cement Kiln Dust (CKD) Landfill (consists of North and South CKD Landfills)
- SWMU 23 – Inactive Kiln Dust Landfill

The existing monitoring well networks, installed during the RCRA Facility Investigation (RFI) (Arcadis 2000, 2003, 2007) at each SWMU, provide adequate coverage for the monitoring program and will be used in part during the groundwater quality monitoring program at the four SWMUs. No additional monitoring wells are planned to be added to the existing monitoring networks at the four SWMUs. A summary of the existing monitoring wells at each SWMU is provided in Table 1 and Figures 2 through 5. It is noted that, the monitoring of all wells at each SWMU is not needed to meet the requirements outlined in the USEPA Statement of Basis.

This GWMP also outlines soil/sediment and surface water monitoring at SWMUs 1 and 23. Soil/sediment and surface water samples required during the CMI will be collected from select locations previously sampled during the RFI. The monitoring programs for the four SWMU’s are described below.

The USEPA Region 7 and Kansas Department of Health and the Environment (KDHE) will be notified at least seven days prior to the start of monitoring events.
2  SAMPLING AND ANALYSIS PLAN

Annual monitoring will be conducted at the four SWMUs. The annual monitoring events are anticipated to be conducted in the second quarter of each year.

2.1  SWMU 1 – Paraffin Waste Disposal Landfill

The monitoring plan for SWMU 1 includes:

- One annual downgradient groundwater sample, to be collected from existing Monitoring Well S1MW-2, located on the south side of the landfill. Well S1MW-2 is screened in the Lane Shale.
- One annual soil/sediment sample from directly around the SWMU, to be collected from previously sampled drainage ditch location S1DS-3 located near the southeast corner of the landfill. The sample will be collected at a depth of 0 to 0.5 ft (0 to 6 inches).
- One annual standing surface water sample from directly around the SWMU, if there is any standing surface water, to be collected from previously sampled drainage ditch location S1SW-3 located near the southeast corner of the landfill.
- Annual gauging of fluid levels in six existing monitoring wells (S1MW-1, 2, 4, 5, 6, and 7) to confirm the groundwater flow direction and gradient.

The groundwater, soil/sediment and surface water sampling locations were selected along the southeast corner of the unit based on best engineering judgment and a review of previous site data. However, alternate soil/sediment and surface water locations along the south or east sides of the unit will be observed in the field during annual sampling events and photo-documented to determine if another location is more appropriate (i.e. wetter in one location versus another). However, sampling at a consistent location over time will provide a better historic data set for statistical analysis and determination if the corrective measures implemented at the unit are effective. A summary of the sampling and analysis program is presented in Table 2. The monitoring locations are provided on Figure 2.

Groundwater, soil/sediment, and surface water samples will be analyzed for the constituents outlined in the Permit. However, the list of analytes is not consistent with the list of constituents of concern (COCs) that were developed in the HHRA, carried through the CMS, and approved by USEPA. The constituents outlined in the Permit that will be monitored during the CMI include:

- pH
- Volatile organic compounds (VOCs) - benzene
- Semi-volatile organic compounds (SVOCs) - 2 methyl-naphthalene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene
- Metals - aluminum, arsenic, cadmium, chromium, cobalt, iron, lead, manganese, vanadium, nickel, strontium

The groundwater sampling results will be compared to the USEPA primary drinking water maximum contaminant levels (MCLs), or where no MCL is available, the USEPA Regional Screening Levels (RSL)
for tap water will be used. The soil/sediment sampling results will be compared to the RSLs for industrial soil. The RSLs used for comparison will include the TR = 1x10^{-6} and THQ = 1.0 values dated November 2017. If a screening level is exceeded, the data will then be compared to the HBGs developed during the HHRA and outlined in the Corrective Measures Study (CMS) (Arcadis 2012), which are summarized in Table 3. HBGs were not calculated for all compounds listed above for media to be monitored during the CMI. HBGs were calculated during the HHRA only for COCs identified for particular associated media. The groundwater analytical results will also be compared to the MCLs to determine that groundwater impacts are contained within the Ash Grove property boundaries (Figure 1).

2.2 SWMU 16 – Industrial Waste Landfill

The monitoring plan for SWMU 16 includes:

- Annual monitored natural attention (MNA) groundwater samples collected from existing Monitoring Wells S16MW-3, 4, 6 (background), 8, and 9, which are screened in the Noxie Sandstone.
- Annual gauging of fluid levels at the existing sandstone monitoring wells (S16MW-1, 2, 3, 4, 5, 6, 7, 8, and 9) to confirm the groundwater flow direction and gradient.

A summary of the sampling and analysis program is presented on Table 2. The monitoring locations are provided in Figure 3.

Groundwater samples will be analyzed for the constituents outlined in the Permit. However, the list of analytes is not consistent with the list of COCs that were developed in the HHRA, carried through the CMS, and approved by USEPA. The constituents outlined in the Permit that will be monitored during the CMI include:

- pH
- VOCs – benzene, chloroform
- SVOCs – bis(2-ethylhexyl)phthalate
- Metals - aluminum, antimony, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, strontium, vanadium
- MNA parameters (alkalinity, chloride, sulfate, nitrate as N, dissolved gases (ethane, ethene, methane), ferrous iron, dissolved iron, dissolved manganese, total organic carbon)

In the event leachate or seeps are noted at the surface, soil/sediment and surface water samples will be collected and analyzed for the same list of constituents.

The groundwater sampling results will be compared to the USEPA primary drinking water maximum contaminant levels (MCLs), or where no MCL is available, the USEPA Regional Screening Levels (RSL) for tap water will be used. If soil/sediment samples are collected, the soil/sediment sampling results will be compared to the RSLs for industrial soil. The RSLs used for comparison will include the TR = 1x10^{-6} and THQ = 1.0 values dated November 2017. If a screening level is exceeded, the data will then be compared to the HBGs developed during the HHRA and outlined in the Corrective Measures Study (CMS) (Arcadis 2012), which are summarized in Table 3. HBGs were not calculated for all compounds listed above for media to be monitored during the CMI. HBGs were calculated during the HHRA only for
COCs identified for particular associated media. The groundwater analytical results will also be compared to the MCLs to determine that groundwater impacts are contained within the Ash Grove property boundaries (Figure 1).

2.3 SWMU 17 – CKD Landfill (North and South)

The monitoring plan for SWMU 17 includes:

- Annual groundwater samples collected from existing alluvial and sandstone monitoring wells located near the North and South CKD landfills. The following wells will be monitored:
  - Alluvial Aquifer – P-11, S17MWA-1, 4, 5, 6, and 9 (background)
  - Sandstone Aquifer – P-2 (background), P-8, S17MWS-1, 3, 4, and 6
- Annual gauging of fluid levels at the following existing alluvial and sandstone monitoring wells to confirm the groundwater flow direction and gradient:
  - Alluvial Aquifer – P-10, P-11, S17MWA-1, 2, 3, 4, 5, 6, 7, 9, and 9a
  - Sandstone Aquifer – P-2, P-4, P-8, P-12, S17MWS-1, 2, 3, 4, 5, 6, and 7

A summary of the sampling and analysis program is presented in Table 2. The monitoring locations are shown on Figure 4.

Groundwater samples will be analyzed for the constituents outlined in the Permit. However, the list of analytes is not consistent with the list of COCs that were developed in the HHRA, carried through the CMS, and approved by USEPA. The constituents outlined in the Permit that will be monitored during the CMI include:

- pH
- Metals - aluminum, arsenic, chromium, cobalt, iron, lead, manganese, mercury, selenium, strontium, vanadium

In the event leachate or seeps are noted at the surface, soil/sediment and surface water samples will be collected and analyzed for the same list of constituents.

The groundwater sampling results will be compared to the USEPA primary drinking water maximum contaminant levels (MCLs), or where no MCL is available, the USEPA Regional Screening Levels (RSL) for tap water will be used. If soil/sediment samples are collected, the soil/sediment sampling results will be compared to the RSLs for industrial soil. The RSLs used for comparison will include the TR = 1x10^{-6} and THQ = 1.0 values dated November 2017. If a screening level is exceeded, the data will then be compared to the HBGs developed during the HHRA and outlined in the Corrective Measures Study (CMS) (Arcadis 2012), which are summarized in Table 3. HBGs were not calculated for all compounds listed above for media to be monitored during the CMI. HBGs were calculated during the HHRA only for COCs identified for particular associated media. The groundwater analytical results will also be compared to the MCLs to determine that groundwater impacts are contained within the Ash Grove property boundaries (Figure 1).
2.4 SWMU 23 – Inactive Kiln Dust Landfill

The monitoring plan for SWMU 23 includes:

- One annual downgradient groundwater sample, collected from existing Monitoring Well S23MW-4, located southeast of the landfill. Well S23MW-4 is screened in alluvium.

- One annual soil/sediment sample from directly around the SWMU, collected from previously sampled drainage ditch location S23DS-3 located near the northeast corner of the landfill. The sample will be collected at a depth of 0 to 0.5 ft (0 to 6 inches).

- One annual standing surface water sample from directly around the SWMU, if there is any standing surface water, collected from previously sampled drainage ditch location S23SW-3 located near the northeast corner of the landfill.

- Annual gauging of fluid levels in six existing monitoring wells (S23MW-1, 1a, 1b, 2, 3, and 4) to confirm the groundwater flow direction and gradient.

The groundwater, soil/sediment and surface water sampling locations were selected along the northeast corner of the unit based on best engineering judgment and a review of previous site data. In addition, Ash Grove also considered the potential impact to soil/sediment and surface water samples at the southeast corner from the neighboring concrete plant unassociated with Ash Grove (see Figure 5). However, alternate soil/sediment and surface water locations along the southeast side of the unit will be observed in the field during annual sampling events and photo-documented to determine if another location is more appropriate (i.e. wetter in one location versus another). However, sampling at a consistent location over time will provide a better historic data set for statistical analysis and determination if the corrective measures implemented at the unit are effective. A summary of the sampling and analysis program is presented in Table 2. The monitoring locations are provided on Figure 5.

Groundwater, soil/sediment, and surface water samples will be analyzed for the constituents outlined in the Permit. However, the list of analytes provided in the Permit is not consistent with the list of COCs that were developed in the HHRA, carried through the CMS, and approved by USEPA. The constituents outlined in the Permit that will be monitored during the CMI include:

- pH
- Metals - aluminum, arsenic, cadmium, chromium, cobalt, iron, lead, manganese, vanadium

The groundwater sampling results will be compared to the USEPA primary drinking water maximum contaminant levels (MCLs), or where no MCL is available, the USEPA Regional Screening Levels (RSL) for tap water will be used. The soil/sediment sampling results will be compared to the RSLs for industrial soil. The RSLs used for comparison will include the TR = 1x10^-6 and THQ = 1.0 values dated November 2017. If a screening level is exceeded, the data will then be compared to the HBGs developed during the HHRA and outlined in the Corrective Measures Study (CMS) (Arcadis 2012), which are summarized in Table 3. HBGs were not calculated for all compounds listed above for media to be monitored during the CMI. HBGs were calculated during the HHRA only for COCs identified for particular associated media. The groundwater analytical results will also be compared to the MCLs to determine that groundwater impacts are contained within the Ash Grove property boundaries (Figure 1).
2.5 Analytical Program

2.5.1 Laboratory Analysis

Groundwater, soil/sediment, and surface water samples will be collected for laboratory analysis in the appropriate pre-preserved containers provided by the laboratory and stored immediately on ice at 4 degrees Celsius (°C). In addition to keeping samples chilled, the samples will be promptly transported to the laboratory and analyzed within the appropriate holding times. The number and type of samples are provided for each SWMU in Table 2. The list of analytes is summarized on Table 2 and outlined in the Quality Assurance Project Plan (QAPP, Appendix A). In addition, a summary of analytical methods, sample containers and preservation requirements, holding times, and field and laboratory quality assurance sampling programs are summarized in the QAPP.

2.5.2 Quality Assurance and Quality Control

To monitor sampling, decontamination, and laboratory performance it is necessary to collect field Quality Assurance/Quality Control (QA/QC) samples. These field QA/QC samples include duplicates, trip blanks, equipment rinsate blanks, and matrix spike/matrix spike duplicates (MS/MSD). The QA/QC samples will be collected at a frequency of 5 percent of the primary samples (one per 20 samples) or one per sampling event, if less than 20 samples. One trip blank will be submitted to the laboratory with each cooler that contains samples to be analyzed for VOCs. The QAPP (Appendix A) provides additional detail about QA/QC samples.

2.5.3 Field Analysis

Groundwater and surface water samples will be analyzed in the field during well purging (for groundwater samples) or immediately following sample collection (for groundwater and surface water samples) for the following parameters:

- pH
- Specific conductivity
- Dissolved Oxygen (DO)
- Temperature
- Oxidation-Reduction Potential (ORP)
- Turbidity

2.5.4 Field Measurements and Instrument Calibration

Several instruments will be used to collect field analytical data. The following equipment (including model number and manufacturer) or equivalents will be used:

- QED Sample Pro bladder pump with QED MP10 Bladder Pump Controller and QED Well Wizard 3020 DC Compressor or similar (no field calibration required)
FIELD SAMPLING PLAN

3.1 Well Condition Evaluation

Before gauging, the wells and piezometers will be inspected to determine their condition. Observations made before groundwater gauging and sample collection will include a description of any well damage, the area surrounding the well, whether or not the lock was secure (if applicable), whether the well could have been impacted by surface water run-off or flooding, ambient weather conditions, and other factors that could affect the final data analysis. This documentation will be recorded on the Groundwater Sampling Form or in the Daily Log.

3.2 Well Repairs, Re-Survey, and Re-Development

Well damage identified during gauging or monitoring events will be repaired as soon as practical, but before the next gauging or sampling event.

Following well repairs that alter the well casing elevation, the top of each well casing and the land surface adjacent to each repaired well will be re-surveyed by a Kansas registered land surveyor to an established benchmark located onsite and tied into the existing well survey.

Wells that have accumulated 10% or more sediment occluding the screen will be redeveloped before the next monitoring event.

3.3 Water Level Measurements

Water level measurements will be referenced to a surveyed elevation point located on the top of the well casing. An electronic water level probe will be used to gauge the water level in the new and existing wells at the Site.

Water level measurements will begin with the upgradient wells (i.e., inferred least potential for impact) and proceed to the downgradient wells (i.e., inferred most potential for impact). All water-level measurements will be collected within a single 24-hour period and will be measured at least two times to check the reproducibility of the measurement data. This measurement validation helps ensure accuracy in regard to the water level data collection. The procedure for obtaining water level measurements is as follows:

1. Put on clean nitrile gloves.
2. Decontaminate the electronic water probe before initiating water level measurements and between all wells.
3. Do not measure the total well depth until after the samples have been collected to prevent suspension of possible sediment at the bottom of the well.

4. Unlock the protective casing and remove the inner cap on the riser.

5. Check the probe to verify that it is operational, then lower it down into the monitoring well.

6. Take fluid level measurements from a fixed reference point (the north side of the top of the well) using an electric tape graduated in 0.01-foot intervals.

7. Repeat the measurements until two measurements are obtained that are within 0.01 ft.

8. Remove and decontaminate the tape, replace the inner cap, and lock the protective casing.

3.4 Well Purging and Sample Collection

Groundwater will be sampled using low-flow sampling techniques. However, alternative groundwater purging and sampling techniques, including downhole submersible pump or equivalent and bailer methods, are also provided below, if low-flow techniques cannot be employed due to poor well yield or low groundwater levels.

3.4.1 Low-Flow Method

1. Put on clean nitrile gloves.

2. Put down plastic sheeting or similar around or near the well to prevent field equipment contact with contaminated surfaces.

3. Do not measure the total well depth until after the samples have been collected to prevent suspension of possible sediment at the bottom of the well.

4. Measure fluid levels in the well per the procedures outlined in Section 4.3.

5. Calculate the volume of water in the well casing using the formula outlined below.

\[ V = 7.48 \pi r^2 h \]

where, \( V \) = Volume of standing water (gallons)

7.48 = gallons per ft\(^3\)

\( \pi \) (pi) = 3.14

\( r \) = Radius of well casing (ft)

\( h \) = Height of standing water (ft), total depth minus depth to water.

Volume for 2-inch well = 0.162 gallons/ft

Volume for 3-inch well = 0.367 gallons/ft

6. Insert new, clean tubing or dedicated tubing attached to a pre-cleaned bladder pump into the well to the midpoint of the well screen (see Table 2 for pre-determined pump depths). Record installation time in field notes.
7. Start pump at the lowest possible flow rate and adjust the pumping rate to approximately 100 milliliters per minute (ml/min). Record pump start time in field notes. Verify the flow rate with the graduated cylinder or equivalent by collecting the water from the discharge line for 1 minute. Record results in field notes.

8. Collect fluids for disposal. Record volume of fluids.

9. Monitor water level to verify that little or no drawdown (0 to 0.3 ft) is occurring in the well. If desired, the flow rate may be increased to up to 300 ml/min in more permeable formations as long as minimal drawdown is observed in the well. Record measurements and flow rates in field notes.

10. Using a flow-through cell, obtain field parameter measurements (temperature, specific conductance, pH, DO, ORP, and turbidity) after each liter of water is purged. Continue purging until the criteria listed below have been met (unless low well recovery precludes this):
   - The field parameters stabilize to within +/- 10 percent of three consecutive meter readings taken at least 3 minutes apart.
   - The measured turbidity is less than 10 nephelometric turbidity units (NTUs), unless low recovery precludes this.

11. Prepare and label sample containers.

12. Collect VOC sample at low flow rate (100 ml/min) for laboratory analysis directly into the pre-prepared appropriate sample container. Ensure that no air bubbles are present in the vial. If air bubbles are visible in the sample vial, a new sample should be recollected in a new sample vial. Proceed with collection of additional samples (i.e., collecting in the order of VOCs, SVOCs, total metals, other inorganics) at low flow rate (100 ml/min).

13. Secure sample container lids, label, and place samples on ice immediately.

14. If inadequate water is present in the well to fill the required sample containers, the sample crew will return periodically within 24 hours until adequate sample volume is obtained and field parameters measured. Groundwater will be collected for individual analyses in the appropriate sample order.

15. Using the flow-through cell, obtain a final set of field parameter measurements.

16. Turn off pump. Remove pump and/or tubing from well (if not dedicated to well) and decontaminate or dispose.

17. Determine the total depth of the well. Compare the measurement of the total depth of the well with previous measurements and well construction log to determine available screen length. If more than 10 percent of a well screen is occluded by sediment, the well must be redeveloped before collecting future groundwater quality samples.

18. Replace cap on well, close protective casing, and lock well.

19. Decontaminate down-well equipment using the procedures described in Section 4.6.
3.4.2 Alternate Method for Low-Yield Wells

The following procedures will be implemented when purging and sampling wells with unsustainable yields:

1. Put on clean nitrile gloves.
2. Unlock the metal protective casing, remove the well cap and document the general condition of the well.
3. Determine static fluid-level using electronic probe following procedures in Section 3.3.
4. Do not measure the total well depth until after the samples have been collected to prevent suspension of possible sediment at the bottom of the well.
5. Compute the volume of water in the well (0.162 gallon/foot for a 2-inch diameter well) using the previously recorded well depth measurement.
6. Insert new disposable bailer into well and start purging process until 3 well volumes are removed or until the well is purged dry.
7. Obtain field parameter measurements (temperature, specific conductance, pH, and turbidity) after each well volume of water is purged.
8. If well is purged dry, allow groundwater level to recover up to 24 hours. At end of recovery period, determine fluid level using electronic probe.
9. Collect metals sample, followed by indicator parameters for laboratory analysis directly into the pre-prepared appropriate sample container. Secure sample container lid and store sample containers in chilled cooler.
10. If inadequate water is present in the well to fill the required sample containers, the sample crew will return periodically within 24 hours until adequate sample volume is obtained and field parameters measured. Groundwater will be collected for individual analyses in the appropriate sample order. Metals will be collected and stored first, then indicator parameters will be collected and stored.
11. Determine the total depth of the well. Compare the measurement of the total depth of the well with previous measurements and well construction log to determine available screen length. If more than 10 percent of a well screen is occluded by sediment, the well must be redeveloped prior to collecting future groundwater quality samples.
12. Replace cap on well and protective casing lock well.

3.5 Soil/Sediment Sample Collection

1. Remove vegetation and surface debris at the sample location by scraping away with a clean stainless-steel trowel or equivalent. Remove gravel or other debris before obtaining the sample.
2. Using a clean stainless-steel trowel, spoon, or equivalent, collect the sample from 0-0.5 ft and fill the laboratory prepared sample containers (i.e., collecting in the order of VOCs, SVOCs, total metals, other parameters).
3. Describe the profile of soil/sediment based on visual observations of the material removed from the sample location and record in a Soil Sampling Log. The sample description will include soil or material type, color, odor, moisture content, plasticity, grain-size, and organic content.

4. After the location has been sampled, use the leftover soil/sediment material to backfill the location.

5. Mark the sample location area with a labeled stake or flag.

6. Collect global positioning system (GPS) coordinates.

### 3.6 Surface Water Sample Collection

The following general procedure is applicable to collection of shallow surface water samples. Waders or rubber boots will be required to collect surface water samples.

1. Approach the sample location from the downstream direction taking care not to disturb sediments.

2. Facing the upstream direction, collect a surface water sample into a clean Pyrex glass sampling cup or equivalent near the mid-point (vertically) of the water column. Use the sample cup to transfer to the laboratory-prepared sample bottles such that water gently flows in with minimal disturbance. Collect the sample in the following order: VOCs, SVOCs, total metals, other parameters.

3. Immerse a clean Pyrex glass sampling cup or equivalent to collect enough additional water to perform appropriate field tests. Record: physical characteristics (e.g., color, clarity, presence of sheen, odor), pH, conductivity, DO, turbidity, and temperature.

4. Mark sampling location (along the bank) with wood stake and flagging or equivalent.

5. Collect GPS coordinates for sampling location.

6. Record the sampling location, date and time of collection, sample collection method, sample identification, sample preservative, methods of analysis, and initials of the sampling personnel.

7. Decontaminate the sampling equipment.

#### 3.6.1 Alternate Shallow Surface Water Sampling Procedures

If the surface water location has good flow but is so shallow that the sampler cannot be filled without disturbing sediment, the following procedures may be used:

1. Approach the sample location from the downstream direction taking care not to disturb sediments.

2. Facing the upstream direction, use a decontaminated stainless-steel spoon/scoop/shovel and dig out a hole in the bottom of the surface water sampling location of sufficient size to allow the sample container to be dipped into the water without disturbing sediments.

3. Wait to return to equilibrium (i.e. allow sediment to settle) before sampling using the procedure above.

4. If rock substrate prevents digging out a location to sample by dipping, use a clean stainless-steel ladle to collect the sample and transfer it to the appropriate container. The sample order should follow the sampling sequence described above.
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5. Collect enough water to perform appropriate field tests. Record: physical characteristics (e.g., color, clarity, presence of sheen, odor), pH, conductivity, DO, turbidity, and temperature.

6. Mark sampling locations with wood stake and flagging or equivalent.

7. Collect GPS coordinates for sampling location.

8. Record the sampling location, date and time of collection, sample collection method, sample identification, sample preservative, methods of analysis, and initials of the sampling personnel.

9. Decontaminate the sampling equipment.

3.7 Sample Documentation and Chain-of-Custody

The sampling team will be responsible for the documentation, custody, and care of collected samples until the containers are transferred to the custody of the laboratory. Documentation of sample collection, as well as other pertinent information, such as weather, site conditions, and sampling anomalies, will be recorded in a field log book dedicated to the project or on appropriate field forms.

Standard chain-of-custody procedures will be followed to maintain and document sample possession. A chain-of-custody form will be completed for each shipping container sent to the laboratory, documenting possession from the time of collection to analysis. If the samples will leave the field personnel's immediate control, such as shipment to a laboratory by a common carrier, a chain-of-custody seal will be provided on the shipping container or individual sample bottles to ensure that the samples have not been disturbed during transportation.

3.8 Decontamination

3.8.1 Field Sampling and Analytical Equipment and Instrumentation

Any equipment used to collect groundwater, soil/sediment or surface water samples or profile the water column will be either decontaminated using the protocol below or dedicated for one-time use. These protocols minimize the possibility of sampling device cross-contamination.

The exterior of sealed, water-tight equipment should be washed with a phosphate-free, laboratory-grade detergent (such as Alconox) and rinsed with tap water before storage. The interiors of such equipment may be wiped with a damp cloth if necessary. Other field instrumentation should be wiped with a clean, damp cloth. Conductivity probes, pH meter probes, and other similar equipment, should be rinsed with deionized or distilled water and dried before storage.

For non-dedicated equipment, such as groundwater pumping equipment, the following decontamination protocols will be used:

1. Prepare a phosphate-free, laboratory grade detergent (such as Alconox), and distilled water mixture in a clean bucket.

2. Put on new nitrile gloves.

3. Perform any necessary disassembly.
4. Using a laboratory scrub brush, scrub each piece of equipment with the detergent/distilled water mixture.

5. Rinse the cleaned equipment with deionized or distilled water.

6. Allow to air dry on new aluminum foil or plastic sheeting.

If the equipment cannot be cleaned using these procedures, it should be discarded or set aside for further decontamination.

3.8.2 Ice Chests and Shipping Containers

If the ice chests and reusable containers that will be used to store or ship samples and sample containers are believed to be contaminated, the shipping containers should be washed with laboratory-grade detergent (interior and exterior), rinsed with portable water, and air dried before storage. If an ice chest or other reusable container becomes severely contaminated, it will be cleaned as thoroughly as possible, rendered unusable, and disposed of properly.

3.9 Waste Management

Investigation-derived wastes (IDW) including decontamination fluids, monitoring well purge water, redevelopment water, and personal protective equipment (PPE) will be characterized and disposed according to the procedures described below.

3.9.1 Wastewater

IDW water including decontamination water, well redevelopment water, and purge water will be temporarily containerized onsite as it is generated and will be discharged back on the respective landfill ensuring that fluids do not run off the landfill, transported to Landfill #759 for discharge to the slurry monofill, or discharged to the leachate treatment system located at SWMU 17.

3.9.2 Waste Soil or Sediment

IDW soil or sediment, including any leftover soil/sediment from landfill monitoring samples, will be placed back in the boring or sampling location.

3.9.3 Disposable Personal Protective and Sampling Equipment

Disposable PPE, such as gloves, and sampling equipment, such as disposable bailers or tubing, will be placed in trash bags and disposed in site trash receptacles as refuse. The disposal PPE and supplies will be visually inspected for gross contamination before disposal.

4 Statistical Analysis Plan

The Permit called for the statistical analysis of monitoring data at SWMU 1 and SWMU 23 to determine if a Statistically Significant Increase (SSI) had taken place. The protocol for alleviating an identified SSI that will be followed is outlined in Section 4.7. This section presents the statistical analysis plan for each
SWMU, an overview of the methodology, and comments concerning the existing background data set against which the annual samples will be compared.

4.1 SWMU 1

Annual sampling at SWMU 1 includes groundwater sampling, sediment sampling, and surface water sampling. The samples collected from all of these media will be analyzed for 17 parameters, including pH, benzene, four SVOCs, and 11 metals.

4.1.1 Groundwater

Monitoring well S1MW-2 is to be sampled annually. The annual sample will be compared to an intrawell upper prediction limit (UPL) computed at 95% confidence. The UPL will be computed following methods presented in Chapter 18 of USEPA's Unified Guidance for the Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (USEPA 2009). Well S1MW-2 has been sampled twice, in 1999 and 2002. Some of the constituents have only been analyzed once. Comparison of new sample data to UPLs will begin for a given analyte when eight background values are available for that analyte to allow the computation of a UPL with adequate statistical power. The background data set will be expanded when four to six new data points are available using the Mann-Whitney U test (Mann and Whitney 1947) following procedures presented in Unified Guidance.

If analyte concentrations from a new sample exceed both the UPL and the HBG, the monitoring well will be resampled within 30 days of the completion of the data validation report for the laboratory data with the exceedance. The new sample will be analyzed only for the constituent that had the suspected SSI. If the new sample also exceeds the UPL and the HBG, then the SSI protocol will be followed to alleviate the exceedance.

4.1.2 Sediment

A sediment sample is to be collected annually from drainage ditch location S1DS-3 at a depth of 0 to 6 inches. Because this sample is recurring, the statistical method that best allows comparison is the 95% UPL. The background data set will consist of previous sediment samples from drainage ditch location S1DS-3. This analysis will be analogous to an intrawell UPL. Comparison of new data to UPLs will begin when there are at least eight members of the background data set. The data set will be expanded every four to six sampling events. If there is a suspected SSI that exceeds the HBGs, then the location will be resampled within 30 days of the completion of the data validation report for the laboratory data with the exceedance. The new sample will be analyzed only for the constituent that had the suspected SSI. If the exceedance is confirmed, then the SSI protocol will be followed.

4.1.3 Surface Water

A surface water sample at S1SW-3 will be collected in any sampling event in which standing water is observed. UPLs will also be used for surface water samples following the methods discussed for groundwater and sediment, including the resampling. UPLs can be computed when eight surface water samples exist for SWMU 1. After that, surface water samples will be compared to the UPLs and the HBGs. If a suspected SSI exceeds the HBGs, then the location will be resampled within 30 days of the
completion of the data validation report for the laboratory data with the exceedance. The new sample will be analyzed only for the constituent that had the suspected SSI. If the exceedance is confirmed, then the SSI protocol will be followed. The surface water data set should be expanded when there are four to six sampling events beyond the initial computation of the UPLs, as in the case of the sediment and groundwater data sets.

4.2 SWMU 16

Annual sampling at SWMU 16 includes groundwater sampling of five monitoring wells, S16MW-3, 4, 6, 8, and 9. The samples collected from these wells will be analyzed for 18 parameters, including pH, benzene, chloroform, bis(2-ethylhexyl)phthalate, and 14 metals. MNA compounds are also included in the analyte list, but will not be part of the statistical analysis program.

MNA is the chosen remedy. Therefore, the statistical test will be trend tests, including the Mann-Kendall test and Sen’s Slope Estimator. These tests will be conducted following methods presented in Unified Guidance (USEPA 2009). At present, the data sets for the eight analytes in the five monitoring wells are too small to allow for a robust analysis of trends. When eight data points are obtained, the trend analysis will begin. If an increasing trend is observed and the most recent data point exceeds the HBG, then the monitoring well will be resampled within 30 days of the completion of the data validation report. If the trend is confirmed, the SSI protocol may be invoked. However, one must also consider groundwater flow velocity and whether there has been time for the remedial actions taken thus far to influence the monitoring well in question. An increasing trend in the background monitoring well will not constitute a SSI, but it will serve as a possible explanation for any unexpected results in the other four monitoring wells.

4.3 SWMU 17

Annual sampling at SWMU 17 includes groundwater sampling of six monitoring wells in the alluvial aquifer and six monitoring wells in the sandstone aquifer. The samples collected from these wells will be analyzed for 12 parameters, including pH and 11 metals.

The monitoring wells are to be sampled annually. The annual samples will be compared to intrawell UPLs. Intrawell methods are necessary to conform to USEPA guidance. The confidence level of the UPLs for SWMU 17 will be determined using methods in Chapter 19 of Unified Guidance (USEPA, 2009) to control the site-wide false positive rate (SWFPR). The UPL will be computed following methods presented in Chapter 18 of USEPA’s Unified Guidance (USEPA, 2009). Up to the time of this writing, none of the monitoring wells have been sampled more than twice (in 1999 and 2002). Comparison of new sample data to UPLs will begin for a given analyte when eight background values are available for that analyte to allow the computation of a UPL with adequate statistical power. The background data set will be expanded when four to six new data points are available using the Mann-Whitney U test following procedures presented in Unified Guidance.

If a new sample exceeds both the UPL and the HBG, the monitoring well will be resampled within 30 days of the completion of the data validation report for the laboratory data with the exceedance. The new sample will be analyzed only for the constituent that had the suspected SSI. If the new sample also exceeds the UPL and the BHG, then the SSI protocol will be followed to alleviate the exceedance.
4.4 SWMU 23

The sampling plan for SWMU 23 is analogous to that of SWMU 1, with a single annual groundwater sample, a single sediment sample, and a single surface water sample. Therefore, the statistical methodology used at SWMU 23 will be the same as that used for SWMU 1.

The analyte list is shorter for SWMU 23 than for SWMU 1, containing only pH and nine metals. However, the same statistically methods (intrawell UPLs with periodic data set expansion) will be followed per Unified Guidance.

4.5 Upper Prediction Limits

The UPLs will be computed following principles set forth in Unified Guidance (USEPA, 2009). A few subjects are worth noting including stationarity, censorship, normality and statistical outliers.

4.5.1 Stationarity

Stationarity is a property of a data population having a constant mean and variance over time and space. For interwell testing to be valid, the data for a given constituent in the background monitoring wells must not be spatially variable. If this is not the case, it will be difficult to ascertain whether differences between upgradient and downgradient data are the result of the regulated unit or of natural variations. Because each of the units has no more than one background monitoring well in a given water bearing unit, it is not possible to test for spatial stationarity. Therefore, intrawell methods will be used.

Temporal stationarity will be achieved by testing each data set for trends. An increasing trend is a flag that conditions are changing. Well-constituent pairs with increasing trends will therefore be tested with UPLs and a second method such as control charts for confirmation. When data sets are expanded, the Mann-Whitney U test will be performed to demonstrate that the new data are of the same statistical population as the existing data set.

4.5.2 Censorship

The presence of non-detect data in the background data set is referred to as censorship. Environmental data are often censored. The method used for handling non-detections is referred to in Unified Guidance as the “15% and 50% Non-Detect Rule” (USEPA 2009, p.15-24). According to this rule, if the data set contains non-detections, these values will be replaced by concentrations equal to one half of the detection limit. If the data consist of more than 15% non-detections, then the mean and standard deviation must be adjusted. In data sets with more than 50% non-detections, non-parametric methods must be used.

The Kaplan-Meier method (Kaplan and Meier 1958) is one of the methods recommended by Unified Guidance for adjusting the mean and standard deviation when the rate of non-detection is between 15% and 50%. This method will be used. The nonparametric method will be to use a large order statistic. The maximum detected value can be used as the UPL if four reuses are planned and the data set has 60 members or less. The rationale for this selection is presented in Unified Guidance (USEPA 2009, p.18-16; Davis and McNichols 1999). Statistical tests will not be performed on data sets composed completely of non-detections. Rather, the Double Quantification (DQ) rule will be applied. The DQ rule
states that “a confirmed exceedance is registered if any well-constituent pair in the ‘100% non-detect’ group exhibits quantified measurements (i.e., at or above the reporting limit) in two consecutive sample and resample events” (USEPA 2009, p.6-11).

In summary, non-detections will be handled based on the proportion of the data set composed of non-detections. If that portion is 15% or less, the non-detections will be substituted with one half for the detection limit. If that portion is 15% to 50%, then the Kaplan-Meier method will be used. If that portion is greater than 50%, then the maximum detection will be used as the UPL. If the portion of the data set that is composed of non-detections is 100%, then the DQ rule will be applied.

4.5.3 Determination of Normality

The Shapiro-Wilk Test for Normality will be used for data sets with sizes up to 50 members (Shapiro and Wilk 1965). The test will be run at the 5% critical level. If larger data sets are encountered, the Shapiro-Francia Test for Normality will be used (Shapiro and Francia 1972). Other tests, such as probability plots (Q-Q Plots), D’Agostino’s Normality Test or the Kolmogorov-Smirnov Test will be used to test normality at the discretion of the statistician.

If a data set does not pass a test of normality, data will be transformed following the ladder of powers (Box and Cox 1964). The ladder of powers is a sequence of transformations: square root, square, cube root, cube, logarithmic transformation, $x^4$, $x^5$, and $x^6$. All points in the untransformed data set will be changed by one of these operations, and the new data set will be tested to determine if the transformed data meet the criterion of normality. If the test fails, the original data will be transformed using the next transformation in the ladder. Transformations will be attempted in the order of the ladder of powers until normality is achieved, or until all of the options are exhausted. In the latter case, non-parametric tests will be necessary.

4.5.4 Statistical Outliers

Extreme outliers in a background data set can bias a statistical test. According to USEPA guidance, outliers should be identified, but they need not be removed from the background data set unless an error is suspected (USEPA 2009, p. 5-5 to 5-6). Unified Guidance does not recommend removing outliers solely on the basis of a statistical test (USEPA 2009, p.12-1). Following this guidance, data sets will be normalized and Dixon’s Test for Outliers (Barnett and Lewis 1994) will be performed on all data sets with 25 or fewer members. Larger data sets will be evaluated using Rosner’s Test for Outliers (Rosner 1975). If outliers are identified, they will be reported in a list. The statistician will recommend whether an outlier should or should not be removed from use in the background data set, and the regulatory agency will evaluate the recommendations. All points deemed unusable will be placed on a list of unused points, and this list will be included in all reports in which the predictions intervals are updated.

4.5.5 Controlling the Sitewide False Positive Rate

Unified Guidance has a method for controlling the Sitewide False Positive Rate (SWFPR) found in Chapter 19 (USEPA 2009). The goal of this method is to find a test-wise value of the statistical significance, $\alpha_{test}$ (which is one minus the confidence level) such that the desired SWFPR is attained. Let $\omega$ be the probability that an analysis exceeds the background limit. The method of controlling the SWFPR
is to select a value of $\omega$ that will lead to the desired SWFPR given $r$ the number of analyses that are planned. Unified Guidance recommends setting the annual SWFPR to 0.1 for the intrawell testing. The SWFPR will be computed based upon a “1 for 2” resampling plan. This plan calls for the resampling of any compliance monitoring well for which the UPL is exceeded. An SSI is only recorded if the exceedance is confirmed by the resampling. If $Q$ is the probability that an analytical result will falsely be declared an exceedance, then

$$\alpha = 1 - (1 - Q)^r$$

where $\alpha$ has been chosen as the SWFPR. In a sampling scheme with a “1 for 2” sampling plan,

$$Q = \omega^2$$

Thus

$$\alpha = 1 - (1 - \omega^2)^r$$

Because $\alpha$ has been chosen and it is $\omega$ that we are seeking to compute, this equation is rewritten as:

$$\omega = \sqrt[1/r]{1 - (1 - \alpha)^1/r}$$

The number of compliance monitoring wells $w$, the number of constituents $c$, and the number of sampling events $v$ are also parameters in the computation of the SWFPR, because they determine the value of $r$. In this application,

$$r = w \cdot c \cdot v$$

For example, monitoring networks at SWMU 17 have five compliance monitoring wells and two constituents that are likely to have parametric UPLs. One sampling event is planned per year. Thus, there will be $5 \times 2 \times 1 = 10$ tests, and $r = 10$. Therefore:

$$\omega = \sqrt[1/10]{1 - (1 - 0.1)^{1/10}}$$

In this illustration, $\omega$ is 0.1024. Per test, the significance is $\omega^2$. That is:

$$\alpha_{\text{test}} = 1 - (1 - \omega)^{1/r}$$

In the example above, the significance for each test would be 0.010481.

 Constituents detected at low frequencies will never have UPLs computed by parametric methods. Therefore, these analytes should not be used in determining $c$ for computing $\omega$. This is why $c$ was 2 and not 3; cobalt is not likely to be detected at sufficient frequency to support parametric methodology. The value of $c$ might change if the newer data alter the detection frequency above or below 50%.

 It should be noted that each SWMU will be treated as a separate “site.” With that in view, this SWFPR methodology can only be applied to UPLs computed where there are multiple monitoring wells. Separate values of the SWFPR are needed for each water-bearing unit, the alluvium, and the sandstone.

 Computing $\alpha$ for the non-parametric tests will involve an alternative strategy. By definition, $\alpha$ cannot be selected precisely for a non-parametric test.
4.5.6 Updating the Background Data Set

The UPLs are being computed for a pre-determined number of future uses. Every four to six sampling events, the background data set will be updated and new UPLs will be computed for the updated data set. There are several methods for updating a data set. One method is continual addition. By this method, the number of data points will increase continually. A second method is the moving window approach. Using this approach, the oldest data points are removed from use in computing UPLs whenever newer ones are added. Both methods have their strengths and weaknesses. The advantage of continually adding data points is obvious. This method can make for a large data set. If the mean and standard deviation are constant, then the sample mean and standard deviation will approach their true values the larger the sample size becomes. The disadvantage of this method is that more recent trends in the data will be lost by the effect of the earlier data points. For this unit, the advantage seems to outweigh the disadvantage. Therefore, the data set will expand continuously.

Before admitting the new data points to the background data set, the new points will be tested to determine if they are from the same statistical population as the existing data. This will be accomplished by comparing the existing background data to the new data points using a Mann-Whitney U test at a 0.01 level of statistical significance. If no significant differences are noted between the means, then the four points will be added. If differences are identified, then the most extreme of the new data points will be removed, and the other data points will be retested. If this test also indicates a difference, then the data set will not be updated, and the old UPL will be used for 4 to 6 more years. In the case of a failure, Mann-Whitney U tests in future years will explore the use of data points previously set aside when making decisions about admitting the new data.

4.5.7 Computing Prediction Limits

Every time the background data set is updated, a new set of UPLs will be computed. In groundwater monitoring, these intervals are usually set up with one tail, to cover the range from zero to an upper limit. The reason for this arrangement is obvious; in environmental investigations, it is rarely an issue if the concentration of an analyte is too low. If it were to become necessary to include pH in the statistical analysis, this parameter would have to be tested in two-tailed mode, because low pH is just as much of an environmental concern as high pH. Thus, a UPL will be computed for every analyte for every monitoring well and a lower prediction limit (LPL) may also be computed for pH.

Prediction intervals are ranges of potential values based on past results in which future measurements can be expected to occur with a chosen rate of confidence. Prediction intervals can be determined parametrically based on the mean ($\bar{x}$), the standard deviation ($S$), the number of samples ($n$), and a quantile value, in this case the t-statistic ($t$). The parametric equations for the UPL and the LPL, respectively are:

\[
UPL = \bar{x} + S \cdot t \sqrt{1 + \frac{1}{n}}
\]

and
\[ LPL = \bar{x} - S t \sqrt{\frac{1}{1 + \frac{1}{n}}} \]

The mean and standard deviation can be obtained directly from the data. The value of the t-statistic can be obtained from Table 16-1 in Unified Guidance (USEPA 2009). The value of \( t \) depends on the number of degrees of freedom and \( \alpha_{\text{test}} \). The former is the \( n - 1 \). The latter will be obtained from the SWFPR calculations discussed in a previous section. In a two-tailed calculation, the statistical significance will be set equal to one half \( \alpha_{\text{test}} \), with half of the significance on each tail.

The use of these parametric equations is conditional. The data must be normally distributed, the principle of statistical independence must be maintained, and there must be stationarity. Outliers and non-detections must be properly handled. If a transformation is needed using the ladder of powers, the UPL will be back-transformed to the original measurement scale for the convenience of the user (USEPA 2009, p.17-16). If the Kaplan-Meier method is needed to handle non-detections, the values of \( x \) and \( S \) used in the above equations will be the adjusted values.

If the rate of detection is less than 50% or if no transformation can be found to satisfy the normality test, then the parametric equations cannot be used. Instead, the maximum detected value will function as the UPL.

A table will be prepared every time UPLs are computed indicating the method used for obtaining the UPL, whether parametric or non-parametric. If transformations were necessary, this will also be recorded.

### 4.5.8 Comparing Monitoring Data Upper Prediction Limits

Every time the monitoring wells or other locations are sampled, the analytical results will be compared to their respective UPLs. A table will be prepared showing the analytical results and the UPLs side by side. Any analytical result outside its respective prediction interval will be indicated by bolding or shading.

### 4.6 Trend Testing

The trend tests, Mann-Kendall and Sen’s Slope Estimator, will be conducted following Unified Guidance (USEPA 2009). The Mann-Kendall trend test (Gilbert 1987) is a non-parametric test for linear trends based upon the concept that a series of data points without a trend should fluctuate randomly around a constant mean. If an increasing trend were to exist, one would expect an earlier point to have a lower value than a later point. The converse would be true if a decreasing trend were present. A Mann-Kendall statistic \( S \) is computed by comparing each pair of data points in a data set and assigning a value of +1 or -1 if the earlier data point is less than the later data point or greater than the later one, respectively. If the two data points are equal, the pair is assigned a zero. The values assigned to the pairs are summed. If the total is positive, it implies that most of the differences between the points are positive, indicating a positive trend. Likewise, a negative sum indicates a decreasing trend. A value at or near zero indicates that the differences are roughly equal, implying that there is no trend. A critical value of \( S \) is determined based on the number of points in the data set and the level of significance of the test. If the Mann-Kendall statistic \( S \) exceeds the critical \( S \), then an upward trend is statistically significant. Conversely, if the Mann-Kendall \( S \) is negative and its absolute value is greater than the critical \( S \), then there is a
statistically significant downward trend. This test is described in detail in Unified Guidance (USEPA 2009, p. 17:30-34).

Unified Guidance is remarkably silent on the question of what confidence level Mann-Kendall should be run. Based on experience and on a communication with the primary author of that guidance, the test will be run at 90% confidence (with 5% statistical significance on each tail) for data sets with fewer than ten members. It will be run at 95% confidence (with 2.5% significance on each tail) for data sets with 10 to 19 members. Data sets with 20 or more data points will be run at 98% confidence (with 1% significance on each tail).

In the data sets in which statistically significant trends were not identified, a distinction will be made between data sets with a coefficient of variation that was less than or equal to 1.0 and those greater than 1.0. Data sets with a coefficient of variation of less than 1.0 are considered “stable”. Data sets will be categorized as having “no trends” if the coefficient of variation was greater than 1.0. The coefficient of variation is defined as the sample standard deviation divided by the sample mean. As such, this coefficient provides a measure as to how “spread out” the data are. For example, suppose two monitoring wells had eight measurements of the concentration of a certain constituent. The first well had the following measurements in this order: [20, 12, 16, 14, 18, 15, 18, 10] and the other one had measurements in this order: [32, 4, 7, 1, 2, 16, 55, 6]. The values in the second data set are more “spread out” than in the first one. If the Mann-Kendall test is run, neither data set has a statistically significant trend. Both data sets have an arithmetic mean of 15.38. The difference is that the standard deviation of the first data set is 3.34 and the standard deviation of the second data set is 18.97. Thus, the respective coefficients of variation are 0.22 and 1.23. We would call the first data set “stable”. The second data set would be designated “no trend”.

Sen’s slope estimator (Helsel 2005) is a good compliment to the Mann-Kendall test, because the values of the concentrations are considered. Like the Mann-Kendall test, it is non-parametric. This test computes the slope of every pair of distinct measurements. Unlike the Mann-Kendall test, where the issue is simply whether the succeeding value is higher or lower than the previous data point in a pair, the amount by which they differ matters, and the actual slope is estimated from the median of the pairwise slopes. The test is nonetheless non-parametric, because it determines the median, not the arithmetic mean of the pairwise slopes. This test is described in detail in Unified Guidance (USEPA 2009, p. 17:34-38).

### 4.7 SSI Protocol

In the event that a SSI is confirmed and the SSI exceeds the respective HBG, the following protocol will be followed. The SSI protocol for monitoring during the CMI includes developing a SWMU-specific plan designed to alleviate the particular exceedance. It may be concluded that only further monitoring is needed or that some other action may be warranted. The plan will be submitted to USEPA and KDHE for review and approval before implementation.

### 5 REPORTING

Following the collection of field data and receipt of laboratory data, the data will be reviewed and validated (see QAPP in Appendix D). The monitoring activities and results will be documented in the annual summary report submitted to USEPA and KDHE (see Reporting section of the CMI Work Plan).
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The annual summary report will include a brief description of the field activities completed and appropriate conclusions about the data. The report will also include summary tables (including fluid-level gauging, total depth comparison, and analytical data), site figures (including groundwater flow maps and maps showing the lateral extent of constituents, as applicable), sample collection forms, chain-of-custody forms, laboratory data, and data validation reports. The report will also include documentation of any well repairs, maintenance, or survey completed since the previous report.

6 REFERENCES


Mann, H.B. and D.R. Whitney. 1947. On a test of whether one of two random variables is stochastically larger than the other. Annals of Mathematical Statistics, 18(1), 50-60.


GROUNDWATER MONITORING PLAN
Ash Grove Cement Company, Chanute, Kansas


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Notes:
ft msl Feet above mean sea level.
ft bgs Feet below ground surface.
1 Measuring point elevations resurveyed 2002.
### Table 2
Sampling and Analysis Program
Ash Grove Cement Company
Chesola, Kansas

#### SWM1 - Paraffin Waste Disposal Landfill

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**Notes:**
- MNA = monitored natural attenuation
Table 3
Screening Criteria Summary
Ash Grove Cement Company
Chanute, Kansas

**Screening Criteria Summary**

**Media Type**

**Groundwater**

<table>
<thead>
<tr>
<th>Screening Criteria</th>
<th>MCL</th>
<th>RSL for tap water (where no MCL)*</th>
<th>HBG</th>
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<td><strong>Units</strong></td>
<td>mg/L</td>
<td>mg/L</td>
<td>mg/L</td>
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<td><strong>VOCs</strong></td>
<td></td>
<td></td>
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<tr>
<td>Benzene</td>
<td>0.005</td>
<td>--</td>
<td>0.034</td>
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<tr>
<td>Chloroform</td>
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<td><strong>pH</strong></td>
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<td>Limits between 5 and 9 per Permit</td>
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</tbody>
</table>

**Units**

mg/L: milligrams per liter
mg/kg: milligrams per kilogram
HBG: Health Based Goal
MCL: Maximum Contaminant Level
SVOC: semi-volatile organic compound
RSL: USEPA regional screening levels dated November 2017
VOC: volatile organic compound

* The RSL for tap water will be used for comparison where an MCL is not available.

** For SWMUs 16 and 17, in the event that seeps or leachate are noted at the surface, soil/sediment and surface water samples will be collected and analyzed for the same constituents as groundwater samples.

*** Secondary drinking water standard

**SOIL/SEDIMENT**

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<th>Screening Criteria</th>
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<td>mg/kg</td>
</tr>
<tr>
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<tr>
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**SURFACE WATER**

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<td>Chloroform</td>
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<td>Vanadium</td>
<td>15</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td></td>
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</tbody>
</table>

Notes:

- mg/L: milligrams per liter
- mg/kg: milligrams per kilogram
- HBG: Health Based Goal
- MCL: Maximum Contaminant Level
- SVOC: semi-volatile organic compound
- RSL: USEPA regional screening levels dated November 2017
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* The RSL for tap water will be used for comparison where an MCL is not available.
** For SWMUs 16 and 17, in the event that seeps or leachate are noted at the surface, soil/sediment and surface water samples will be collected and analyzed for the same constituents as groundwater samples.
*** Secondary drinking water standard
FIGURES
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 1 - Paraffin Waste Disposal Landfill

Legend
- Bedrock Monitoring Well (Lane Shale)
- Sediment Sample
- Surface Water/Sediment Sample
- Drainage Ditch
- Topographic Contour (5-Foot Interval)
- Surface Water Feature
- Solid Waste Management (SWMU) Area
- CMI Annual Sample Locations
- SWMU 1 Wells Gauged Only During Annual CMI Sampling Events

Notes:
1) All locations are approximate

City: Div/Group: Created By: Last Saved By: DHolmes
Z:\GISProjects\_ENV\Ash_Grove_Chanute_KS\MXD\2017\GW Monitoring Plan\Fig 2 - SWMU 1 Site Map.mxd 12/15/2017 8:51:53 AM
Legend:
- Monitoring Well
- Sandstone Monitoring Well
- Drainage Ditch
- Topographic Contour (5-Foot Interval)
- Surface Water Feature
- Solid Waste Management (SWMU) Area
- CMI Annual Sample Locations
- Wells Gauged Only During Annual CMI Sampling Events

Notes:
1) All locations are approximate
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 17 - CKD Landfill

Notes:
1) All locations are approximate

Legend
- Alluvial Aquifer Monitoring Well
- Limestone Aquifer Monitoring Well
- Sandstone Monitoring Well
- Deep Piezometer
- Drainage Ditch
- Topographic Contour (5-Foot Interval)
- Surface Water Feature
- Solid Waste Management (SWMU) Area
- CMI Annual Sample Locations
- Wells Gauged Only During Annual CMI Sampling Events
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 23 - Inactive Kiln Dust Landfill

Legend
- Monitoring Well
- Sediment Sample
- Surface Water/Sediment Sample
- Drainage Ditch
- Surface Water Feature
- Solid Waste Management (SWMU) Area
- S23SW-3 CMI Annual Sample Locations
- S23MW-6 Wells Gauged Only During Annual CMI Sampling Events

Notes:
1) All locations are approximate
ATTACHMENT 7

DESCRIPTION OF CURRENT CONDITIONS REPORT
SCOPE OF WORK
ATTACHMENT 7
DESCRIPTION OF CURRENT CONDITIONS REPORT
SCOPE OF WORK

PURPOSE

The purpose of a Description of Current Conditions (DCC) Report is to document pertinent background information to facilitate identification of potential contamination sources and to characterize current Site conditions. The DCC Report shall include information gathered during any previous investigations, inspections, corrective action/interim measure activities, and any other relevant data/information. In addition, as applicable, the DCC Report shall determine whether or not current human exposures and migration of contaminated groundwater are under control. Specifically, the DCC Report must evaluate whether current human exposure to environmental contamination is occurring at unacceptable levels and assess migration of existing groundwater contaminant plumes to verify whether or not plumes are expanding or adversely affecting nearby surface water bodies. As required, development and submittal of a DCC Report may be accomplished in advance of or during the RCRA Facility Investigation (RFI). Independent of the RFI, the Secretary may also require submission of a DCC Report to provide baseline conditions or update current conditions at the Site, for example, to supplement the RCRA Permit Application.

SCOPE

As required, consistent with Section III.G. of the Permit, the Permittee shall submit for the Secretary’s approval a DCC Report providing the following information:

A. Facility Background

The DCC Report shall summarize the regional location, pertinent boundary features, general Site physiography, hydrogeology, and historical use of the Site for the treatment, storage, or disposal of solid and hazardous waste. At a minimum, the report shall include:

1) Map(s) of sufficient detail and accuracy, consistent with the requirements set forth in 40 CFR 270.14, depicting:
   a. General geographic location;
   b. Property lines, with the owners of all adjacent property clearly indicated;
   c. Topography, with an appropriate contour interval and scale of 1 inch = 100 feet, and showing all waterways, wetlands, floodplains, water features, drainage patterns, and surface water containment areas;
   d. All tanks, buildings, utilities, paved areas, easements, rights-of-way, and other features;
   e. All solid or hazardous waste treatment, storage, or disposal areas active after November 19, 1980;
   f. All known past solid or hazardous waste treatment, storage, or disposal areas regardless of whether active on November 19, 1980;
g. All known past spill, fire, or other accidental release locations;

h. All known past and present product/waste underground tanks or piping;

i. Surrounding land uses, such as residential, commercial, industrial, agricultural, recreational, or other uses required by the Secretary;

j. Location of all past and present injection, production, and groundwater monitoring wells, at and in the vicinity of the Site, with wells clearly labeled, and ground surface and top of casing elevations included on map or as table summary, and well construction details may be included as attachment; and,

k. Wind rose and meteorology data.

2) History and description of ownership and operation, solid and hazardous waste generation, and, treatment, storage and disposal activities at the Site;

3) Approximate dates or periods of past product and waste spills, identification of materials spilled, amount spilled, location where spilled, and description of response actions conducted, including any inspection/technical reports generated as a result of response; and,

4) Summary of past permits requested and/or received, any enforcement actions taken and subsequent outcomes/responses, and a list of documents and studies prepared related to the Site.

B. Nature and Extent of Contamination

The DCC Report shall present existing information on the nature and extent of contamination. At a minimum, the report shall include:

1) Summary of all possible source areas of contamination, including all regulated units, solid waste management units (SWMUs), areas of concern (AOCs), spill areas, and other suspected source areas of contamination, with identification of the following for each unit/area:
   a. Location of unit/area, depicted on a facility map;
   b. Quantities of solid and hazardous wastes, both managed and spilled/released;
   c. Type of hazardous waste or hazardous constituents, both causing or potentially causing contamination, to the extent known;
   d. Identification of areas where additional information is necessary; and,
   e. Proposal/schedule for acquisition of additional information.

2) Preliminary assessment and description of the existing degree and extent of contamination including:
   a. Available monitoring/sampling data for all media, and evaluation of contaminant transport mechanisms between environmental media;
b. General assessment of data quality and indication of whether contaminant migration beyond the Facility boundary has occurred;
c. Qualitative, or, if available, definitive depiction of locations and levels of contamination at the Site on a map(s) showing sampling locations in relation to potential source areas, as well as contaminant distribution;
d. All potential migration pathways including information on geology, soils, hydrogeology, physiography, hydrology, water quality, meteorology, and air quality;
e. Potential impact(s) on human health and the environment, including demography, identification of possible sensitive subpopulations (e.g., schools, nursing homes, hospitals, ecosystems, or other subpopulations required by the Secretary, groundwater and surface water use, and land use; and,
f. Brief description of all previous investigations at the Site including date, purpose, and results.

C. Implementation of Interim Measures

The DCC Report shall document all Interim Measures (IMs) which were, or are, being undertaken at the Site. At a minimum, the report shall include:

1) Objectives of IM implementation with discussion of how each measure is mitigating a potential threat to human health and the environment and/or is consistent with and integrated into any long-term corrective measures at the Site;

2) Design, construction, and operation and maintenance (O&M) requirements for each IM;

3) Schedule for design, construction, monitoring, progress reporting of each IM; and, if applicable,

4) Data in support of the potential need for future IMs or related to any assessment undertaken to determine the need for future IM.

D. Establishment of Institutional Controls

The DCC Report shall provide a summary of all Institutional Controls (ICs) which are currently in place for the Site. In addition, copies of relevant documents and declarations such as deed restrictions, Environmental Use Control Agreements (EUCAs), or other IC’s shall be included as attachments to the DCC Report.

E. Environmental Indicator Assessment

The DCC Report shall include an assessment of whether the current data supports achievement of the following U.S. Environmental Protection Agency (EPA) Environmental Indicators:
Current Human Exposures Under Control, and Migration of Contaminated Groundwater Under Control. Unless otherwise directed or approved by the Secretary, the assessment shall be performed in accord with EPA guidance available at https://www.epa.gov/hw/measuring-progress-resource-conservation-and-recovery-act-rcra-corrective-action-facilities#whatare.
ATTACHMENT 8

RCRA FACILITY INVESTIGATION
SCOPE OF WORK
ATTACHMENT 8  
RCRA FACILITY INVESTIGATION  
SCOPE OF WORK

PURPOSE

Permittee shall conduct a RCRA Facility Investigation (RFI), where required by the Secretary, and submit an RFI Report, consistent with Section III.I of the Permit. The purpose of an RFI is to determine the nature, extent, direction, rate, movement, and concentration of releases of hazardous wastes or hazardous constituents from regulated units, solid waste management units (SWMUs), areas of concern (AOCs), and other source or release areas at the Site. The information gathered during the RFI is used to determine potential human health and ecological risks, and to support development and implementation of interim measure (IM) and/or corrective measure (CM) activities, as necessary. The RFI should be tailored to the Site-specific conditions and focused on the units, releases, and exposure pathways of concern. Subject to the Secretary’s approval, the RFI may be implemented in a phased manner based on Site-specific needs as long as all RFI objectives are fully and timely satisfied.

OBJECTIVES

The RFI must meet the following primary objectives:

1) Determine and describe current Site conditions, as required;

2) Identify and fully evaluate the known and suspected primary origin(s) or source(s) of contamination at the Site, including identification of all chemicals used and wastes generated/managed/stored/disposed, to facilitate determining the mechanisms of release, estimating the quantities of release, and determining whether these releases are ongoing or inactive;

3) Delineate and fully characterize the nature, and lateral and vertical extent of contamination for all known and suspected contaminants of concern (COCs) for all affected or potentially affected environmental media at the Site;

4) Characterize the environmental setting, including regional and local geology, hydrogeology, and hydrology, particularly as those physical characteristics may pertain to contaminant transport and fate mechanisms or may affect the evaluation, selection, and design of corrective measure alternatives for the Site;

5) Characterize the physiochemical properties of all known and suspected COCs, their mobility and persistence in the environment, and their important fate and transport mechanisms as they relate to the physical characteristics of the Site;

6) Identify and evaluate all potential human and ecological receptors that may be threatened or affected by all COCs associated with the Site;
7) Develop a conceptual Site model (CSM) of Site conditions depicting what is known or suspected about the sources, releases and release mechanisms, contaminant fate and transport, exposure pathways and potential receptors, and human health and ecological risks;

8) Revise/update the CSM as more information becomes available to determine the need for additional investigation, to support risk-based decisions, and to aid in identification and design of potential corrective measure alternatives;

9) Utilize KDHE’s October 2010 Risk-Based Standards for Kansas RSK Manual – 5th Version (RSK Manual), and any subsequent updates, and/or other applicable KDHE-approved threshold levels, to perform rapid assessment of human health risk, and to facilitate determination of cleanup goals for the Site;

10) Utilize U.S. Environmental Protection Agency (EPA) Region 6 Ecological Exclusion Criteria Worksheet and Ecological Assessment Checklist to perform a rapid assessment of ecological risk, and to facilitate determination of cleanup goals for the Site;

11) As determined necessary by the Secretary, perform a Site-specific quantitative baseline human health risk assessment (HHRA) and screening level ecological risk assessment/baseline ecological risk assessment (SLERA/BERA) to determine whether and the extent to which the Site requires corrective action;

12) Perform bench- or pilot-scale treatability study testing, as required, to support development of potential corrective measure alternatives and/or corrective measures design;

13) Develop a preliminary list of Site-specific corrective action objectives and corresponding potential corrective measure alternatives; and,

14) Evaluate the need for IM implementation for source control purposes and/or to mitigate imminent threats to human health and/or the environment consistent with the Secretary’s RCRA Interim Measures Scope of Work (Attachment 10).

Besides all known or suspected discharges, releases, or spills, the RFI is required to also fully assess any and all secondary contamination issues, including daughter/degradation products and from mobilization of naturally-occurring elements/substances in the presence of Site-related contamination. In addition, if there is any uncertainty in Site history and potential release mechanisms, the Secretary may require a broader, more robust sampling and analytical program in the early stages of the RFI to ensure complete identification/quantification of all known and suspected Site-related COCs. Also, consideration of current and anticipated future land use may result in a more rigorous sampling and analytical program. Initial RFI results will be used to focus, to the extent possible, any future sampling and analysis associated with the Site.
**SCOPE**

After a Corrective Action Agreement Meeting\(^1\) to establish framework, objectives, criteria, and expectations; identification of SWMUs, AOCs, and other source or release areas, or conducting a RCRA Facility Assessment (RFA), as required; and, a RFI Scoping Meeting\(^1\), Permittee will develop and implement a RFI consisting of each of the following steps:

**STEP 1: DESCRIPTION OF CURRENT CONDITIONS (as required)**

As required by the Secretary, prior to or as a component of the RFI Work Plan, the Permittee shall submit for the Secretary’s approval a Description of Current Conditions (DCC) Report providing the background information pertinent to the Site. Consistent with the Secretary’s Description of Current Conditions Report Scope of Work (Attachment 7), the DCC Report shall include information gathered during any previous investigations, inspections, interim measure activities, and any other relevant data, which helps to identify potential sources of contamination and characterize the current Site conditions.

**STEP 2: RFI WORK PLAN DEVELOPMENT AND IMPLEMENTATION**

The Permittee must prepare and submit to the Secretary for review and approval an RFI Work Plan describing in detail all activities proposed to satisfy the RFI objectives before any investigation activities commence, unless otherwise required or approved by the Secretary. The RFI Work Plan shall, at a minimum, include the following project- or Site-specific components: 1) field sampling plan; 2) quality assurance project plan (QAPP); and, 3) health and safety plan. A detailed RFI working schedule, presented graphically in the form of a milestone chart (e.g., Gantt chart) to show the duration and interdependencies of the various activities must be included in the RFI Work Plan.

A field sampling plan provides the guidance for all fieldwork by defining in detail the sampling and data gathering methods and standard operating procedures (SOPs) to be used. The field sampling plan shall be written so that a field sampling team unfamiliar with the Site would be able to gather the required samples and field information. A QAPP describes the policy, organization, functional activities, and quality assurance and quality control protocols necessary to achieve the data quality objectives dictated by the intended use of the data. The Secretary requires that QAPPs be prepared in general accord with available EPA guidance titled Requirements for Quality Assurance Project Plans (QA/R-5) (EPA 2006) and Guidance for Quality Assurance Project Plans (G-5) (EPA 2002). Key components of a QAPP must include quality assurance objectives for data, sample custody and handling, data generation and acquisition, standard operating procedures, report and data management, project management elements, laboratory QAPP, and data validation and usability. Permittee may be required to update the QAPP throughout a project’s lifecycle to ensure that the document encompasses all Site-related activities. A health and safety plan prepared to support the field effort must conform to the Permittee’s or contractor’s health and safety program, which must, in turn, be in compliance with requirements of the Occupational Safety and Health Administration (OSHA). Although submittal to the Secretary is necessary for completion of the Administrative Record
In general, a detailed description of field activities to satisfy the primary objectives of the RFI must be included in the RFI Work Plan. RFI activities may include any of several components including, but not limited to, the following: investigation of waste, soil, groundwater, surface water, sediment, air or biota; geotechnical evaluations; inspection and tightness testing of tanks, pipelines, sewers, or other areas or containers; water well surveys; geophysical surveys; land elevation surveys; personnel interviews; or other relevant activities, or activities as required by the Secretary. The Permittee must include all data gathered during the investigation in the RFI Report. Permittee must propose sufficient biased/unbiased grid sampling to ensure meeting RFI objectives. With the Secretary’s prior approval, the RFI may be implemented in a phased manner; however, the Secretary’s expectation is that the total duration of the investigative effort be limited to the extent possible, generally within six months to a year. If a phased investigation program is proposed, the initial work plan submittal shall describe the anticipated scope and schedule of each investigative phase to avoid unnecessary delays in the investigation process. In addition, the Secretary may require interim reports/memoranda to support a phased implementation prior to submittal of the RFI Report.

The RFI Work Plan shall, at a minimum, include a review of available information and documented findings, including, but not limited to the following: description of physical location, including legal description, and street address of the Facility and Site; complete summary of ownership/operational history of the source Facility and ownership status of other nearby affected properties; Facility layout identifying operational features and chemical/waste management/storage/disposal areas or units, such as vapor degreasers and sumps; description of all past and present activities/operations conducted, including the nature of business operations, chemicals used, wastes generated, chemical and waste disposal methods, and records or descriptions of all known discharges, releases, spills, and other relevant information, or as required by the Secretary; a description of the physical Site characteristics, such as the geology, hydrogeology, surface water hydrology, meteorology, past/present land use, and other relevant information; a detailed description of the type(s) of contaminants/wastes involved, release characteristics and contaminated media; evaluation or investigation objectives; and, detailed procedures for determining waste distribution as well as the nature and extent of contamination, and an evaluation of all exposure pathways of concern. Environmental permits issued relative to past or present business operations should be identified. Descriptions of any previous environmental investigations conducted at the Site and summaries of the significant findings of those investigations shall be included. While acceptance and use of data for the purposes of the RFI is subject to the Secretary’s approval, the Secretary encourages consideration of previously collected data or investigation results for the purpose of focusing or optimizing the proposed RFI effort. However, if those previous data collection or investigation efforts were collected without the Secretary’s oversight, then the Secretary may require verification sampling at key locations to corroborate the earlier data/results.

The RFI Work Plan must: summarize available historical records including drawings, aerial photographs, plot plans, and as-builts, encompassing the entire Site history to ensure comprehensive identification of all known or potential COCs; provide a listing and
corresponding map of chemical/waste management/storage/disposal areas and wastewater management units; and, provide a written summary of all wastes generated and management/storage/disposition methods. Focus in the RFI Work Plan should be on known and suspected source areas such as, but not limited to, the following: pits; holding ponds, waste ponds or surface impoundments; drains, oil/water separators; vapor degreasers; drum storage areas; loading docks or racks; earthen mounds, fill and soil disturbance areas; landfill, landfarm or land application areas; conveyance piping; tanks; stained soil and standing liquid areas; septic tank and lateral field areas; and, any other chemical/waste management/storage/disposal areas and wastewater management units.

Through conduct of the RFI at a given Site, besides assessing the distribution of any wastes present, the Permittee shall fully delineate the lateral and vertical extent of contamination for all known and suspected COCs for all affected or potentially affected environmental media. Potential media to be investigated during the RFI shall include surface and subsurface soils, groundwater, surface water, sediment, air, including the vapor intrusion into indoor air pathway, and biota. To accomplish these activities, this component of the RFI may include monitoring well or piezometer installation, soil boring/sampling, soil or groundwater probing/sampling, field and laboratory analyses, geophysical surveys, hydrogeological evaluations, surveying, computer modeling, and biota studies, among others. The Permittee must collect analytical data of appropriate data quality and quantity to facilitate comparison to applicable threshold levels as established in KDHE’s Risk-Based Standards for Kansas RSK Manual (RSK Manual) or support a more thorough evaluation of risks posed through conduct of a quantitative baseline risk assessment, such as HHRA and SLERA/BERA, if one is to be performed, and to support the evaluation of potential corrective measures alternatives. In addition, Permittee shall perform a rapid assessment of ecological risk using the EPA Region 6 Ecological Exclusion Criteria Worksheet and Ecological Assessment Checklist at this stage. (Attachment 9)

The Permittee shall validate all data at the appropriate field or laboratory quality control level to determine whether it is appropriate for its intended use. Data quality is of critical importance because decisions about how to appropriately manage the relative risk to human health and the environment depend on the quality of data collected for a project. Quality Control (QC) samples will be collected by the Permittee during each sampling event to help evaluate data quality and usability. The number and types of QC samples collected is typically specified in the QAPP and will vary depending on the types of sampling being performed, types of equipment used, number of samples collected, analytical methodology, and intended use of the data. The following are the most common types of QC samples collected and analyzed during an RFI: field duplicate samples; equipment rinsate samples; trip blank samples; field blank samples; matrix spike and matrix spike duplicate samples; performance evaluation samples; split samples; laboratory control and laboratory control duplicate samples; and, method blank samples.

**STEP 3: BASELINE RISK ASSESSMENT (as required/optional)**

Information and environmental data collected and validated by the Permittee as representative of Site conditions are used to qualitatively or quantitatively assess the potential excess human health risk and/or ecological risk posed by the Site in the absence of remediation. For simplicity, this is typically accomplished through direct comparison to the Tier 2 Levels which become the
default cleanup goals for a Site, or through other methods of analysis, as provided in KDHE’s RSK Manual. However, in lieu of such direct comparison or simplified tier analysis, a Site-specific quantitative baseline risk assessment, such as HHRA and SLERA/BERA may either be proposed by the Permittee or required by the Secretary to evaluate human health and ecological risk and facilitate determination of cleanup goals for a Site. If the Secretary determines that the completion of a quantitative risk assessment is appropriate, the Permittee may, at their option, perform such risk assessment for submittal to the Secretary for review and approval. The Secretary typically utilizes an outside contractor to support technical review and discussion of risk assessment documents. Alternatively, the Permittee may elect to have the Secretary, utilizing outside contractor support, perform the risk assessment. In either case, the Secretary’s direct and indirect costs associated with oversight or conducting of risk assessment activities will be reimbursed by the Permittee.

Prior to performing the risk assessment, the Permittee must submit a baseline risk assessment work plan that, among other items, provides a Site-specific exposure conceptual model, which either graphically illustrates or clearly identifies the impacted media and all the primary and secondary exposure pathways, lists all contaminants of concern, standard exposure parameters, current and future land use assumptions, methodologies for determining reasonable maximum exposure point concentrations, proxy determinations, and other statistical considerations. The quantitative baseline risk assessment must be performed in accordance with KDHE policy in a manner consistent with available EPA guidance at https://www.epa.gov/risk/risk-assessment-guidelines and www.epa.gov/risk/. All risk assessment work plan documentation must be approved by the Secretary prior to commencing risk assessment activities. Resultant risk assessment reports must then be submitted to the Secretary for review and approval. Permittee’s coordination with the Secretary is required throughout the risk characterization process and cleanup goal determination process. However, early on scoping discussions between the Secretary and the Permittee as part of work plan development will be critical to the overall success of the risk assessment effort. Ultimately, the Secretary will make all final risk management decisions related to the Site.

**STEP 4: TREATABILITY STUDIES/MODELING/ADDITIONAL DATA ACQUISITION**

*(as required/optional)*

To keep the RFI process on schedule, the Secretary may deem it appropriate for the Permittee to identify and initiate any bench- or pilot-scale treatability study testing necessary to evaluate corrective measure alternatives early in the RFI process. Treatability studies are conducted to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the corrective measures study (CMS) process and to support the subsequent remedial design of the corrective measures ultimately selected by the Secretary. Treatability studies also serve to reduce cost and performance uncertainties to acceptable levels for treatment alternatives under consideration to allow a more reliable corrective measures selection process. Examples of treatability data gathering activities that might be performed during the RFI include aquifer pumping tests, soil vapor extraction pilot tests, or bench- or pilot-scale applications of innovative technologies to evaluate their applicability to Site wastes and contamination. All treatability studies/modeling/additional data acquisition activities must be completed by the Permittee in a manner consistent with available KDHE policy and guidance. If there is a desire or requirement
to conduct such activities, the Permittee must first submit an appropriate work plan for the Secretary’s review and approval. At the Secretary’s discretion, the Permittee’s reporting associated with treatability study/modeling/additional data acquisition activities may be reported separately or incorporated into the RFI Report. Similar to baseline risk assessments, the Secretary typically utilizes an outside contractor to support technical review and discussion of environmental modeling documents, for example a groundwater fate and transport model work plan and report. The Secretary’s direct and indirect costs associated with oversight or conduct of environmental modeling activities will be at the Permittee’s expense.

**STEP 5: RFI REPORT**

Consistent with Section III.I.3, of the Permit, upon completion of all investigative/evaluation activities necessary to fully achieve the RFI objectives, the Permittee must submit an RFI Report to the Secretary, in a timeframe consistent with the implementation schedule in the approved RFI Work Plan, for review and approval. The RFI Report must include all information and data collected during the investigation and describe in detail the work performed to accomplish the objectives as set forth within this scope of work (SOW) attachment. The RFI Report format shall be consistent with this SOW attachment and include appropriate tables, figures, well logs, laboratory analytical data, references, appendices, etc. to effectively portray the data generated during the investigation and to support any conclusions drawn in the RFI Report. The RFI Report shall present the results of the RFI including, but not limited to, the following:

1) Summary of Site investigation/evaluation work completed with relevant presentation of the data in figures and tables, including appendices with all ancillary documentation such as field notes; photographs; chain-of-custody records; laboratory reports; survey reports; data validation summary; and all other relevant information.

2) Description of all COCs, including a discussion and summary of data collected with appropriate QA/QC and data validation information;

3) An evaluation of possible exposure pathways including areal extent of all COCs;

4) A preliminary list of corrective measure objectives, corresponding potential corrective measure alternatives and initial identification of key regulatory requirements that may have bearing on corrective measures implementation;

5) Comparison of data collected to appropriate threshold levels, such as Tier 2 Levels in the RSK Manual; and,

6) Conclusions and recommendation(s), and if applicable, a proposal for further investigation and/or interim measure activities.

Once samples have been collected and data reported by the laboratory, Permittee shall assess the quality of the data to ensure it is precise, accurate, representative, complete, and comparable before relying on it to support project decisions. The procedures and thresholds for evaluating data quality are typically laid out in the QAPP. It is the Secretary’s general expectation that data
validation be performed in accord with EPA Contract Laboratory Program’s *National Functional Guidelines for Superfund Organic Methods Data Review* (EPA 2017) and *National Functional Guidelines for Superfund Inorganic Methods Data Review* (EPA 2017), or as otherwise approved by the Secretary. Together, these documents identify methods for evaluating and documenting the quality of analytical data for the majority of contaminants encountered at sites in Kansas. In all cases, Permittee must incorporate data validity into reporting documentation in the form of a data validation summary. The data validation summary should describe all data validation activities and discuss, in detail, the results of analysis of quality control samples and their effect on primary data. The summary should provide an overall assessment of the data evaluated with respect to precision, accuracy, representativeness, completeness, comparability, and the general acceptability and usability of the data.

Upon Permittee’s successful completion of the RFI effort, the Secretary will determine the path forward for future Site activities to be conducted by the Permittee, including further investigation, development of a presumptive corrective measures design concept, detailed evaluation/comparative analysis of cleanup alternatives through a separate CMS process, interim measure design/implementation, and/or implementation of the corrective measures selected by the Secretary with consideration of public input on the Fact Sheet.

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1Face-to-face meetings or teleconferences between the Secretary and Permittee are strongly encouraged to achieve consensus on approach and overall streamlining of the corrective action process.
ATTACHMENT 9

ECOLOGICAL EXCLUSION SCREENING
SCOPE OF WORK
INTRODUCTION

With minor modification, the Kansas Department of Health and Environment (KDHE) has adopted the ecological exclusion screening methodology developed by the U.S. Environmental Protection Agency (EPA) Region 6 to help facilities and regulators determine whether or not further ecological evaluation is necessary at an affected property where corrective action is contemplated. The methodology includes use of an Ecological Exclusion Criteria Worksheet and an Ecological Assessment Checklist to facilitate such determinations, as required by Section III.1.4.a of the Permit.

Utilizing the Ecological Exclusion Criteria Worksheet, the ecological screening process involves initial collection of general information about the Facility operations, physical Site characteristics, ecological habitats, and receptors. A determination is then made as to whether incomplete or insignificant exposure pathways exist at the affected property thereby eliminating the need for further ecological evaluation.

If an area cannot be excluded from further evaluation, the Permittee shall collect more detailed information about ecological areas utilizing the Ecological Assessment Checklist to assist in determining the need for further ecological risk evaluations. If the ecological area meets the exclusion criteria, then the Permittee shall document the Site conditions and justification(s) for how the criteria have been met within the rapid assessment of risk section of the RCRA Facility Investigation (RFI) Report. Upon review and approval of the exclusion by the Secretary, further evaluation of ecological risk will not be required.

If the affected property does not meet the exclusion criteria, then the Secretary may require Permittee to conduct a screening level ecological risk assessment/baseline ecological risk assessment (SLERA/BERA). Permittee shall conduct additional ecological risk screening/assessment following EPA’s Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments dated June 5, 1997 and Guidelines for Ecological Risk Assessment (EPA/630/R-95/002F) dated April 1998, or other guidance for ecological risk evaluation as approved by the Secretary.

ECOLOGICAL EXCLUSION CRITERIA WORKSHEET

The Ecological Exclusion Criteria Worksheet is intended to facilitate determination of whether or not further ecological evaluation is necessary at an affected property where corrective action may be required. Exclusion criteria refer to those conditions at an affected property which preclude the need for a formal ecological risk assessment, such as a SLERA/BERA, where there are incomplete or insignificant ecological exposure pathways due to the nature of the affected property setting and/or the condition of the affected property media. The worksheet is designed for general applicability to all affected property; however, there may be unusual circumstances which require professional judgment or technical support, such as, consultation with U.S. Fish
and Wildlife Service, in order to determine the need for further ecological evaluation (e.g., cave-dwelling receptors). In these cases, Permittee shall contact the Secretary for additional guidance before proceeding.

The worksheet consists of three major parts: Part 1, identification of the affected property and background information, Part 2, the actual exclusion criteria and supportive information, and Part 3, a qualitative summary statement and certification of the information submitted. Answers to the worksheet should reflect existing conditions and should not consider future corrective measures at the affected property. Completion of the worksheet should lead to a logical conclusion as to whether further detailed ecological evaluation is warranted.

**Part 1: Affected Property Identification and Background Information**

1) Provide a description of the specific area of the corrective action and the nature of the release. Include estimated acreage of the affected property and the Facility property, and a description of the type of Facility and/or operation associated with the affected property. Also describe the location of the affected property with respect to the Site property boundaries and public roadways.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

   Attach available USGS topographic maps and/or aerial or other affected property photographs to this form to depict the affected property and surrounding area.

   _____ Topo map   _____ Aerial photo   _____ Other _______________ (specify)

2) Identify the environmental media known or suspected to contain contaminants of concern (COCs) at the present time. Check all that apply:

   Known/Suspected Impacted Media                      Based on sampling data?
   _____ Soil < 5 ft below ground surface     _____ Yes _____ No
   _____ Soil > 5 ft below ground surface     _____ Yes _____ No
   _____ Groundwater                               _____ Yes _____ No
   _____ Surface Water/Sediment                   _____ Yes _____ No

   Explain (previously collected information may be referenced):

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
3) Provide the information below for the nearest surface water body which has become or has the potential to become impacted from migrating COCs via surface water runoff, air deposition, groundwater seepage, etc.

Exclude: wastewater treatment facilities and stormwater conveyances/impoundments authorized by permit.

Also exclude: conveyances, decorative ponds, and those portions of the process facilities which are:

  a. Not in contact with surface waters of the State or other surface waters which are ultimately in contact with surface waters of the State; and,

  b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, etc.

The nearest surface water body is ______________ feet/miles from the affected property.
The surface water body is named ________________________________.
The surface water body is best described as a:

- Freshwater stream: ______ perennial (has water year round)
- ______ intermittent (dries up completely ≥ one week/year)
- ______ intermittent with perennial pools
- Freshwater swamp/marsh/wetland
- Saltwater or brackish swamp/marsh/wetland
- Reservoir, lake or pond; approximate surface acres ________________________
- Drainage ditch
- Tidal stream
- Other (specify) _____________________________________________________

Is the water body listed as a State classified segment?

- Yes    Segment #: ______ Use Classification: _____________________________
- No

If the water body is not a State classified segment, identify the first downstream classified segment.
Name: _____________________________________________________________
Segment #: _________________________________________________________
Use classification: ___________________________________________________

As necessary, provide further description of surface waters in the vicinity of the affected property:

____________________________________________________________________
____________________________________________________________________
Part 2: Exclusion Criteria and Supporting Information

Subpart A. Surface Water/Sediment Exposure

1) Regarding the affected property where corrective action is being contemplated, have COCs migrated and resulted in a release or imminent threat of release to either surface waters or to their associated sediments via surface water runoff, air deposition, groundwater seepage, or other means of transmission?

Exclude: wastewater treatment facilities and stormwater conveyances/impoundments authorized by permit.

Also exclude: conveyances, decorative ponds, and those portions of the process facilities which are:

a. Not in contact with surface waters of the State or other surface waters which are ultimately in contact with surface waters of the State; and

b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, and other living organisms.

_____ Yes _____ No

Explain: __________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

If the answer is “Yes” to Subpart A above, the affected property does not meet the exclusion criteria. However, complete the remainder of Part 2 to determine if there is a complete and/or significant soil exposure pathway, and then complete Part 3, Qualitative Summary and Certification.

If the answer is “No” to Subpart A above, go directly to Subpart B.

Subpart B. Affected Property Setting

In answering “Yes” to the following question, it is understood that the affected property is not attractive to wildlife or livestock, including threatened or endangered species. That is, the affected property does not serve as valuable habitat, foraging area, or refuge for ecological communities. Further consultation with management agencies may be required.

1) Is the affected property wholly contained within contiguous land characterized by: pavement, buildings, landscaped area, functioning cap, roadways, equipment storage area, manufacturing or process area, or other surface cover or structure, or otherwise disturbed ground?

_____ Yes _____ No
Explain: __________________________________________________________
........................................................................................................
........................................................................................................
........................................................................................................

If the answer is “Yes” to Subpart B above, the affected property meets the exclusion criteria, assuming the answer to Subpart A was “No.” Then, skip Subparts C and D and complete Part 3, Qualitative Summary and Certification.

If the answer is “No” to Subpart B above, go directly to Subpart C.

Subpart C. Soil Exposure

1) Are COCs which are in the soil of the affected property solely below the first 5 feet beneath ground surface, or does the affected property have a physical barrier present to prevent exposure to receptors to COCs in the surface soil?
   _____ Yes _____ No

Explain: __________________________________________________________
........................................................................................................
........................................................................................................
........................................................................................................

If the answer is “Yes” to Subpart C above, the affected property meets the exclusion criteria, assuming the answer to Subpart A was “No”. Then, skip Subpart D and complete Part 3, Qualitative Summary and Certification.

If the answer is “No” to Subpart C above, go directly to Subpart D.

Subpart D. DeMinimus Land Area

In answering “Yes” to the question below, it is understood that all of the follow conditions apply:

- Affected property is not known to serve as habitat, foraging area, or refuge to threatened/endangered or otherwise protected species. (Note: Will likely require consultation with wildlife management agencies).
- Similar but unimpacted habitat exists within a half-mile radius.
- Affected property not known to be located within one-quarter mile of sensitive environmental areas, such as rookeries, wildlife management areas, preserves. (Note: Will likely require consultation with wildlife management agencies).
- No reason to suspect COCs associated with the affected property will migrate such that the affected property will become larger than one acre.

Using human health protective concentration levels as a basis to determine the extent of the COCs, does the affected property consist of one acre or less and does it meet all the conditions described above?
_____ Yes _____ No

Explain how the conditions are/are not met:
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

If the answer is “Yes” to Subpart D, then no further ecological evaluation is needed at the affected property, assuming the answer to Subpart A was “No”. Then, complete Part 3, Qualitative Summary and Certification).

If the answer is “No” to Subpart D, proceed to an Ecological Risk Evaluation, that is, SLERA/BERA.

**Part 3. Qualitative Summary and Certification (Complete in all cases)**

Attach a brief statement (one page or less) summarizing the information provided in this form. This summary should include sufficient information to verify that the affected property meets or does not meet the exclusion criteria. The Permittee should make the initial decision regarding the need to conduct further ecological evaluation based on the results of this worksheet. However, the Secretary will make a final determination on the need for further detailed ecological assessment.

**Note: The Permittee has the continuing obligation to re-enter the SLERA/BERA process if changing circumstances result in the affected property not meeting the exclusion criteria requirements presented in this worksheet.**

Completed by: ___________________________________________ (Typed Name)
_________________________________________ (Title)
_________________________________________ (Date)

I believe that the information submitted is true, accurate, and complete, to the best of my knowledge.
_________________________________________ (Typed Name of Person)
_________________________________________ (Title of Person)
_________________________________________ (Signature of Person)
_________________________________________ (Date Signed)
**Definitions:** The following definitions are applicable only to the Exclusion Worksheet; the Definitions in Attachment 1 also apply to the Exclusion Worksheet.

**Affected property** - entire area all affected environmental media at the Site containing releases of contaminants of concern at concentrations equal to or greater than the assessment level applicable for the land use, either residential or non-residential, and groundwater classification, or other threshold level for each affected media.

**Assessment level** - critical protective concentration level for a contaminant of concern used for affected property assessments where the human health protective concentration level is established by State regulation, standards, or guidance.

**Bedrock** - solid rock, or, consolidated, coherent, and relatively hard naturally formed material that cannot normally be excavated by manual methods alone, that underlies gravel, soil, or other surficial material.

**Contaminant of concern** - any contaminant that has the potential to adversely affect ecological or human receptors due to its concentration, distribution, and mode of toxicity.

**Community** - assemblage of plant and animal populations occupying the same habitat in which the various species interact via spatial and trophic relationships, such as, a desert community or a pond community.

**Complete exposure pathway** - exposure pathway where a human or ecological receptor is exposed to a contaminant of concern via an exposure route, such as, incidental soil ingestion, inhalation of volatiles and particulates, consumption of prey, or other exposure routes.

**De Minimus** - description of an area of affected property comprised of one acre or less where the ecological risk is considered to be insignificant due to small extent of contamination, absence of protected species, availability of similar unimpacted habitat nearby, and lack of adjacent sensitive environmental areas.

**Ecological protective concentration level** - concentration of a contaminant of concern at the point of exposure within an exposure medium, such as, soil, sediment, groundwater, or surface water, which is determined to be protective for ecological receptors. These concentration levels are intended to be protective for more mobile or wide-ranging ecological receptors and, where appropriate, benthic invertebrate communities within waters of the State. These concentration levels are not intended to be directly protective of receptors with limited mobility or ranges, such as plants, soil invertebrates, and small rodents, particularly those residing within active areas of a Site, unless these receptors are threatened/endangered species or unless impacts to these receptors result in disruption of the ecosystem or other unacceptable consequences for the more mobile or wide-ranging receptors, for example, impacts to a grassland habitat eliminate rodents which causes a desirable owl population to leave the area.
**Ecological risk assessment** - process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors; however, as used in this context, only chemical stressors, or COCs, are evaluated.

**Environmental medium** - material found in the natural environment such as soil, (including non-waste fill materials), groundwater, air, surface water, and sediment, or a mixture of such materials with liquids, sludges, gasses or solids, including hazardous waste which is inseparable by simple mechanical removal processes, and is made up of primarily natural material.

**Exclusion criteria** - those conditions at an affected property which preclude the need to establish a protective concentration level for an ecological exposure pathway because the exposure pathway between the contaminant of concern and the ecological receptors is not complete or is insignificant.

**Exposure medium** - environmental medium or biological tissue in which or by which exposure to contaminants of concern by human or ecological receptors occurs.

**Functioning cap** – low-permeability layer or other approved cover meeting its design specifications to minimize water infiltration and chemical of concern migration, and prevent ecological or human receptor exposure to contaminants of concern, where design requirements are routinely maintained.

**Landscaped area** - area of ornamental, introduced, commercially installed, or manicured vegetation, which is routinely maintained.

**Physical barrier** - any natural or manmade structure or system that prevents exposure or prevents physical migration of contaminants of concern to points of exposure.

**Point of exposure** - location within an environmental medium where a receptor will be assumed to have a reasonable potential to come into contact with contaminants of concern. The point of exposure may be a discrete point, plane, or an area within or beyond some location.

**Protective concentration level** - concentration of a contaminant of concern which can remain within the source medium and not result in levels which exceed the applicable human health risk based exposure limit considering cumulative risk and hazard index for both carcinogenic and non-carcinogenic effects respectively, or ecological protective concentration level at the point of exposure for that exposure pathway.

**Sediment** - non-suspended particulate material lying below surface waters such as bays, oceans, rivers, streams, lakes, ponds, or other similar surface water body, including intermittent streams. Dredged sediments which have been removed from surface water bodies and placed on land shall be considered soils.

**Sensitive environmental areas** - areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding,
hatching, rearing of young, and overwintering. Examples include: critical habitat for threatened and endangered species, wilderness areas, parks and wildlife refuges.

**Site** means the Facility, in addition to all areas and media to which hazardous constituents, hazardous wastes, releases and/or any other contamination or pollution that originated at the Facility, have been released and/or have migrated.

**Source medium** - environmental medium containing contaminants of concern which must be removed, decontaminated and/or controlled in order to protect human health and the environment. The source medium may be the exposure medium for some exposure pathways.

**Stressor** - any physical, chemical, or biological entity that can induce an adverse response; however, as used in this context, only chemical entities apply.

**Subsurface soil** - for human health exposure pathways, this is the portion of soil zone between base of surface soil and top of groundwater-bearing unit(s). For ecological exposure pathways, this is the portion of soil zone between 0.5 feet and 5 feet in depth.

**Surface cover** - layer of artificially-placed utility material, such as gravel.

**Surface soil** - for human health exposure pathways, this is the soil zone extending from ground surface to 15 feet in depth for residential land use, and from ground surface to 5 feet in depth for non-residential land use; or to the top of the uppermost groundwater-bearing unit or bedrock, whichever is less in depth. For ecological exposure pathways, this is the soil zone extending from ground surface to 0.5 feet in depth.

**Surface water** - any water meeting the definition of surface water in Kansas.
ECOLOGICAL ASSESSMENT CHECKLIST

The evaluation associated with the checklist is intended to be a screening-level survey of the developed and undeveloped ecological portions of the Site. Answers to the checklist should reflect existing conditions and should not consider future remedial actions at the Site.

In general, the checklist is designed for applicability to all sites; however, there may be unusual circumstances which require professional judgment or technical assistance in order to determine the need for further detailed ecological evaluation. Sources and general information available for the identification of ecological receptors and habitats may include: the U.S. Fish and Wildlife Service, Kansas Department of Wildlife, Parks, and Tourism, United States Geological Service (USGS), Kansas Geological Survey, National Wetland Inventory Maps, National Audubon Society, Kansas Biological Survey, national and local wildlife clubs, National and State Heritage Programs, State and National Parks System, and tribal organizations.

Section 1. Site Description

1) Facility Name:____________________________________________________________

Location:________________________________________________________________

County:________________________ City:________________________
State:______

Type of Facility: __________________________________________________________

2) Latitude:_________________________ Longitude:___________________________

3) What is the approximate area of the Site?___________________________________

4) Is this the first Site visit?  Yes _____ No _____.  If “No”, attach trip report of previous
Site visit(s), if available. Date(s) of previous Site visit(s):

5) Please attach to the checklist USGS topographic map(s) of the Site, if available.

6) Are aerial or other Site photographs available? Yes ____ No _____.  If “Yes”, please
attach any available photo(s) to the Site map at the conclusion of this section.
7) The land use on the Site is:

- % Urban
- % Rural
- % Residential
- % Industrial __ light __ heavy
- % Agriculture
  (Crops: ______________________)
- % Recreational
  (Describe; note if it is a park, etc.)
- % Undisturbed
- % Other

The area surrounding the Site is:

- % Urban
- % Rural
- % Residential
- % Industrial __ light __ heavy
- % Agriculture
  (Crops: ______________________)
- % Recreational
  (Describe; note if it is a park, etc.)
- % Undisturbed
- % Other

8) Has any movement of soil taken place at the Site? Yes ___ No ___. If “Yes”, please identify the most likely cause of this disturbance:

- Agricultural Use
- Heavy Equipment
- Natural Events
- Erosion
- Other

Please describe:

9) Do any potentially sensitive environmental areas exist adjacent to or in proximity to the Site, such as, Federal and State parks, National and State Monuments, wetlands, prairie potholes? Remember, flood plains and wetlands are not always obvious; do not answer “No” without confirming information from a reliable source.

10) What type of Facility is located at the Site?

- Chemical
- Manufacturing
- Mixing
- Waste Disposal
- Other (specify)

11) What are the suspected contaminants of concern at the Site? If known, what are their maximum concentration levels?

_______________________________________________________________________

_______________________________________________________________________

12) Check any potential routes of off-Site migration of contaminants observed at the Site:

- Swales
- Depressions
- Drainage Ditches
- Runoff
- Windblown Particulate
- Vehicular Traffic
- Other (specify)

13) If known, what is the approximate depth to the water table?
14) Is the direction of surface runoff apparent from Site observations? Yes ___ No ___. If “Yes”, to which of the following does the surface runoff discharge? Mark all that apply. 
   _____ Surface water _____ Groundwater _____ Sewer _____ Collection impoundment

15) Is there a navigable waterbody or tributary to a navigable waterbody? Yes ___ No ___.

16) Is there a waterbody anywhere on or in the vicinity of the Site? If “Yes”, also complete Section 3: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section 4: Aquatic Habitat Checklist - Flowing Systems.
   Yes ___ approximate distance ________________ No ___

17) Is there evidence of flooding? Yes _____ No ___. Wetlands and flood plains are not always obvious; do not answer “No” without confirming information with a reliable source. If “Yes”, complete Section 5: Wetland Habitat Checklist.

18) If a field guide was used to aid any of the identifications, please provide all references. Also, estimate the time spent identifying the fauna. (Use a blank sheet if additional space is needed for text).

19) Are any threatened and/or endangered species, plant or animal, known to inhabit the area of the Site? Yes _____ No ___. If “Yes”, you are required to verify this information with the U.S. Fish and Wildlife Service. If species identities are known, please list them in the text.

20) Are any species in need of conservation, either plant or animal, known to inhabit the area of the Site? Yes _____ No ___. If “Yes”, you are required to verify this information with the Kansas Department of Wildlife and Parks. If species identity is known, please list them in the text.
21) Record weather conditions at the time this checklist was prepared:

Date: _______________

Temperature (°C /°F) _________ Temperature (°C /°F) _________ Normal daily high temperature

Wind (direction/speed) _________ Wind (direction/speed) _________ Precipitation (rain, snow, other)

Cloud cover _________ Cloud cover

Section 1A. Summary of Observations and Site Setting

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Completed by _______________________________ Affiliation _________________________

Additional Preparers ____________________________________________________________

Site Manager __________________________________________________________________

Date _______________________

Section 2. Terrestrial Habitat Checklist

Section 2A. Wooded

1) Are there any wooded areas on the Site? Yes _____ No ______. If “No”, go to Section IIB: Shrub/Scrub.

2) What percentage of the area of the Site is wooded? (_____ % _____ acres) Indicate the wooded area on the Site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the Site. ________________

3) What is the dominant type of vegetation in the wooded area?
   (Circle one: Evergreen/Deciduous/Mixed) Provide a photograph(s) if available.
   Dominant plant, if known: __________________________________________________

4) What is the predominant size of the trees at the Site? Use diameter at breast height.
   _____ 0-6 inches _____ 6-12 inches _____ > 12 inches

5) Specify type of understory present, if known. Provide a photograph(s), if available.

______________________________________________________________________________

Section 2B. Shrub/Scrub

1) Is shrub/scrub vegetation present at the Site? Yes _____ No ______. If “No”, go to Section IIC: Open Field.
2) What percentage of the Site is covered by shrub/scrub vegetation? (_____ % _____ acres) Indicate the acres of shrub/scrub on the Site map. Please identify what information was used to determine this area.

__________________________________________________________________________

3) What is the dominant type of shrub/scrub vegetation, if known? Provide a photograph(s) if available.

__________________________________________________________________________

4) What is the approximate average height of the shrub/scrub vegetation?
   _____ 0-2 feet  _____ 2-5 feet  _____ > 5 feet

5) Based on Site observations, how dense is the shrub/scrub vegetation?
   _____ Dense  _____ Patchy  _____ Sparse

Section 2C. Open Field

1) Are there open, field areas, for example, bare or barren, present at the Site? Yes _____ No _____. If “Yes”, please indicate the type below:
   _____ Prairie/plains  _____ Savannah  _____ Old field  _____ Other (specify) _________

__________________________________________________________________________

2) What percentage of the Site is open field? (_____ % _____ acres) Indicate the open field areas on the Site map.

3) What is/are the dominant plant/plants? Provide a photograph(s) if available. __________

__________________________________________________________________________

4) What is the approximate average height of the dominant plant? _____________________

5) Describe the vegetation cover: _____ Dense _____ Sparse _____ Patchy
**Section 2D. Miscellaneous**

1) Are other types of terrestrial habitats present at the Site, other than woods, shrub/scrub, and open field? Yes _____ No _____. If “Yes”, identify and describe below.

2) Describe the terrestrial miscellaneous habitat(s) and identify these areas on the Site map.

3) What observations, if any, were made at the Site regarding the presence and/or absence of insects, fish, birds, mammals, or other living organisms?

4) Review the questions in Section I to determine if any additional habitat checklists should be completed for this Site.

**Section 3. Aquatic Habitat Checklist – Non-Flowing Systems**

*Note: Aquatic systems are often associated with wetland habitats. Please refer to Section 5, Wetland Habitat Checklist.*

1) What type of open-water, non-flowing system is present at the Site?
   - Natural (pond or lake)
   - Artificially created (lagoon, reservoir, canal, impoundment)

2) If known, what is the name(s) of the waterbody(ies) on or adjacent to the Site?

3) If a waterbody is present, what are its known uses (for example, recreation, navigation, other)?

4) What is the approximate size of the waterbody(ies)? ____________ acre(s)

5) Is any aquatic vegetation present? Yes _____ No _____. If “Yes”, please identify the type of vegetation present, if known.
6) If known, what is the depth of the water? ________________________________

7) What is the general composition of the substrate? Check all that apply.

- Bedrock
- Boulder (>10 inch)
- Cobble (2.5-10 inch)
- Gravel (0.1-2.5 inch)
- Other (specify)
- Sand
- Silt (fine)
- Marl (shells)
- Clay (slick)
- Concrete
- Muck (fine/black)
- Debris
- Detritus
- Debris
- Cobble (2.5-10 inch)
- Marl (shells)
- Clay (slick)
- Concrete

8) What is the source of water in the waterbody?

- River/Stream/Creek
- Industrial discharge
- Surface runoff
- Groundwater
- Other (specify)

9) Is there a discharge from the Site to the waterbody? Yes _____ No _____. If “Yes”, please describe this discharge and its path.

10) Is there a discharge from the waterbody? Yes _____ No _____. If “Yes”, and the information is available, identify from the list below the environment into which the waterbody discharges.

- River/Stream/Creek
- Wetland
- Facility
- Groundwater
- Site
- Distance
- Impoundment
- Site
- Distance
- Facility

11) Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

- Area
- Depth (average)
- pH
- Dissolved Oxygen
- Salinity
- Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)
- Other (specify)

12) Describe observed color and area of coloration.

13) Mark the open-water, non-flowing system on the Site map attached to this checklist.

14) What observations, if any were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds mammals, or other organisms?
Section 4. Aquatic Habitat Checklist – Flowing Systems
Note: Aquatic systems are often associated with wetland habitats. Please refer to Section 5, Wetland Habitat Checklist.

1) What type(s) of flowing water system(s) is (are) present at the Site?
   - River
   - Dry wash
   - Artificially Created (ditch, etc.)
   - Stream
   - Arroyo
   - Intermittent Stream
   - Creek
   - Brook
   - Channeling
   - Other (specify) _____________________________

2) If known, what is the name of the waterbody? ___________________________________________

3) For natural systems, are there any indicators of physical alteration, such as, channeling, debris, or other alterations? Yes _____ No _____. If “Yes”, please describe indicators that were observed.

4) What is the general composition of the substrate? Check all that apply.
   - Bedrock
   - Boulder (>10 inch)
   - Cobble (2.5-10 inch)
   - Gravel (0.1-2.5 inch)
   - Other (specify) _____________________________
   - Sand
   - Silt (fine)
   - Marl (shells)
   - Clay (slick)
   - Concrete
   - Muck (fine/black)
   - Debris
   - Detritus

5) What is the condition of the bank: include, height, slope, extent of vegetative cover, and other information?

6) Is the system influenced by tides? Yes _____ No _____. What information was used to make this determination?

7) Is the flow intermittent? Yes _____ No _____. If “Yes”, please note the information that was used in making this determination.

8) Is there a discharge from the Site to the waterbody? Yes _____ No _____. If “Yes”, please describe the discharge and its path.
9) Is there a discharge from the waterbody? Yes _____ No _____. If “Yes”, and the information is available, please identify what the waterbody discharges to and whether the discharge is on the Facility or on the Site.

10) Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected, provide the measurement and the units of measure in the appropriate space below:
   ____________ Width (feet)
   ____________ Depth (feet)
   ____________ Velocity (specify units)
   ____________ Temperature and depth of the water at which the temperature was taken
   ____________ pH
   ____________ Dissolved Oxygen
   ____________ Salinity
   ____________ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)
   ____________ Other (specify) ________________________________

11) Describe observed color and area of coloration.

12) Is any aquatic vegetation present? Yes _____ No _____. If “Yes”, please identify the type of vegetation present, if known.
   _____ Emergent       _____ Submergent       _____ Floating

13) Mark the flowing water system on the attached Site map.

14) What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, or other organisms?

Section 5. Wetland Habitat Checklist

1) Based on observations and/or available information, are designated or known wetlands definitively present at the Site? Yes _____ No _____. Please note the sources of observations and information used (e.g., USGS Topographic maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.
2) Based on the location of the Site (for example, along a waterbody, in a floodplain) and Site conditions (such as, standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? Yes _____ No _____. If “Yes”, proceed with the remainder of the wetland habitat identification checklist.

3) What type(s) of vegetation are present in the wetland?
   _____ Submergent    _____ Emergent
   _____ Shrub/Scrub    _____ Wooded
   _____ Other (specify) _____________________________

4) Provide a general description of the vegetation present in and around the wetland, including height, color, and other descriptors. Provide a photograph of the known or suspected wetlands, if available.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
5) Is standing water present? Yes ____ No ____. If “Yes”, is this water: Fresh ____ Brackish ____ What is the approximate area of the water (sq. ft.)? _________________ Please complete questions 4, 11, 12 in Checklist 3 - Aquatic Habitat -- Non-Flowing Systems.

6) Is there evidence of flooding at the Site? What observations were noted?
   ____ Buttressing      ____ Water marks      ____ Mud cracks
   ____ Debris line      ____ Other (describe) ________________________________

7) If known, what is the source of water in the wetland?
   ____ Stream/River/Creek/Lake/Pond  ____ Groundwater
   ____ Flooding                  ____ Surface Runoff

8) Is there a discharge from the Site to a known or suspected wetland? Yes ____ No ____. If “Yes”, please describe.

9) Is there a discharge from the wetland? Yes ____ No ____. If “Yes”, to what waterbody is the discharge released?
   ____ Surface Stream/River  ____ Groundwater  ____ Lake/pond  ____ Marine

10) If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.
    Color (blue/gray, brown, black, mottled) ________________________________
    Water content (dry, wet, saturated/unsaturated) __________________________

11) Mark the observed wetland area(s) on the attached Site map.
ATTACHMENT 10

INTERIM MEASURES
SCOPE OF WORK
ATTACHMENT 10
INTERIM MEASURES
SCOPE OF WORK

PURPOSE

Permittee shall design and implement Interim Measures, where required and/or approved by the Secretary, consistent with Section III.J of the Permit. This Kansas Department of Health and Environment (KDHE) scope of work (SOW) establishes the general framework for implementation of interim measure activities at a Site. The primary purpose of an interim measure is to achieve the goal of stabilization, which is to control or abate immediate threats to human health and the environment, and to prevent or minimize the spread of contamination while long-term corrective measures are being evaluated. When a release or potential release of hazardous waste(s) and/or hazardous waste constituent(s) from regulated units, solid waste management units (SWMUs), areas of concern (AOCs), and other source or release areas at the Site, poses a threat to human health or the environment, the Secretary may require interim measure implementation. Alternatively, subject to the Secretary’s approval, the Permittee may propose interim measure implementation as long as the interim measure(s) is/are consistent with and integrated into any long-term corrective measures at the Site.

Interim measures may be warranted in either an emergency or non-emergency situation. In the case of an emergency, the Permittee may initiate interim measures with concurrent notification of the Secretary, no later than twenty-four (24) hours of becoming aware of the need for interim measure implementation to mitigate or stabilize an emergency situation.

DEFINITION AND APPLICABILITY

In general, an interim measure is defined as a set of short-term actions or activities taken to quickly prevent, mitigate, or remedy unacceptable risk(s) posed to human health and the environment by an actual or potential release of a hazardous substance, pollutant, or other contaminant. An interim measure is generally a less complex type of remedial response, requiring minimal design effort, and somewhat presumptive in nature, thereby negating the need for rigorous treatability study or pilot testing. An interim measure may be warranted in either an emergency which requires an immediate response, or in a non-emergency situation, to manage the source(s) of contamination, control the exposure pathway(s), and/or control the hazard(s) to human and environmental receptors. An interim measure may be conducted without extensive investigation at any time during the investigation or corrective measure alternatives evaluation process with the Secretary’s approval. Minimally, implementation of an interim measure must be conducted in a manner consistent with the concept of best management practices (BMPs) wherein overall improvement in Site conditions is achieved. Depending upon Site-specific circumstances or conditions, one or more interim measures may be determined necessary.

Factors to be considered by the Permittee in assessing the need for interim measure implementation include the following:
• Actual or imminent threat of exposure to hazardous substances, pollutants, or contaminants by nearby human populations, ecological receptors or ecosystem food web;
• Actual or imminent threat of contamination to drinking water supplies or sensitive ecosystems;
• Hazardous substances, constituents, wastes, or other contaminants in drums, barrels, tanks, piles, or other bulk storage containers that may pose an imminent threat of release;
• High levels of hazardous substances, constituents, pollutants, or contaminants in predominantly surface soils that may readily migrate;
• Weather conditions that may cause hazardous substances, constituents, pollutants, or contaminants to migrate or be released;
• Threat of fire or explosion; and,
• Other situations or factors that may pose imminent threats to public health or welfare or the environment.

In order to assess the relative magnitude of an actual or imminent threat to human health and the environment and the need for possible interim measure implementation, the Secretary will consider all applicable federal and state regulatory standards or threshold screening levels for the media of interest including, but not limited to, the following:

• U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs);
• EPA numeric removal management levels (RMLs) for contaminated drinking water sites listed at https://www.epa.gov/risk/regional-removal-management-levels-rmls-users-guide;
• Tier 2 screening levels as provided in the KDHE Risk-Based Standards for Kansas RSK Manual, 5th Version—October 2010 (RSK Manual), and any subsequent updates/revisions; and,
• Kansas surface water quality standards.

If gross measurable or visible contamination to the environment is evident (e.g., catastrophic release of separate phase liquid waste), this may serve as a threshold criterion for interim measure implementation as required by the Secretary.

The intent in allowing interim measure implementation is not to circumvent the more linear RCRA corrective action process: investigation, alternatives evaluation, and corrective measures design/implementation. However, if Site characteristics suggest circumstances are amenable to interim measures designed to control or abate imminent threats, or prevent or minimize the further spread of contamination, the Secretary may consider the appropriateness of interim measure implementation as an element of the final corrective measures.

GOALS/OBJECTIVES AND TIMING

The ultimate goal of an interim measure is to control or abate threats to human health and/or the environment from releases of or exposures to hazardous substances, constituents, pollutants, or other contaminants, and to prevent or minimize the further spread of contamination while long-term corrective measures are evaluated. An interim measure is intended to provide a partial, albeit more immediate, solution while being consistent with the final Site corrective measures.
Implementation of an interim measure often results in significant overall reduction in cost and scope of the final Site corrective measure(s). In some instances, the interim measure may prove to be all that is necessary to achieve Site-wide corrective action goals should all significant threats to human health and the environment be mitigated or eliminated. In terms of timing, an interim measure is generally conducted before the investigation and evaluation of corrective measure alternatives are completed. However, for an active facility, this timing preference is largely irrelevant in the case of a new or newly-discovered release warranting immediate action.

PROCESS ELEMENTS AND EXAMPLES

Again, an interim measure is intended to be a generally less complex type of remedial response requiring only focused characterization by the Permittee, as necessary or as required by the Secretary; simplified target receptor identification and exposure pathway analysis; focused interim measure identification/selection; and, minimal design effort with emphasis on “off-the-shelf” remedial system components. Since somewhat contrary to the overall purpose of interim measure implementation, the scope and duration of treatability study or pilot-testing activities is expected to be limited. A typical interim measure may include, but is not limited to, one or more of the following:

- Removal of abandoned drums or other waste containers;
- Excavation of contaminated soil “hot spots”;
- Hydraulic control of groundwater contaminant plume;
- Removal of non-aqueous phase liquid (NAPL) from groundwater;
- Provision of alternate water supply or point-of-use treatment;
- Installation of vapor intrusion mitigation systems;
- Construction of perimeter fencing to limit uncontrolled Site access;
- Construction of surface or subsurface barriers such as dikes, berms, French drains, or interceptor trenches; and/or,
- Receptor point monitoring, for example, periodic residential well or public water supply sampling.

PLAN/DESIGN AND REPORTING REQUIREMENTS

Whether conducted in an emergency or non-emergency situation, the decision process leading to the selection and implementation of an interim measure, and the resultant action itself, must be appropriately documented by the Permittee. As part of the initial notification to the Secretary, the Permittee must provide a brief proposal consisting of a description, implementation schedule and justification for the emergency interim measure proposed to be taken. Upon completion of the emergency interim measure, the Permittee will be required to provide a final summary report of the emergency action taken while noting any deviations from the original proposal. The Secretary may request the Permittee to perform additional investigative or mitigative measures, and/or submit a more formal work plan or report.

For all non-emergency interim measures, the Permittee must submit an Interim Measure Work Plan/Design to the Secretary for review and approval. This Work Plan/Design may vary in detail depending on program requirements. The Work Plan/Design shall include, at a minimum, a
summary of available Site information and available investigation results; a detailed description of the proposed interim measure; justification and benefit of interim measure implementation including interim corrective action objectives; depending on the complexity of the interim measure, complete design specifications and drawing/schematics, including any relevant figures and/or Site system engineering layouts, such as, process flow diagram, piping and instrumentation diagram, or other items required by the Secretary, and engineering design basis; cost estimate; and, a detailed working schedule presented graphically in the form of a milestone chart (e.g., Gantt chart) to show the duration and interdependencies of the various activities. Depending on the complexity of the proposed interim measure and specific program requirements, Permittee may need to address operation and maintenance (O&M) as well as performance monitoring needs in the Interim Measure Work Plan/Design. Attachment A provides an example outline of an Interim Measure Work Plan/Design package. Attachment A is not intended to be prescriptive in nature, rather a model from which to work. The exact elements and content of any Interim Measure Work Plan/Design package will be determined by the Secretary, depending on the overall complexity of the anticipated interim measure, while being consistent with specific program requirements and conditions of the Permit.

Once the non-emergency interim measure is determined by the Secretary to be complete (e.g., alternate water supply provided) or fully operational and functional (e.g., soil vapor extraction system is installed in accordance with the Secretary-approved design and achieves performance expectations), the Permittee must submit an Interim Measure Report documenting the nature of the threat, the action(s) taken and the success in mitigating the threat. The Secretary will determine the appropriate form or content of the Interim Measure Report. If the interim measure continues as an on-going effort (e.g., subsurface interceptor trench operation), then the Permittee must submit a monitoring/progress report at a frequency specified in the Secretary-approved Interim Measure Work Plan/Design.

**PUBLIC INVOLVEMENT**

Given that interim measure implementation will normally precede the final corrective measures and any associated decision documents such as the Corrective Measures Decision, the Secretary may prepare a Fact Sheet describing the interim measures and distribute it to interested parties in the immediate Site vicinity. This is not for the intent of soliciting public comment on the proposed interim measures, but rather to keep local government officials and area residents informed as to Site activities. Depending on the Site-related complexities or sensitivities, conduct of a public availability session may be warranted, as determined necessary by the Secretary. In such instance, the Secretary may require Permittee to prepare supporting documents or presentation materials.
Attachment A
Interim Measure Work Plan/Design Package
Example Outline

I. Site Background
II. Previous Investigations and Summary of Results
III. Description of Proposed Interim Measure
IV. Interim Measure Corrective Action Objectives
V. Interim Measure Design
   a. Design Basis
   b. Design Specifications
   c. Drawings/Schematics
   d. Cost Estimate
   e. Detailed Working Schedule (to be periodically updated)

APPENDICES
Appendix A – Data Acquisition Plan (optional)
Appendix B – Quality Assurance Project Plan (or reference existing document)
Appendix C – Treatability Study Testing Plan (optional)
Appendix D – Health and Safety Plan (or reference existing document)
Appendix E – Operations and Maintenance Plan
Appendix F – Community Relations Plan
INTRODUCTION

Conducted by the Permittee in accordance with Section III.K. of the Permit and this Attachment the Corrective Measures Study (CMS) provides an objective and standardized process for evaluating, comparing, and contrasting potential corrective measure alternatives. The primary objectives of the CMS are to:

1) Evaluate the feasibility, effectiveness, and cost of at least two (2) potential corrective measures alternatives based on the findings of the RCRA Facility Investigation (RFI), and to compare and contrast those alternatives to each other and to the "no action" alternative;
2) Recommend and justify the specific corrective measure(s) for the Site; and,
3) Determine the benefits and consequences of the recommended corrective measure(s).

The individual corrective measure alternatives selected by the Permittee for evaluation as part of the CMS process must be plausible and not skew or bias the evaluation process. The alternatives evaluated by the Permittee must be capable of achieving cleanup objectives while, to the maximum extent practicable, contemplate permanent solutions and treatment technologies. Depending upon project needs, the alternatives to be evaluated by the Permittee may be broken out on a media-specific basis, or on a geographic basis. For example, if contaminant impacts are to be addressed in groundwater and soil, a minimum of two corrective measures alternatives, in addition to the no action alternative, for each media of concern shall be evaluated by the Permittee. If interim measures have been implemented or other actions taken in the past at the Site, Permittee is not required to subject these actions/measures to a comparative analysis at the time of CMS development; however, they must be described/justified in detail within the CMS Report itself with an estimate of associated implementation costs, to the extent available. The overall intent is that any interim measures taken must not be inconsistent with the final selected corrective measure(s).

CMS EVALUATION PROCESS

This guidance and scope of work (SOW) attachment outlines the primary activities to be completed by Permittee as part of the CMS process to satisfy the objectives stated above. At the Secretary’s discretion, this general process may be streamlined and focused to best serve project or Site needs. In general, the evaluation of corrective measure alternatives must include:

- Description of the contaminants of concern (COCs) and media affected;
- Identification of human and ecological targets and an evaluation of all direct and indirect exposure pathways;
- Description of the Site-specific corrective action objectives (CAOs);
- Detailed individual analysis of each alternative;
- Tabular summary of regulatory requirements and relevant guidance for each alternative;
and,

- Comparative analysis of each of the proposed corrective measure alternatives.

Permittee’s detailed evaluation of potential corrective measure alternatives provides the basis for Permittee’s recommending and supporting a specific corrective measure or group of corrective measures for the Site. Notably, any corrective measure selected by the Permittee for the Site is required to satisfy the four identified threshold criteria identified in Figure 1. The seven balancing criteria represent the primary criteria upon which the Permittee’s CMS evaluation/comparative analysis shall be based.

![Figure 1: Criteria for evaluation of corrective action alternatives](image)

Face-to-face meetings or teleconferences between the Secretary and the Permittee are strongly encouraged to facilitate consensus on approach and overall streamlining of the corrective action process. Such meetings may eliminate the need to for the Permittee to submit a CMS Work Plan. However, if the Secretary deems that additional data gathering is warranted following completion of the RFI in order to evaluate potential corrective measure alternatives, the Secretary may require the Permittee to submit a CMS Work Plan for his/her review and approval.

The exact content requirements of any CMS Work Plan should be developed by the Permittee in consultation with the Secretary. The Permittee must include in its CMS Work Plan a detailed CMS working schedule, presented graphically in the form of a milestone chart (e.g., Gantt chart) to show the duration and interdependencies of the various activities. In addition, any analytical data collected by the Permittee must be of appropriate data quality and quantity to facilitate comparison to applicable threshold levels as established in KDHE’s Risk-Based Standards for Kansas RSK Manual (RSK Manual), or as otherwise approved or required by the Secretary, or to support the evaluation of potential corrective measure alternatives.
In some cases, the Permittee may propose or the Secretary may require implementation of bench- or pilot-scale treatability study testing to demonstrate the efficacy of a particular technology where there might be some uncertainty in the viability or suitability to Site conditions. Treatability studies are conducted to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the CMS process and to support the subsequent remedial design of the corrective measure(s) alternative ultimately selected by the Secretary. Treatability studies also serve to reduce cost and performance uncertainties to acceptable levels for treatment alternatives under consideration to permit a more reliable corrective measure(s) selection process. Permittee must complete all treatability studies/modeling/additional data acquisition activities in a manner consistent with available KDHE policy and guidance. If there is a need or requirement to conduct such activities, the Permittee must first submit a treatability study work plan for the Secretary’s review and approval. At the Secretary’s discretion, reporting associated with treatability study/modeling/additional data gathering activities may be reported separately or incorporated into the CMS Report.

**CMS REPORTING**

Consistent with Section III.K.3. of the Permit, the Permittee must submit a CMS Report to the Secretary for review and approval, in a timeframe consistent with the implementation schedule in the approved CMS Work Plan, or as otherwise directed by the Secretary. The CMS Report must include all information and data collected during the investigation and describe in detail the work performed to accomplish the objectives as set forth within this attachment. The CMS Report shall include: 1) a brief summary of the findings of previous environmental investigations, including the findings of a risk assessment, if performed; 2) a description of the Site-specific CAOs, including any media cleanup or risk-based standards for the protection of human health and the environment; 3) a detailed description of each corrective measure alternative evaluated, including the "no action" alternative; 4) a detailed discussion of each corrective measure alternative evaluated relative to the threshold and balancing criteria identified above; 5) a comparative analysis of one alternative versus the others in both narrative and tabular form; 6) a recommendation for corrective action at the Site which provides a clear basis for recommending and supporting a specific corrective measure or group of corrective measures for the Site; and, 7) any supporting background information or literature which was used to evaluate each corrective measure alternative, which shall be included in an appendix.

All elements of the recommended corrective measure(s) as proposed in the CMS Report must be fully substantiated. Specifically, sufficient data must be available and presented in the CMS Report to support the recommended alternative consistent with available state and federal policy and guidance. The Secretary may also require identification of a contingent corrective measure(s) up front in the event the selected corrective measure(s) is not able to achieve CAOs, or if there is uncertainty as to the efficacy of that being proposed. Once the Secretary has reviewed and approved the CMS Report, a Fact Sheet will be prepared that identifies the Secretary’s preferred corrective measure(s) for the Site. The draft decision document will be made available for public comment before the Secretary issues a final corrective measures decision. At this juncture, the Permittee will be required to design and perform corrective measure activities under the Secretary’s oversight.
STEP 1: Identification and Development of Corrective Measure Alternatives

Based on RFI results, the Permittee shall identify, screen, and develop the alternatives for removal, containment, treatment and/or other remediation of the contamination based on established media cleanup objectives. In general, the media cleanup objectives, established in conjunction with the Secretary, shall be based upon available KDHE and EPA guidance, public health and environmental criteria, information gathered during the RFI, and generally include the following components:

- Cleanup levels which are media-specific concentrations that must be achieved before the final corrective measure(s) is considered complete;
- Point(s) of compliance representing where the media-specific cleanup levels are to be achieved; and,
- Corrective measure(s) construction timeframe and estimate of time needed to achieve media-specific cleanup levels.

Multiple technologies (e.g., treatment train) can be combined to constitute the overall corrective measure alternative being carried through the evaluation. Again, each of the alternatives being considered must be screened against the threshold criteria shown in Figure 1. If a given alternative does not meet all of the threshold criteria, then the alternative does not warrant further consideration by the Permittee.

STEP 2: Detailed Evaluation of Corrective Measure Alternatives

For those alternatives that satisfy the threshold criteria screening in Step 1, the Permittee must fully describe and evaluate each alternative and its individual components relative to the balancing criteria depicted in Figure 1.

Long-Term Effectiveness

The Permittee shall demonstrate the expected long-term effectiveness, reliability, and risk of failure of the alternatives in terms of:

- Effectiveness of the alternative under analogous Site conditions;
- Potential impact resulting from alternative failure, including failures from uncontrollable changes affecting the Site, such as: heavy precipitation events, off-Site pumping well influences, and other relevant factors; and,
- Estimates of alternative projected useful life, including any component technologies.

Reduction in Toxicity, Mobility, or Volume of Waste(s)

In general, the Secretary’s preference is for corrective measures capable of eliminating or substantially reducing the potential for wastes in the contaminated media to cause future environmental releases or other risks to human health and/or the environment. For the sake of the CMS evaluation, the Permittee must estimate how much or to what extent the corrective measure alternatives will reduce the toxicity, mobility, or volume of waste. The assessment must include a comparison of initial Site conditions to anticipated post-corrective measure(s) conditions.

Short-Term Effectiveness
Short-term effectiveness has particular bearing when the corrective measure activities will be occurring in densely populated areas, or where waste characteristics pose a high risk to workers/environment necessitating special protective measures during the implementation. Consequently, typical factors Permittee must consider in the CMS evaluation include, but are not limited to: fire, explosion, exposure to hazardous substances and potential threats associated with treatment, excavation, transportation and disposal, or containment of the waste material.

**Implementability**
The Permittee shall fully describe the implementability of each alternative, including the relative ease of installation or construction within the context of time required to achieve an anticipated result (e.g., hydraulic containment achieved). Permittee shall consider and include in the CMS Report the following specific information:

- Administrative activities, such as, permits, and off-Site approvals, needed to implement the alternative, and the length of time needed to accomplish these activities;
- Constructability, implementation time, and time for beneficial results;
- Availability of adequate off-Site treatment, storage capacity, disposal services, needed technical services and materials; and,
- Availability of prospective technologies for each corrective measure alternative.

**Community Acceptance**
The Permittee is responsible for involving and supporting community involvement activities as an ongoing part of corrective action. The CMS Report shall include a discussion of any concerns raised by the community during previous corrective action activities, such as investigation and interim measures. In addition, the CMS Report shall discuss any aspects associated with an evaluated corrective measure alternative for which there is a potential for community concerns and objections.

**State Acceptance**
The Permittee shall include a discussion in the CMS Report of how the specific corrective measure(s) activities will be conducted in compliance with all applicable state laws and regulations, including all permit requirements, and KDHE policy and guidance relevant to the proposed corrective measure(s) implementation.

**Cost**
The Permittee shall develop a cost estimate for each corrective measure alternative. Cost estimates shall include costs for engineering, Site preparation, construction, materials, labor, sampling/analysis, waste management/disposal, permitting, health and safety measures, training, operation and maintenance, long-term monitoring, and other relevant costs.
**STEP 3: Corrective Measure(s) Recommendation**

The Permittee/Respondent shall fully justify and recommend a corrective measure(s) for implementation with a detailed summary of how the measure(s) satisfy each of the threshold criteria and why the measure(s) appears most favorable based on the balancing criteria comparative analysis evaluation. This recommendation shall include summary tables presenting the alternatives in an easily understood manner and specifically highlighting tradeoffs among the balancing criteria factors for the alternatives considered/evaluated. The Secretary will then identify the proposed corrective measure(s) in the Fact Sheet. With consideration of public comment on the Fact Sheet, The Secretary will make a final selection of the corrective measure(s) to be implemented.
INTRODUCTION

The final Corrective Measure(s) Decision (CMD) issued by the Kansas Department of Health and Environment (KDHE) identifies the corrective measures that the Permittee will implement to address residual waste and contamination of environmental media and prevent or eliminate exposure to human and ecological receptors from Site-related contaminants of concern (COCs). The selected corrective measures sometimes referred to as the remedy are planned, designed, constructed, and implemented by the Permittee during Corrective Measures Implementation (CMI), consistent with Section III.M. of the Permit. All approved plans for implementation of the selected corrective measures shall be compiled by the Permittee, for the Secretary’s approval, into a comprehensive document referred to as the CMI Work Plan that is comprised of all design plans and specifications, IC plans, O&M plans, monitoring and performance evaluation plans, sampling and analysis plans, recordkeeping plans, QA/QC plans, and other descriptive Site summary information. Permittee’s development of the CMI Work Plan may occur over time with oversight provided by the Secretary and is generally divided into a planning and action phases. Face-to-face meetings or teleconferences between the Secretary and Permittee are strongly encouraged to facilitate achieving consensus on approach and overall streamlining of the CMI process.

CMI OBJECTIVES

Permittee’s primary objectives in the CMI planning phase are described as follows:

1) To provide a CMI Work Plan consisting of a preliminary design of the corrective measures implementation and a description of the tasks necessary to implement the corrective measures consistent with the CMD;
2) To obtain additional data, if necessary, to support the development of the detailed design plans and specifications;
3) To provide detailed intermediate, pre-final and final design plans and specifications including an Operations and Maintenance (O&M) Plan for the corrective measures system;
4) To provide a Contingency Plan, as required by the Secretary, that identifies alternative corrective measures to be implemented in the event of a significant failure of the corrective measures system;
5) To identify and obtain necessary easements and permits required for the implementation of the corrective measures; and,
6) To provide a Site Monitoring and Performance Evaluation Plan to monitor the effectiveness of the corrective measures.

The CMI Work Plan and associated design documents may vary in detail and delivery strategy (e.g., preliminary (10%), intermediate (30-50%), pre-final/final (90-100%)) depending on project-specific needs and the Secretary’s requirements. For example, in the case of complex
design efforts, Permittee’s preliminary and/or intermediate design submittals may be appropriate in advance of the pre-final/final design stage. For a simple corrective measure, it may only be necessary for Permittee to submit a draft and final CMI Work Plan where no up-front design is explicitly warranted or required; similarly, if the Secretary determines preliminary or interim measures have achieved corrective action objectives, the Permittee provides a CMI Report that documents the implementation/installation of the corrective measures.

If approved by the Secretary, the Preliminary CMI Work Plan design submittal will be considered the Final CMI Work Plan in cases where it ultimately meets pre-final/final design requirements. At the discretion of the Secretary, Permittee may submit the O&M Plan and Site Monitoring and Performance Evaluation Plan in the CMI Report after corrective measures implementation/start-up instead of submitting with the CMI Work Plan and associated design package. The Secretary may also require upfront or later submittal of a Contingency Plan, primarily if identified explicitly in the CMD, or as project needs dictate based on Site-wide and performance monitoring. Typically, in these circumstances, the Secretary’s expectation is that a contingency be identified in general terms only with a Contingency Plan developed if/when the need arises at a later date as requested by the Secretary. If the contingent corrective measure represents a fundamental change from the original selected corrective measure(s), then community involvement activities and/or decision document amendment may be required.

The Permittee’s primary objectives of the CMI phase are as follows:

1) To implement the CMI Work Plan and associated design documents as approved by the Secretary;
2) To operate and maintain the corrective measures system as described in the approved O&M Plan;
3) To evaluate and monitor the performance of the corrective measures as described in the approved Site Monitoring and Performance Evaluation Plan;
4) To determine whether corrective action objectives (CAOs) or media cleanup goals have been attained, or are likely to be attained;
5) To confirm attainment of CAOs or media cleanup goals by conducting post-corrective measures monitoring as described in the approved Site Monitoring and Performance Evaluation Plan;
6) To implement the approved Contingency Plan, as required by the Secretary, to design, install and operate additional or alternative corrective measures in the event the implemented corrective measure(s) is unable to attain CAOs within a reasonable timeframe, as determined by the Secretary;
7) To document and report to the Secretary all activities performed pursuant to the corrective measures decision; and,
8) To submit a final report for the Secretary’s approval which briefly describes the corrective measures implemented at the Site, and provides the appropriate data documenting that Site-specific CAO’s have been attained.

Depending on the complexity of the selected corrective measures and the Secretary’s requirements, the CMI Work Plan and associated design documents submitted by the Permittee may need to address operation and maintenance via an O&M Plan as well as corrective measures system performance monitoring and Site-wide monitoring (e.g., plume control) via a Site Monitoring and Performance Evaluation Plan. As discussed above, the Secretary may also
CMI PLANNING/IMPLEMENTATION/REPORTING

CMI Work Plan - In general, the Permittee’s CMI Work Plan and associated design documents will include, at a minimum, a summary of available Site information and available investigation results; a detailed description of the proposed corrective measures; CAOs or media cleanup goals; depending on the complexity of the proposed corrective measures, complete design specifications and drawing/schematics, including any relevant figures and/or Site system engineering layouts such as process flow diagram, piping and instrumentation diagram, or other relevant documents; engineering design basis; cost estimate; and, a detailed working schedule presented graphically in the form of a milestone chart (e.g., Gantt chart) or critical path diagram to show the duration and interdependencies of the various activities. As necessary or required, Permittee shall update and submit the detailed working schedule to the Secretary as part of the routine reporting requirements.

The exact elements, content and delivery strategy of the CMI Work Plan and all associated design documents will be determined by the Secretary, in consultation with the Permittee. Typically, a preliminary (10%) design package will minimally include a design delivery strategy, preliminary construction schedule, specifications outline, preliminary drawings, design basis report, and a detailed statement of how all applicable regulatory requirements will be met. An intermediate (30-50%) design package will include an updated construction schedule, preliminary specifications, intermediate drawings, updated design basis report, and updated requirements evaluation. A pre-final/final (90-100%) design package will include updates of the above-mentioned items plus pre-final/final design specifications/drawings and design basis report/design analysis. Unless submitted separately, the CMI Work Plan/Final Design Package must address O&M and performance monitoring needs as well as shakedown testing and startup procedures. There may also be a need or requirement for development of a Construction Quality Assurance Plan and a separate Health and Safety Plan for CMI activities.

The Permittee must describe in detail all tasks necessary to acquire additional data to support the development of a CMI Work Plan/Final Design Package and to construct, implement, and monitor the performance of the corrective measures. All necessary tasks shall be documented and described by the Permittee in adequate detail to clearly state the manner in which they will be implemented and reported. The tasks shall address obtaining appropriate easements, permits, or other administrative approvals or documents, and, where wastes or hazardous substances, pollutants, or contaminants will remain on the Facility at concentrations that disallow unlimited use and unrestricted exposure, include those tasks necessary for establishing institutional controls as approved by the Secretary.

Additional Data Acquisition Plan (Optional)—If additional data collection is needed or required to prepare the CMI Work Plan or support the design effort, an Additional Data Acquisition Plan must be submitted by the Permittee in advance, for the Secretary’s approval. The intent of any additional data acquisition is to provide sufficient data to support the subsequent corrective measures design and/or start-up of the Secretary’s selected corrective measures. All data gathering activities must be completed in a manner consistent with available KDHE policy and
guidance. The Permittee must collect analytical data of appropriate data quality and quantity to facilitate comparison to applicable threshold levels as established in KDHE’s Risk-Based Standards for Kansas RSK Manual (RSK Manual). All data should be validated at the appropriate field or laboratory quality control level to determine whether it is appropriate for its intended use. At the Secretary’s discretion, Permittee’s reporting associated with additional data gathering activities may be reported separately, incorporated into the CMI Work Plan/Final Design Package or incorporated into the CMI Report.

**Site Monitoring and Performance Evaluation Plan**—Whether included in the CMI Work Plan described above, the Corrective Measures Construction Completion (CMCC) Report, or prepared separately, the Permittee must submit for approval a Site Monitoring and Performance Evaluation Plan, which will document the activities necessary to evaluate the effectiveness of the corrective measures in terms of corrective measures system performance monitoring and Site-wide monitoring, as appropriate. At a minimum, the Site Monitoring and Performance Evaluation Plan shall include:

- a description of the Site-specific CAOs or media cleanup goals;
- a description of the corrective measures system operations that will be evaluated and identification of criteria that will be used to evaluate system performance;
- frequency, methods, parameters, and rationale for Site monitoring;
- a description of the environmental media to be monitored, such as groundwater, surface water, soil, soil vapor, indoor air, or other media, or as required by the Secretary;
- a description of quality assurance/quality control (QA/QC) considerations for the laboratory and field;
- identification of institutional controls that will be inspected/monitored;
- a plan for evaluating changes in land use of impacted areas that may alter the effectiveness of the corrective measures; and,
- a description of reporting methods, format, and frequency.

**O&M Plan**—Whether included in the CMI Work Plan/Final Design Package described above or prepared separately, the Permittee must submit an O&M Plan to the Secretary for review and approval. To facilitate preparation of an O&M Plan, the Permittee shall follow U.S. Environmental Protection Agency (EPA) guidance entitled Operation and Maintenance in the Superfund Program (OSWER 9200.1-37FS; EPA540-F-01-004; May 2001), or as approved by the Secretary. The objective will be that any operator is be able to use the O&M Plan and clearly understand O&M procedures to be followed, documentation requirements and corrective measures to be taken, dependent upon anticipated circumstances or upset conditions. The Permittee shall include proper planning and advance contingency considerations to minimize corrective measures system downtime.

**CM Implementation and Reporting**—The Permittee shall implement the corrective measures selected for the Site in accordance with the Secretary-approved CMI Work Plan/Final Design Package. Implementation of the corrective measures by the Permittee shall follow the Secretary-approved schedule. The Permittee shall conduct a pre-construction inspection and meeting as well as routine inspections during CMI. Depending on the complexity and duration of the corrective measures effort, the Secretary may require submission of interim status reports on a
periodic basis (e.g., weekly, bi-monthly, monthly, or other time period determined by the Secretary) documenting CMI activities. When construction is complete, the Permittee shall notify the Secretary to conduct a final inspection consisting of a walk-thru of the Site.

The Permittee’s Final CMI Report shall document the corrective measures constructed or implemented at the Site and shall be submitted to the Secretary for review and approval. The Permittee shall consult with the Secretary to determine the appropriate form or content of the Final CMI Report. Submission of the Final CMI Report should not be construed to constitute fulfillment of all obligations on the part of the Permittee at a given site. Instead, the Final CMI Report represents reporting of the corrective measures taken to that point in time, predominantly a reporting of the constructed or engineered systems. Depending on project needs, and/or the Secretary’s requirements, CMI-related reporting may also necessitate the Permittee’s submission of a Corrective Measures Construction Complete (CMCC) Report and/or Corrective Measures Completion (CMC) Report.

**Site Monitoring and Performance Evaluation Reporting**—The effectiveness of the corrective measures, including schedule and frequency, shall be monitored as specified in the Secretary-approved Site Monitoring and Performance Evaluation Plan. The Permittee must submit Site Monitoring and Performance Evaluation Reports to the Secretary in accordance with the Secretary-approved Site Monitoring and Performance Evaluation Plan. The Site Monitoring and Performance Evaluation Reports must contain all of the information and data as described within the Site Monitoring and Performance Evaluation Plan, including a narrative description and/or graphic evaluation of the effectiveness of the corrective measures in achieving Site-specific CAOs or media cleanup goals.

If the Site monitoring and performance evaluation program demonstrates that the implemented corrective measures are incapable of achieving corrective action goals within a reasonable timeframe as determined by the Secretary, the Site Monitoring and Performance Evaluation Report should recommend modifications or augmentation to the existing corrective measures system that will enable the system to achieve the media cleanup goals. The Permittee must notify the Secretary within seven days of any significant changes that may diminish the effectiveness of the implemented corrective measures in protecting human health and the environment.

At a minimum, the Site Monitoring and Performance Evaluation Reports shall include:

- a narrative description and graphic illustration of the effectiveness of the corrective measures;
- a description of system operations and performance;
- a system startup report and “as built” drawings of the corrective measures system, which are required for the first Site Monitoring and Performance Evaluation Report, unless approved by the Secretary to be reported separately;
- a description of repairs or modifications made to the corrective measures system during the reporting period, as appropriate;
- laboratory analytical data, including copies of laboratory reports and summary tables;
- contaminant isoconcentration maps;
- a tabular comparison of the current monitoring data to previous monitoring results;
- a figure illustrating the Site and associated monitoring wells or other sample point locations;
- static water elevation measurements;
- a contour map of the water level elevation;
- a description of any deviations from the approved sampling procedures;
- results of QA/QC data and an evaluation of the validity of the analytical data;
- logs of any newly constructed Site wells;
- an evaluation of the effectiveness of institutional controls implemented for the corrective measures; the frequency of evaluations will be identified in the approved Site Monitoring and Performance Evaluation Plan;
- an evaluation of land use of the impacted area; frequency of evaluations will be identified in the approved Site Monitoring and Performance Evaluation Plan;
- specific conclusions and recommendations for further corrective measures or changes based on historical Site monitoring and performance data trends; and,
- all other relevant Site data collected during the reporting period or as required by the Secretary.
ATTACHMENT 13

FORM OF INVOICE FOR OVERSIGHT COSTS
ATTACHMENT 13
FORM OF INVOICE FOR OVERSIGHT COSTS
(Payroll and Expense Detail Entries are for Example Purposes Only)

KDHE/Bureau of Waste Management
Attr: Mandy Patek
1000 SW Jackson Street, Suite 320
Topeka, KS 66612-1366

Period: XX/XX/XX through XX/XX/XX
Date: XX/XX/XX

Payment Due in 30 days

This invoice is for costs incurred by, or on behalf of, KDHE for the referenced project. Please make check payable to the KDHE/Bureau of Waste Management and enclose a copy of the invoice with payment to the above address to appropriately credit your account. Questions regarding this invoice should be directed to Mandy Patek at (785) 296-0680 or Mandy.Patek@ks.gov.

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<td>Permit Date: XXXX XX, 20XX</td>
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<td>Project Code: EPA ID No. KSXXXXXXXXXXXXX</td>
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Payroll Details:

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Summary:

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Note: The Kansas Department of Health and Environment's (KDHE) administrative office expenses include computer use, rent, utilities and other support services. This amount equals 40% of the sum of Payroll and Other Expense Costs. Contractual, field supplies, KDHE equipment use, and lab analysis, and other administrative field expenses are computed at 12.5%.

THIS IS AN INVOICE
ATTACHMENT 14

KDHE/BUREAU OF WASTE MANAGEMENT
(KDHE/BWM)
RCRA CORRECTIVE ACTION FIELD ACTIVITIES
NOTIFICATION FORM
ATTACHMENT 14
KDHE/BUREAU OF WASTE MANAGEMENT (KDHE/BWM)
RCRA CORRECTIVE ACTION FIELD ACTIVITIES NOTIFICATION FORM

This field notification form is only applicable to certain Facilities/Sites managed by the Hazardous Waste Permits Section and is not intended for use by other programs. Specifically, the form is to be used solely for notification of RCRA corrective action-related field activities. Please provide advance written notification by completing this form and submitting it to the Secretary at least 14 (fourteen) days before the field activity. If you have any problems completing this form, please call the assigned KDHE/BWM Project Manager, or 785-296-1602 for assistance. Note: If you are amending or canceling a previous notification, please enter the date of that previous notification (if known).

☐ I want to submit a new notification.
☐ I want to amend a previous notification. (Enter date if known)___________________
☐ I want to cancel a previous notification. (Enter date if known)___________________

(*denotes required fields)

*Project Name:_________________________________________________________________
*KDHE Project Manager:_________________________________________________________

Location of work:
*County:_____________________________________________________________________
*City (or nearest city):__________________________________________________________

Anticipated dates and duration of work:
*Start Date (mm/dd/yy):__________________________________________________________
*Duration of work (days):________________________________________________________
☐ Check this box if work is expected to occur on any weekend or holiday days.

Primary Field Contact:
*Name:_______________________________________________________________________
*Affiliation/Company:__________________________________________________________
*Primary Phone Number:___________________Alternate Phone Number:_____________
Email Address:_________________________________________________________________

Alternate Contact:
*Name:_______________________________________________________________________
*Affiliation/Company:__________________________________________________________
*Primary Phone Number:___________________Alternate Phone Number:_____________
Email Address:_________________________________________________________________

*Brief Description of Work to be Performed:
_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________

DRAFT Ash Grove Cement Company
EPA ID. #KSD031203318
Attachment 14 – KDHE/BWM RCRA Corrective Action Field Activities Notification Form
ATTACHMENT 15

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

Ash Grove Cement Plant
Chanute, Kansas
EPA ID #KSD031203318

December 21, 2017
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1 INTRODUCTION

On behalf of Ash Grove Cement Company (Ash Grove), Arcadis U.S., Inc. (Arcadis) has prepared this Corrective Measures Implementation Work Plan (Work Plan) to present the basis of design for corrective measures to be implemented at the Ash Grove Cement Plant (the Plant) in Chanute, Kansas (Figure 1). The corrective measures are being implemented as part of the requirements contained in the Resources Conservation and Recovery Act (RCRA) Permit (HSWA, Part II), U.S. Environmental Protection Agency (USEPA) ID# KSD031203318 (Permit), as modified and effective July 19, 2017 (USEPA 2017). This document has been prepared consistent with the Final Remedy Decision for the Statement of Basis and Response to Comments, the Corrective Measures Decision (included in the Permit as Attachment 8) and consistent with the RCRA Corrective Action Plan guidance (USEPA 1994).

The purpose of this Corrective Measures Implementation Work Plan is to present the design basis to support the associated design drawings and construction specifications for the corrective measures to be implemented at the Plant. The report covers the engineering basis for each element of the design and discusses the project construction, health and safety, and quality control procedures that will be implemented during the construction, operation, and maintenance of the Corrective Measures.

1.1 Background

1.1.1 Site Location

The Ash Grove Cement Company Plant is located within the northern limit of the City of Chanute, Kansas in north-western Neosho County (Figure 1). The entire Ash Grove property occupies approximately 3,600 acres and consists of current quarry operations, locations of past and future quarrying activity, cement manufacturing areas, and a hazardous waste management facility. The Plant mines the majority of raw materials necessary for cement production on site. Portland cement is manufactured by a multi-stage dry pyroprocessing technology, which uses a specific mixture of raw materials to form cement clinker in a large-capacity rotary kiln. The clinker is then ground with a small amount of gypsum and other additives into the various final cement products.

Neighbouring properties include tracts of land used for agricultural purposes to the north and west of the Plant. The Plant is bounded by Village Creek to the north and residential and some commercial properties to the south.

1.1.2 Plant History

The Plant has been producing cement since 1907 and has been owned by Ash Grove since its initial construction. The Plant was expanded in the 1920s, the 1960s, and again in 2000. The most recent expansion increased the annual plant capacity to approximately 1,500,000 tons of cement. Types of cement manufactured at the Plant include Portland Type I/II, Type IA, Type IP, Type III, and masonry cement.

Based on the history and location of the Plant, the industrial land use of the property is not expected to change in the foreseeable future.
1.1.3 Plant Operations

Ash Grove’s Plant manufactures various Portland cement products for shipment throughout a large geographical area in the Midwest region of the United States. The cement manufacturing process involves the following steps:

- Quarrying and crushing limestone and acquisition of other raw materials.
- Proportioning and grinding of the raw materials.
- Pyroprocessing the raw material mix in the cement kiln system to form Portland cement clinker.
- Grinding the clinker with gypsum and other additives to form Portland cement products.

Ash Grove acquires much of the raw materials for the cement production operation from adjacent quarries. Materials such as limestone are mined from these quarries and transported to the primary crusher. Once initial sizing has occurred, the limestone material is then transported through a secondary crusher unit and conveyed into a storage dome.

Additional raw materials such as clay, sand, and iron ore are received from on-site and off-site sources, unloaded into receiving bins, and conveyed into a covered storage building. From these two storage operations, raw materials are transported into holding bins for proper proportioning into the raw mill grinding systems. Predetermined ratios of the various materials are determined by the cement laboratory and depend on the cement chemical composition of the individual components within each raw material.

The ground raw materials, known as the raw material mix or kiln feed, are stored in a blending silo system prior to introduction into the top portion of the preheater/precalcer tower. Features of the pyroprocessing system include a relatively short rotary kiln, five stages of cyclone-type preheater vessels located in a tall tower adjacent to the kiln, and a precalcer vessel at the base of the tower in which burning fuel is intimately mixed with raw materials. Coal, petroleum coke, natural gas, used oil, hazardous waste-derived fuels (WDF), and alternative non-hazardous waste-derived fuels are used to provide thermal energy to the pyroprocess in both the preheater/precalcer tower and the rotary kiln. The Plant has been permitted for, and continues to use liquid (pumpable) and solid (containerized) WDF for beneficial energy recovery in the new pyroprocessing system. Flame temperatures of approximately 3400°F must be reached within the rotary kiln to produce material temperatures in the range of 2700°F to bring about the final chemical reactions that turn the raw materials into clinker. The hot exhaust gases from the tower are used to dry the raw materials in the vertical roller raw mill.

In conjunction with the kiln and raw mill replacement, Ash Grove has expanded the finished cement grinding capacity of the plant through the conversion of the existing raw mill into a finish mill system and the addition of a new finish mill. The two existing finish mills will remain in production. All finish mill operations are typical ball mill systems that include the rotary ball mill, a high efficiency separator, dust collectors, material bins and feeders, and material handling/conveyance equipment. The finished cement products are stored in existing silos systems for bulk transport loading.

Aside from the described major processes, there are numerous minor operations such as cement bagging operations, coal unloading/storage, and diesel/gasoline storage tanks.
1.1.3.1 Permitting History

Since May 9, 1988, Ash Grove has replaced a portion of the fossil fuel used in the cement kilns with waste-derived fuel (WDF) to reduce energy costs. The initial RCRA Part A permit application for the WDF activity was filed on May 2, 1986, relative to the on-site storage and management of WDF. The Kansas Department of Health and Environment (KDHE) issued a formal request for a RCRA Part B permit application on December 31, 1986, which requested submission by June 25, 1987. Ash Grove complied with this request. After KDHE requested revisions to the Part B application, Ash Grove incorporated these revisions in the October 13, 1987 version of the Part B permit application. The Part B permit application subsequently was revised several times between 1987 and 1994 to respond to comments received from the KDHE and to add facilities for the storage of solid WDF (SWDF), but the KDHE took no further action on the permit.

In 1991, after the promulgation of the USEPA’s Boiler and Industrial Furnace (BIF) Regulations, Ash Grove amended its RCRA Part A permit application to include the Plant’s two cement kiln pyroprocessing systems. On August 18, 1992, Ash Grove submitted a separate Part B permit application to the USEPA Region 7 addressing the BIF requirements. Ash Grove, therefore, maintained separate RCRA permits for management and storage of WDF in tanks and containers and for Corrective Action and burning of waste fuels. In the late 1990's Ash Grove filed an application to modernize the plant that replaced the two wet kilns with a single preheater/precalcerin kiln system. The new permit removed most of the combustion requirements from the permit and retained the corrective action requirements. New Maximum Achievable Control Technology (MACT) regulations now subject the facility to the Hazardous Waste Combustor MACT standards. Part I and Part II of the HSWA Permits renewed in 2010.

The KDHE Bureau of Waste Management has issued five solid waste permits to Ash Grove for operation of on-site landfills. Two of the permits are currently active. Permit No. 177 was issued in 1976 for an industrial waste landfill, which was closed in 1994. This landfill is identified as solid waste management unit (SWMU) 16, Industrial Waste Landfill. Permit No. 345 was issued in 1979 for the Kiln Dust Landfill (SWMU 17). This permit is inactive, and the landfill was closed in 1999. Permit No. 522 was issued to Ash Grove in 1987 for a proposed new cement kiln dust (CKD) landfill to be located in the sandstone quarry. However, CKD was never disposed in this area, and Ash Grove terminated the permit. Permit No. 653 was issued in 1993 for the New Industrial Waste Landfill (SWMU 22), which replaced Permit No. 177 when the former industrial landfill was closed. Permit No. 653 is active. Permit No. 759 was issued on July 7, 1998 for the new CKD Monofill (SWMU 26).

The RCRA Part B Permit originally identified 24 SWMUs and four areas of concern (AOCs) located on Plant property. Subsequent to the issuance of the HSWA Part II Permit, Ash Grove identified two additional SWMUs. Only five of the original 26 SWMUs (SWMUs 1, 16, 17, 22, and 23) required a RCRA Facility Investigation (RFI). SWMU 22, the New Industrial Landfill was permitted by the KDHE under Solid Waste Permit No. 653 was fully characterized as part of the Description of Current Conditions in the RFI Work Plan (Arcadis Geraghty & Miller 1999). As part of the KDHE Permit, a groundwater monitoring program was established at SWMU 22 in 1992 and therefore, SWMU 22 was not part of the RCRA Corrective Action process as outlined in the EPA approved RFI Work Plan (Arcadis Geraghty & Miller 1999).

Subsequent to the completion of the Phase I RFI Report, Ash Grove identified one additional SWMU referred to as the Shot Rock Stockpile Area or SWMU 27. Ash Grove determined that a limited RFI at SWMU 27 was warranted. The RFI at SWMU 27 was conducted as part of the Phase II RFI. The
SWMUs were adequately characterized in the Phase I, II, and III RFI Reports (Arcadis 2000, 2003, and 2007).

A Corrective Measures Study (CMS) Work Plan was submitted to USEPA in 2009. A Human Health Risk Assessment (HHRA) was submitted to USEPA in 2011. The CMS Work Plan was revised to include the health-based Corrective Action Objective Goals contained in the HHRA and re-submitted to USEPA in April 2012. The final CMS was submitted to USEPA in August 2012.

USEPA prepared a Statement of Basis describing the proposed Remedy Decision that was placed on public notice in July and August 2015. The Final Remedy Decision for the Statement of Basis and the Modified RCRA Permit was signed and made effective on July 19, 2017.

1.1.4  SWMU History

The four SWMUs being addressed in this Work Plan include:

- SWMU 1 Paraffin Waste Disposal Landfill
- SWMU 16 Industrial Waste Landfill
- SWMU 17 CKD Landfill
- SWMU 23 Inactive Kiln Dust Landfill.

Each SWMU is briefly described below. Refer to the CMS (Arcadis 2012) for a complete description of each SWMU, the SWMU-specific nature and extent of contamination, and the history of response actions completed at each SWMU.

1.1.4.1  SWMU 1 - Paraffin Waste Disposal Landfill

The Paraffin Waste Disposal Landfill (SWMU 1), also known as the Warwick Wax Site and Neosho No. 1, is located approximately 4.5 miles southwest of the Plant near the intersection of West 21st Street and the Southern Kansas and Oklahoma (SKO) Railroad line. The location and layout of SWMU 1 are shown on Figure 2.

The disposal area covers approximately 5.5 acres, with the southern limit bounded by West 21st Street. The waste acid sludge was disposed of at SWMU 1 in the late 1950s. The sludge originated from tank bottoms and was generated during paraffin-based petroleum manufacturing by the Warwick Wax Company, Inc. (a subsidiary of Sun Chemical Company, and predecessor of SEQUA Corporation). The acid tank bottom sludge was reportedly produced by passing waste acid (H₂SO₄) through a clay filter, thereby introducing acid, wax, and oil into the clay filter, which produced a sludge. The acid tank bottom sludge was placed in an unlined shale pit on Ash Grove's property. Since then, SWMU 1 has not been used for industrial purposes.

Within the SWMU boundaries, the waste thickness ranges from 0 to 15 ft thick, with the greatest depths of waste concentrated at the north central portion and the southern half of the SWMU. During the RFI, no waste was encountered in the central and the northeastern portions of the SWMU. The waste was covered with a thin veneer (0 to 1 ft) of soil, which supports native grasses.

Data collected during the Phase I RFI were used to revise the waste volume at SWMU 1. The extent of waste material at SWMU 1 covers approximately 180,551 square ft and has an estimated volume of 56,358 cubic yards of waste.
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The waste material encountered at SWMU 1 during the RFI was generally homogeneous and consisted of slightly moist, black, hydrocarbon granules with pieces of a dark-coloured, hard, waxy material ranging from gravel to cobble size. The waste exhibited a slight to moderate hydrocarbon odor.

1.1.4.1.1 Summary of Completed Interim Corrective Measures

Visual observations during the Phase I RFI activities in 1999 indicated a small breakout of paraffin wax waste along the south-central toe of SWMU 1. Small amounts of waste material had collected in the ditch between SWMU 1 and West 21st Street.

In February 2000, Ash Grove excavated the waste material from the drainage ditch, including impacted sediments, using a track hoe. The impacted material was placed in an east-west trending mound along the northern portion of SWMU 1 and was covered with approximately 2 ft of compacted clay. After the excavation activities were completed, the entire southern toe of SWMU 1 was covered with approximately 2 ft of compacted clay. Upon completion, the stabilized area was seeded with native grasses.

During the Phase II field activities in July 2002, the stabilized area exhibited some erosion, but was still mitigating the release of waste material from SWMU 1. In addition, no breakouts of waste material were observed anywhere around SWMU 1.

In July 2005, the vegetated topsoil cover in the western drainage swale and the south slope of the landfill was observed to be in need of repair. In September 2005, an area that measured approximately 25 feet by 200 feet was excavated where the breakout was observed along the west drainage swale. The depth of the excavation was approximately 1.5 to 2 feet. Once the material was removed, clay was placed in the open excavation and compacted in 1-foot lifts. The disturbed area was restored to match existing grade using loosely compacted topsoil. Removed material was placed on top of the landfill in a thin layer (approximately 6 inches in thickness) and covered with loosely compacted topsoil to preserve the surrounding contours.

The erosion channel on the south slope of the landfill measured approximately 15 feet wide by 30 feet long. The channel was smoothed and restored to match existing surface grade with approximately 6 inches to 1 foot of loosely compacted topsoil. On October 18, 2005, grass seed was spread over all the disturbed areas and covered with straw mulch.

1.1.4.2 SWMU 16 - Industrial Waste Landfill

The Industrial Waste Landfill (SWMU 16), which was permitted by the KDHE under Solid Waste Permit No. 177, occupies approximately 11.5 acres and was used for disposal of solid waste generated on site from at least the 1970s until closure in 1995. The location and layout of SWMU 16 are shown on Figure 3.

The landfill consists of a northern portion (7.4 acres) and a southern portion (4.1 acres), which historically were separated by a gravel road. Materials documented to have been deposited in this landfill include paper, wood, steel, cement, rubber, fabric, asbestos, and CKD. Approximately 56,000 tons of wastes have been disposed of in this landfill. This industrial landfill was not the primary CKD landfill, and CKD was not regularly placed in it.

The thickness of the waste encountered during the RFI ranged from 11.5 to 24.5 ft, while the combined clay cap and topsoil cover ranged in thickness from 2.5 to 6.5 ft. The extent of waste material at SWMU 16 covers approximately 500,000 square ft with an estimated volume of 296,296 cubic yards.
The type of waste material encountered at SWMU 16 during the RFI varied across the landfill but consisted primarily of moist to wet, light gray, powdery off-specification cement, pinkish-gray CKD, black clinker, and to a lesser extent concrete and limestone rubble and wood debris.

1.1.4.2.1 Summary of Completed Interim Corrective Measures

On March 21, 1994, Ash Grove submitted a closure plan to KDHE Bureau of Waste Management for the inactive industrial waste landfill (KDHE Landfill Permit Number 177, or SWMU 16). The closure plan was revised and resubmitted to KDHE. KDHE approved the closure plan on May 31, 1994.

The landfill closure work was completed between October 1994 and February 1995, and consisted of the following:

- The closure cap consisted of 2 feet of clay compacted to a permeability of no greater than $1 \times 10^{-6}$ centimeters per second (cm/sec). Twelve inches of topsoil was placed on top of the clay liner. The topsoil was seeded with vegetation recommended for the area.

- A borrow area was designated and compaction curves along with corresponding permeability data for the clay used for the clay liner was submitted to KDHE for approval before placement.

- The crown drainage was a minimum of 2 percent, as requested by KDHE, and a terrace system was constructed into the side slopes. The design provided for all water to exit the property to the north and southeast. National Pollutant Discharge Elimination System (NPDES) monitoring points were established for all final discharge points.

In September 1994, as part of the restrictive covenant for the closed landfill, Ash Grove surveyed the landfill to determine the location of the buried asbestos and to determine the final grade of the landfill cap. The survey was recorded with the Neosho County Registrar of Deeds for the Ash Grove property. The final closure documents were submitted to KDHE on December 8, 1995.

In March 1998, Ash Grove discovered leachate seeping from an area primarily west of the landfill drain outlet structure and extending less than 100 ft downslope from NPDES Outfall 004. In response, Ash Grove partially blocked NPDES Outfall 004 to prevent the discharge of leachate into Village Creek. The collected water was periodically pumped from a low spot in the ditch using a pump truck and transported to the Plant’s raw mill for use as process make-up water. The KDHE had previously authorized use of the CKD landfill for disposal of leachate from SWMU 17. This practice continued until November 1998, when plans to conduct cap maintenance were completed and implemented. Throughout that time, weekly inspections were conducted to ensure that discolored water was not discharging into Village Creek. No visual evidence of such discharge was observed.

The landfill cap repairs approved by the KDHE Bureau of Waste Management consisted of the following major elements:

1) excavating ditch sediments along the leachate impacted portion of the drainage ditch;
2) backfilling the drainage ditch with 2 ft of clean compacted clay;
3) repairing the cap along the southwestern toe of landfill by placing a 2 ft compacted clay barrier along the landfill side slope;
4) excavating a 3 ft radius around drain pipe inlets on top of the landfill (i.e., Hickenbottom drains) and backfilling with compacted clay (i.e., clay plugs); and
5) placing topsoil above the clay barrier.

Landfill cap repairs were then initiated in November 1998, and consisted of excavating approximately 200 ft of ditch sediments along the leachate impacted portion of the drainage ditch and repairing 200 ft of cap along the landfill toe. In December 1998, clay plugs were installed around the three drain pipe inlets.
on top of the landfill to prevent infiltration of precipitation around the inlet pipes. The clay plugs were constructed by excavating a 3 ft radius around the drain pipe inlets and backfilling with compacted clay. Final cap repairs were made in December 1999, and consisted of excavating an additional 165 ft of ditch sediments and repairing 165 ft of cap along the landfill toe. The average width of the clay installed along the landfill toe and side slopes, including the ditch area, was approximately 85 ft. A total of 1,664 cubic yards of clay were used during cap repair activities. Ash Grove completed the above activities before the USEPA authorized Ash Grove to proceed with the requirements of the HSWA Part II Permit.

As part of ongoing landfill maintenance activities at SWMU 16, Ash Grove submitted a stabilization plan to the USEPA in June 1999 pursuant to Condition C.5., Stabilization of the HSWA Part II Permit. The proposed stabilization activities consisted of the following: 1) removal of the Hickenbottom drains and associated subsurface drainage pipe; 2) removal of berms, re-grading portions of the cover system, and installation of riprap-lined side channels to promote drainage from the top of the landfill; and 3) installation of a leachate collection sump upgradient of the clay barrier along the southern toe of the landfill to reduce the hydraulic head behind the clay barrier. The USEPA approved the stabilization plan on August 16, 1999. Stabilization activities were completed in the fall of 1999 according to the USEPA approved stabilization plan.

In March 2003, Ash Grove discovered a release of leachate along the southwest corner of SWMU 16 during a routine inspection of the landfill. The new release area occurred in the same area previously stabilized, but was significantly smaller than the historical release area. Ash Grove notified the USEPA of the re-occurrence of the leachate release. The extent of the discolored water extended from the southwest corner of SWMU 16 to approximately 15 ft downstream of NPDES Outfall 004. Ash Grove mitigated the release by more aggressively pumping the landfill sump and the low spot in the ditch east of Outfall 004.

In July 2005, the engineered clay cap on the west side of the landfill was observed to be in need of repair. In September 2005, an area wider and longer than the observed leachate breakout was excavated. The area removed and repaired measured 25 feet wide by 65 feet long by 2.5 to 3 feet deep. The bottom of the excavation contacted the native limestone bedrock surface. The removed material was relocated into an open excavation on top of the landfill, reburied, and recapped. Upon excavating the material impacted by leachate, it was replaced with 2 to 2.5 feet of compacted clay similar in geotechnical qualities to the removed cap material. Compaction was performed using repeated passes by heavy equipment. The entire disturbed area was restored to match existing grade using loosely compacted topsoil. An estimated total of 300 tons of topsoil was used that includes additional amounts to decrease the abrupt change in slope where the landfill cap meets the surrounding terrain.

Approximately 100 cubic yards of excavated material was placed in a separate excavation located on top of the landfill (approximately 100 feet northeast of the repaired area) that measured 15 feet wide by 50 feet long and 2.5 to 3 feet deep. The relocated material was re-capped, re-covered, and the area graded to preserve the existing contour of the top of the landfill. In October 2005, grass seed was spread over all the disturbed areas and covered with straw mulch.

A ramp was constructed northwest of the area where the repair work was conducted to facilitate equipment access to the work area. The ramp was constructed by widening an existing engineered rock-lined drainage swale and adding crushed rock to flatten the grade of the slope. The general contours of the swale were preserved, and the ramp will permit access in the event future repairs are needed.
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Several hundred tons of crushed rock ("one-time" rock, which averages 3 to 6 inches in diameter) were used to make the ramp suitable for heavy equipment access.

During an inspection in December 2005, discolored water was noted in the drainage ditch sump located east of Outfall 004A, and several possible small seeps were noted adjacent to the earthen sump. As an immediate response action, Ash Grove started pumping out the fluids in the sump to minimize the potential for migration.

Site activities were conducted in January 2006 to: 1) identify the distribution of leachate seeps; 2) characterize the soil and bedrock conditions within the area of leachate seeps; and 3) identify the potential discharge rate of leachate that would be captured in a collection trench, if installed. During the initial activities, a total of nine test trenches (E-1 through E-9) were installed to the top of the limestone at depths between 1.6 and 8 ft deep. The excavator available for use during the initial site activities (a small backhoe) was not large enough to excavate through the limestone. Therefore, to complete the delineation, a second round of trenching (trenches E-10 through E-13) was conducted using a larger track-mounted excavator capable of penetrating the bedrock.

In each of the test trenches, the following activities were conducted: lithologic descriptions of sediments and bedrock encountered in the trench were noted and recorded; the presence/absence of seepage was noted and recorded; where seepage was present, pH measurements were collected and recorded; where seepage was present, the rate at which water entered the excavations was measured and recorded; and the location and approximate relative elevation of each trench was field surveyed and recorded.

Additional information relating to the site conditions was collected: the location, depth to water, total depth and relative elevation of the existing landfill sump (currently pumped periodically by Ash Grove); the pH of standing water in the drainage ditch and drainage ditch sump; the location and relative elevation at each of the sample locations was measured; depths to water in monitoring wells located on the landfill were also measured; and the condition of the clay cap along the southwestern toe of the landfill was inspected and noted.

Based on the results of the field activities conducted in January 2006 and on the observations of discolored water in the existing drainage ditch sump, it appeared that leachate-impacted water was seeping from the southwestern toe of Landfill 177 (SWMU 16) into the drainage ditch.

The results of the field investigation indicated that the subsurface lithology consisted of between 1 and 6 ft of clay soil overlying the Paola Limestone. Underlying the limestone was a sequence consisting of approximately 2.5 ft of shale, and an 8- to 12-inch thick coal seam (i.e., Thayer coal) underlain by a competent shale. The upper shale interval appeared to be weathered, and in several locations produced water from this weathered zone. The coal seam was saturated and transmitted perched water at every location where it was encountered. The lower competent shale did not appear to be either fractured or water-bearing.

The observations from the test trenches indicated that the leachate was seeping through both the unconsolidated material overlying the limestone bedrock and the underlying coal seam. Thus, to control the release of leachate at this location, it was necessary to intercept impacted water from both the unconsolidated sediments and the coal seam.

Contribution to the surface discharge of leachate-impacted groundwater appeared to be limited primarily to the clay soils in an area approximately 100 ft long along the southwest corner of the landfill. However, leachate-impacted water was also encountered within the bedrock north and west of this area. This
provided for the potential for leachate to be discharged to the drainage ditch and drainage ditch sump from the underlying bedrock.

Based on the January 2006 data, a comprehensive approach to mitigate seeps and leachate releases along the southwestern corner of the landfill was developed and submitted to USEPA in November 2007. The objectives of the stabilization activities were to:

- Collect and treat leachate before seepage into the drainage ditch.
- Minimize the mixing of stormwater run-off and leachate to allow the routine off-site discharge of non-impacted stormwater.
- Restore landfill cover system disturbed by stabilization activities.
- Transfer leachate produced from interceptor trench and French drain to elementary neutralization treatment system.
- Implement a record-keeping procedure to ensure proper operation of the leachate collection system.

The stabilization activities for the southwestern area of the landfill were completed in 2008 and consisted of the following components:

- A collection trench approximately 205 ft long installed along the landfill’s southwestern perimeter and at constant elevation
- A French drain installed in the drainage ditch adjacent to the western end of the collection trench
- A collection sump located near the midpoint of the collection trench and on the west side of the French drain
- Discharge piping and electrical conduit connecting the submersible pumps in the collection sumps to the treatment system
- An elementary neutralization treatment system and building capable of batch treating up to 7,000 gallons of leachate-impacted water with a pH greater than 12.5
- Discharge piping to deliver the treated water to existing piping located south of the main haul road
- Regrading the drainage ditch to minimize ponding of water that could allow intermingling of stormwater runoff with leachate impacted groundwater.

1.1.4.3 SWMU 17 - CKD Landfill

The Kiln Dust Landfill (SWMU 17), the northern portion of which was permitted by the KDHE under Solid Waste Permit No. 345, is composed of two disposal areas separated by the quarry haul road. The SWMU location and layout are shown on Figure 4.

Both areas have been used only for the disposal of CKD. The disposal area south of the haul road (i.e. south CKD landfill) consists of approximately 24 acres and has been inactive since the early 1970s. The northern portion of the south CKD landfill is capped with a 24-inch cap, consisting of 18 inches of clay and 6 inches of topsoil, which supports native grasses. The south landfill also has a trench leachate collection system. The disposal area north of the haul road consists of the permitted solid waste landfill, which occupies approximately 64 acres and was used as a disposal area for CKD captured in the cement kiln
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Air pollution control devices before being closed in 1999. The entire northern landfill is capped with a composite cap system. The thickness of CKD material in both landfills is approximately 20 to 30 ft.

1.1.4.3.1 North CKD Landfill - Summary of Completed Interim Corrective Measures

Between 1996 and 2001, a substantial amount of stabilization and landfill closure activities were completed at the North CKD Landfill portion of SWMU 17 (Landfill 345). The stabilization and closure activities include the following:

- 1996 - Installation of Interim Recovery Collection (IRC) Trench, recovery sumps, and leachate treatment system to address leachate seeps observed along the northeastern toe of the landfill
- 1997-2000 – Completion of Stage A and B closure activities, including construction of a composite barrier cover system, installation of a toe drain collection system, construction of two stormwater detention ponds and drainage ditches, and revegetation.
- 2000 – Final site inspection and submittal of Closure Certification Report

In 1996, before closure activities at the North CKD Landfill, an IRC trench was installed along the northeast corner of the CKD Landfill to address leachate seeps observed along the toe of the Phase I area at the North CKD Landfill. The total length of the collection trench was approximately 1,200 linear ft. A 40-inch-wide trench was excavated with a hydraulic excavator to a depth of between 10 and 12 ft below ground surface (bgs). A hydraulic hammer was used to break up limestone bedrock where encountered, typically at a depth of between 6 and 9 ft bgs. The bottom of the trench was aligned to slope the trench towards the three recovery sumps at a grade of approximately 1 percent. Once the excavation of the trench was completed, the downgradient side of the trench was lined with a 60-mil polyethylene liner. A 6-inch-diameter polyethylene drain pipe was then placed at the base of the trench and covered with CA-5 limestone aggregate to a depth of approximately 8 ft. A gravel tie between the CKD in the landfill, and the trench was constructed by placing a 1-foot layer of CA 5 aggregate over a geotextile fabric. The geotextile fabric was then placed over the tie-in and trench aggregate. The remainder of the excavation was covered with compacted clay.

The recovery sumps were placed near the north and south ends of the trench, with a third sump located approximately 550 ft north of the south end of the trench. Each of the sumps was constructed by placing prepacked 6-inch-diameter, wire-wrapped, stainless steel well screen with 6-inch-diameter polyvinyl chloride (PVC) riser pipe into the trench backfill. A submersible pump was installed using a pitless adapter. Piping from the sump was routed through a 3-foot-diameter manhole containing a flow meter and valves for each individual sump. Manholes were constructed so the base is open to the gravel backfill in the trench. Leaks that may develop in the piping drain back into the trench.

The collected leachate is conveyed to an on-site elementary neutralization treatment system. Leachate is pumped from the sumps through high-density polyethylene (HDPE) dual-walled piping to the treatment system. The pumped leachate flows into one of two 7,000-gallon HDPE storage tanks located in a building at the southeast corner of the North CKD Landfill, adjacent to the treatment system building. A concrete secondary containment structure surrounds the storage tanks and is designed to contain 100 percent of the capacity of the largest tank within its boundary. The system has the capability to provide elementary neutralization, if needed, on the leachate prior to beneficial reuse. Current operations indicate that pH adjustment is not required, and the collected leachate is currently being pumped to a
temporary storage tank located on the south side of the haul road, adjacent to the South CKD Landfill, and is conveyed to the Plant for use as contact cooling water in the cement manufacturing process or to the active CKD slurry landfill.

Landfill closure implementation activities were conducted in 1997 through 2000 in two separate stages (Stages A and B) to facilitate closure of areas that have achieved final waste placement grades while maintaining active disposal areas until final grades are attained. For Stage A, closure activities commenced for Phase I area of the CKD Landfill in June 1997 and were completed in January 1998. Stage B consisted of the remaining three phases of the landfill (Phases II, III, and IV). Closure activities were initiated in March 1998, and substantial completion was achieved in January 2000. Final inspection of the North CKD Landfill was conducted on October 19, 2000. The closure implementation work for all phases was completed in accordance with the approved closure plan and applicable closure requirements specified in Kansas Administrative Regulations (K.A.R.) 28-29-121.

The scope of the closure included construction of a composite barrier cover system, installation of a toe drain collection system, construction of two stormwater detention ponds and drainage ditches, and revegetation. The toe drain collection system was connected to the existing IRC trench to provide continuous leachate collection on the eastern portion of the CKD Landfill along the toe of Phase I. The work was separated into two stages (Stage A and Stage B) to facilitate closure of Phase I, which achieved final waste placement grades, while maintaining operations in the active areas of the landfill (Phases II, III, and IV). In Stage A, the final cover system for Phase I and the toe drain collection system was constructed. This initial phase of closure activities, on the east and south sides of the landfill, was conducted before the termination of landfill operations. Closure of the remaining three phases of the landfill, including construction of permanent stormwater management controls, was completed as part of Stage B closure implementation activities.

The closure implementation consisted of the following activities: general site preparation; installation of temporary stormwater controls for sediment management during closure construction activities; construction of a final cover system; placement of a clay plug barrier within the designated sections of the Phase III perimeter ditch; installation of a toe drain collection system; connection of the toe drain collection system to an existing IRC trench; construction of permanent stormwater management controls; and site restoration, including permanent vegetative growth.

A sequencing strategy facilitated continuous disposal operations in the active portions of the landfill while closure activities were conducted in the Phase I area and provided effective control of surface water runoff throughout construction. Several construction activities were conducted simultaneously.

Equipment and personnel were mobilized by the construction contractors in June 1997 for Stage A work and March 1998 for Stage B work. During mobilization, a topographic survey was conducted to establish site controls for determining the limits of the work area, staging areas, landfill boundaries, each Phase area, and stormwater management controls. To minimize off-site sedimentation due to construction activities, silt fence was installed at the perimeter of the CKD landfill, including the east and west ends of the landfill where the stormwater detention ponds were constructed. In specific areas, the silt fence was reinforced with straw bales for stability and to increase filtration efficiency of sediment-laden runoff. A stabilized construction entrance was constructed in the southeast corner of the landfill to provide access to the east end of the landfill.

Following the installation of silt fence and the stabilized construction entrance, clearing and grubbing were performed in the Phase I area, including surrounding areas necessary to provide an adequate and safe
operating area for the construction equipment. All grubbed materials, including CKD-laden soils, were consolidated on top of the Phase I area and overlain by the foundation subbase layer. Clean stripped soils resulting from the clearing and grubbing operations were screened for removal of stumps, roots, brush and other vegetative refuse and stockpiled for reuse as vegetative soil in the cover system. The remaining three phases of the landfill did not require clearing and grubbing because no vegetation was established in the active disposal areas of the landfill. The final cover system consisted of, in ascending order: regraded and prepared CKD surface (foundation subbase), blanket drain (Phase I area only), composite barrier layer, drainage layer, and vegetative layer.

Before the placement of the cover system components, the existing CKD pile was contoured and compacted to attain specified grades and slopes, to provide a stable firm foundation subbase to support the overlying cover layers, and to protect the composite barrier layer against settlement induced by loads imposed during construction. Foreign matter, such as rocks, roots, and weeds, were cleared before the subbase was prepared. Water from the existing east stormwater pond was used for moisture conditioning of the subbase during compaction and to control dust emissions, as necessary. As each phase area achieved final CKD disposal grade, the foundation subbase layer was prepared by compacting the previously placed CKD material. Additional CKD material from the stockpile in staging area was placed, as required, to fill in low spots and to achieve the required grades. The order of closure of the landfill phases is: Phase I, Phase IV, Phase III, and Phase II. As each phase of the landfill was closed, the active areas for waste disposal operations were shifted to the remaining open phases.

A blanket drain layer and toe drain collection system were constructed simultaneously along the toe of the Phase I cover system. Activities were initiated in the northwest corner of Phase I area and proceeded in a clockwise direction toward the south. The blanket drain layer was installed over the foundation subbase in the Phase I area to intercept and convey any leachate to the toe drain collection system and IRC trench. This layer was constructed in the Phase I area only to address leachate seeps observed at the toe of this phase. The blanket drain consisted of a 1-foot-thick coarse aggregate layer with 7.25-ounce non-woven geotextile filter fabric enveloping the layer to prevent fines from clogging the void spaces. The geotextile filter fabric was installed parallel to the slope and overlapped by a minimum of 6 inches to ensure continuous coverage. Six-inch metal staples constructed out of No. 16 wire, spaced approximately 1.5 to 2.5 ft apart, were used to hold the geotextile filter fabric in place during installation. At the toe of the cover system, the geotextile filter fabric, both bottom and top layers, were extended approximately 2 to 3 ft into the toe drain collection system and IRC trench to establish a continuous system for interception and recovery of leachate. The blanket drain layer was tapered to the top of the foundation subbase layer at the boundary limit of the Phase I area.

The toe drain collection system consisted of a 3-foot-wide trench lined on the outer side with a 60-mil HDPE synthetic membrane; a 4-inch-diameter, perforated PVC pipe placed along the centerline of the trench; and crushed rock manufactured at the Ash Grove Cement Plant. The existing IRC trench on the northwest side of the landfill was uncovered and connected to the toe drain collection system in the northwest corner of Phase I to create a continuous leachate collection system at the toe of the Phase I cover system. The geotextile filter fabric layers and the blanket drain layer were tied into the toe drain trench and IRC trench to facilitate the collection of seeps beneath the barrier layer. The bottom of the toe drain was located at the top of the bedrock beneath the CKD; therefore, the elevation of the trench ranged from approximately 919.5 to 935 ft above mean sea level (amsl). A minimum slope of approximately 1 percent was maintained, and five sumps were installed at the low points of the trench. A
minimum 30-inch-thick clay plug was placed over the trench to prevent the infiltration of precipitation through the top of the toe drain collection system.

Collected water from the sumps is removed via a force main system (pressurized) and transported to a treatment unit located near the southeast corner of the North CKD Landfill. The force main system consisted of a 1-inch by 3-inch dual containment HDPE pipe that enlarges to a 2-inch by 4-inch dual containment HDPE pipe after the third sump on the north side of the Phase I area. Electrical utilities were trenched into the clay plug over the toe drain collection system approximately 3 ft bgs. The lines were enclosed in a PVC conduit. Collected leachate is currently being pumped to a temporary storage tank located on the south side of the haul road, adjacent to the South CKD Landfill, and is conveyed to the Plant for use as contact cooling water in the cement manufacturing process or to the active CKD slurry landfill.

A composite barrier layer was then placed over the blanket drain layer in the Phase I area and over the foundation subbase layer for Phases II, III, and IV. The composite barrier layer is composed of a minimum 2-foot-thick layer of compacted CKD overlain with a 6-inch-thick compacted clay veneer. The CKD was placed and spread by bulldozers for each loose lift; lifts were approximately 6 inches to 1 foot thick. The CKD was then compacted with a vibratory segmented pad roller to 85 percent of Modified Proctor density and a permeability of 1 x 10^{-5} cm/sec. If needed, water from an existing stormwater pond on the east side of the landfill was used to moisture condition the CKD during compaction to increase moisture content and reduce dust conditions.

Once the compacted CKD layer was completed, the finished surface was inspected for debris and rocks before placement of the clay material in a 9-inch-thick loose lift with earthmovers. The clay was then compacted to a minimum 90 percent of Modified Proctor density (minimum compacted thickness of 6 inches) and a permeability of 5x10^{-7} cm/sec with a vibratory smooth drum roller. On average, given the cohesive properties of the on-site clay, the thickness of the clay layer was approximately 1 foot. The top of each lift was scarified before placement of the overlying material to allow bonding of the lifts so as not to exhibit an identifiable interface.

During the construction of the final cover system in the Phase III area, additional clay material was placed within the perimeter ditch and on the side slope to address leachate seeps observed at the toe of the landfill. The ditch was dewatered and excavated to the top of the bedrock, approximately 2 to 4 ft deep, before placement of a minimum 2-foot-thick clay barrier plug. This barrier also extended approximately 4 ft upslope from the toe of the landfill to an elevation of +946 ft amsl. In this area, the compacted CKD layer was replaced with clay materials to form a continuous clay barrier plug. Scarifying and recompacting at the interface of the materials were performed to assure a continuous layer so as to not exhibit an identifiable interface (i.e., the perimeter ditch and sides slopes, including the north, east, and west sides of the clay barrier plug). Materials removed from the ditch were placed within the active disposal area in Phase II.

The drainage layer consisted of a minimum 10 inches of coarse aggregate (crushed rock) obtained from an on-site quarry where material was crushed and sorted by the Ash Grove Cement Plant. The material was placed and graded with bulldozers and road graders. The coarse aggregate layer has a minimum permeability of 1 x 10^{-3} cm/sec. The overlying vegetative layer consisted of a 10-inch-thick layer of topsoil with a range of pH values from 6.1 to 6.7 and a range of 4.6 to 6.3 percent organics to support vegetation. The material was obtained from an on-site stockpile created from soils stripped during mining activities at the facility and from a borrow source north of the North CKD Landfill. Once the vegetative layer was
completed, permanent seeding was conducted. The permanent seed consisted of a mixture of western wheat grasses. Mulch was placed over the seed mixture to provide stability and erosion control until vegetation was established. Erosion mats were installed in the diversion ditches and areas with potentially high concentrated surface-water flow during the seeding operations.

During the construction of the final cover system on the Phase I area, a phase transition berm was constructed at the top of Phase I along the inner edge of the cover system to protect the installed cover system and allow for continued placement of CKD in the topographically higher Phase IV area. The berm was constructed of clay and compacted to 90 percent of Modified Proctor density with a vibratory segmented pad roller. The height of the berm was approximately 2 ft with an approximate 3:1 side slope; an erosion mat, secured by six-inch staples, was placed over the berm to enhance stability and prevent erosion of the face of the berm. During the construction of the Phase IV cover system, the phase transition berm was removed, and the cover system constructed for Phase I was connected to the Phase IV cover system in order to form a continuous layer across the eastern end of the CKD Landfill. The blanket drain layer was tapered to the top of the foundation subbase layer at the boundary limit of the Phase I area and did not extend into the Phase IV area.

The stormwater management controls consist of perimeter and side slope diversion ditches, and two stormwater detention ponds. The diversion ditches were constructed at a minimum 1 percent slope on the surface of the cover system to intercept surface water run-off. These ditches are located on the north and south sides of the landfill and are defined by the side slopes and 2 ft to 2.5 ft high berms. Erosion mats were placed within the diversion ditches and secured with 6-inch-long staples, spaced approximately 1.5 ft apart. Collected stormwater is diverted to the stormwater detention ponds located on the east and west ends of the CKD Landfill. The ponds discharge to tributaries and ditches, which ultimately discharge to Village Creek.

The east stormwater detention pond was constructed after the composite barrier layer was placed on the east end of the landfill. This sequence of construction was followed to prevent CKD-laden surface water from entering the permanent stormwater pond and commingling with collected stormwater. After the existing stormwater pond was dewatered, debris and stained soils were removed from the pond and placed in the active waste disposal areas of the North CKD Landfill. A clay berm was constructed in the middle of the existing pond to form a new stormwater detention pond for the east end of the landfill. This berm was contoured into the existing berms on the north and south sides of the pond to form a continuous berm on three sides of the pond; the west end of the pond remained open for surface water run-off from the east end of the Phase I area. A minimum 1-foot-thick clay liner was placed on the bottom of the pond and connected to the clay berm to allow a smooth transition on the bottom of the detention pond. Clay was placed in loose 9-inch-thick lifts and compacted to a minimum 90 percent of Modified Proctor density with a sheepsfoot roller. Inlet riser structure and discharge pipe were constructed simultaneously. After the clay berm was completed, a cut was made in the berm to place the discharge pipe. A concrete saddle was poured around the pipe and allowed to set. Clay was then replaced and compacted to a minimum 90 percent of Modified Proctor density. Riprap inlet flumes were installed in the northeast and southeast corners of the pond and a riprap apron at the outlet of the discharge pipe. Discharged stormwater flows toward the east end of the Plant, eventually to Village Creek.

Construction of the west stormwater detention pond was not initiated until the composite barrier layer was constructed on the west end of the landfill. The west pond is located in the former staging area for CKD from plant operations. The staging area was excavated down to the base of the quarry floor, and all debris, soils, and CKD were placed within the Phase II active disposal area. The inlet riser structure was
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constructed after Ash Grove deemed this area free of CKD materials. Clay berms were then constructed on the north, south, and east sides of the detention pond; the east end of the pond remains open for surface water run-off from the west end of the CKD Landfill. A minimum 1-foot-thick clay liner was placed on the bottom of the pond and connected to the clay berms to allow a smooth transition on the bottom of the detention pond. Clay was placed in loose 9-inch-thick lifts and compacted to a minimum 90 percent of Modified Proctor density with a sheepsfoot roller. The top surface of each lift was scarified before placing the next lift so as not to exhibit an identifiable interface between the lifts. After the clay berm was completed, a cut was made in the berm, and the discharge pipe was set in place. A concrete saddle was then poured around the pipe and allowed to cure. Clay was then replaced and compacted to a minimum 90 percent of Modified Proctor density. Baffles were installed near the center of the pond to increase the detention time of collected water within the pond to allow adequate sediment removal before surface water discharge to Village Creek. Riprap inlet flumes were installed in the northwest and southwest corners of the pond and a riprap apron at the outlet of the discharge pipe. Discharged stormwater flows toward a tributary of Village Creek on the west side of the North CKD Landfill via a ditch and culvert, and ultimately to Village Creek. Upon completion of the construction activities, the work site, storage areas, stockpile areas, and landfill perimeter were restored to previous conditions.

The North CKD landfill closure activities were documented in the Closure Certification Report dated December 2000 prepared by Arcadis Geraghty & Miller. The KDHE approved the report in 2001.

1.1.4.3.2 South CKD Landfill - Summary of Completed Interim Corrective Measures

Between 1999 and 2001, several major stabilization activities were completed at the South CKD Landfill, which include the following:

- 1999 – Construction of an earthen barrier to prevent leachate and impacted stormwater from entering the drainage to Outfall 011
- 1999 – Excavation of a perimeter ditch and associated structures, construction of a clay barrier in the perimeter ditch, repair of the existing cap along the northern toe of the South CKD Landfill, installation of stormwater diversion berms, and revegetation of disturbed areas
- 2000 – Construction of west leachate collection trench
- 2000 to 2001 – Construction of east leachate collection trench
- 2002 – Construction of elementary neutralization treatment system for South CKD Landfill.

Before stabilization activities in 1999, stormwater commingled with leachate from the toe of the South CKD Landfill flowed through the South Drainage Area. USEPA-approved stabilization activities consisted of re-covering the north toe of the South CKD Landfill and drainage ditch with clay and building a temporary impoundment on the east side of the South CKD Landfill to prevent leachate-impacted stormwater from flowing into the South Drainage Area. The leachate-impacted stormwater contained in the temporary impoundment was pumped to the Plant raw mill and used as process make-up water during cement manufacturing.

In January 1999, Ash Grove personnel observed stormwater and leachate from the South CKD Landfill portion of SWMU 17 that had collected in a low area east of the landfill. As an immediate response action, an earthen barrier 1,150 ft long was constructed approximately 400 to 600 ft east of the South CKD Landfill from the haul road to the quarry wall to prevent leachate and impacted stormwater from
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entering the drainage ditch system, which eventually discharges to Village Creek. After the impacted stormwater was contained, Ash Grove constructed a pipeline to the temporary impoundment and installed a pumping system to continuously dewater the temporary impoundment until stabilization measures could be implemented. A stabilization plan for the South CKD Landfill was submitted to the USEPA in April 1999. The objectives of the stabilization activities were to: 1) minimize stormwater contact with CKD; 2) promote positive drainage along the north perimeter ditch; 3) minimize the release of leachate from SWMU 17; 4) contain leachate and impacted stormwater within the boundaries of SWMU 17; and 5) minimize the mixing of stormwater run-off and leachate to allow routine off-site discharge of non-impacted stormwater.

Stabilization activities were completed in November and December 1999 according to the USEPA approved stabilization plan. The stabilization construction activities consisted of the following tasks: general site preparation; excavation of a perimeter ditch and associated structures; construction of a clay barrier in the perimeter ditch; repair of the existing cap along the northern toe of the South CKD Landfill; installation of stormwater diversion berms; and revegetation of all disturbed areas.

Before initiating construction, and as part of a previously conducted immediate response action, a temporary skid-mounted 30,000-gallon storage tank and foundation pad were installed adjacent to the earthen barrier to dewater the existing bermed area. A pumping system was installed adjacent to the tank to convey collected leachate and impacted stormwater collected within the bermed area to the storage tank, and thereafter through an underground pipeline to the Plant raw mill for use in cement manufacturing operations as process make-up water. The pumping system is housed in a building adjacent to the storage tank. Once the bermed area was dewatered sufficiently to provide access, construction activities to stabilize the South CKD Landfill were initiated. Any future leachate and impacted stormwater collected in the existing bermed area is pumped to the Plant as contact cooling water as needed or to the active CKD Monofil.

The perimeter ditch adjacent to the haul road was excavated to the top of the bedrock to remove all CKD and impacted sediments. The depth of excavation varied from 2 to 6 ft depending on the location of the bedrock surface. Clay was subsequently placed within the excavated areas to construct a vertical clay barrier at the toe of the landfill; the thickness of the clay barrier likewise varied from 2 to 6 ft based on the depth of excavation in the perimeter ditch. A drainage divide, consisting of establishing a high point, was installed in the northeast section of the perimeter ditch to promote surface water drainage toward the east and west ends of the ditch and to reduce ponding in the perimeter ditch. No old quarry drainage ditches, sumps, or pits were encountered during excavation.

A clay barrier was constructed along the northern side slope to a point that encompassed and extended beyond the location of the leachate seeps observed during construction. The clay barrier was placed in a manner to promote a smooth surface transition from the perimeter ditch up the side slope of the landfill. Vegetation was cleared from the side slopes of the landfill before construction of the clay barrier. The surface of the existing soil cover was scarified immediately before placement of the clay barrier to form a continuously integrated bond between the soil cover and clay barrier so as not to exhibit an identifiable interface between the two layers. A 6-inch topsoil layer was then placed over the clay barrier to support vegetative growth on the side slope of the landfill.

Two stormwater diversion berms were constructed on the side slopes of the landfill and along the haul road. These diversion berms were installed to segregate normal stormwater run-off from leachate discharges at the South CKD Landfill. The berms were a minimum height of 2.5 ft and consisted of a
minimum 2-foot-high clay core and a 6-inch-thick layer of topsoil; the height of the diversion berms varied based on the existing ground elevation and the final location of the berm. The top surface of the berms was sloped perpendicular to their alignment at approximately 2 percent downslope to induce positive drainage of stormwater. The constructed clay barrier on the north side of the South CKD Landfill was extended up the side slope as necessary to tie into the stormwater diversion berm on the north side of the landfill, thereby forming a continuous clay barrier on the side slope of the landfill. The stormwater diversion berm on the east side of the South CKD Landfill was tied into the existing earthen berm, which was constructed during the immediate response action in February 1999. This diversion berm separated stormwater run-off from the leachate collected in the existing bermed area east of the South CKD Landfill. It should be noted that the eastern end of the South CKD Landfill was not capped with clay in order to provide a controlled outlet for leachate discharges, which entered the bermed area. Collected leachate and impacted stormwater was removed as needed from this area by the installed pumping system and pumped via underground pipeline to the Plant raw mill for use as make-up water in cement manufacturing.

The existing dirt access road at the west end of the perimeter ditch was removed to allow the continuous flow of stormwater run-off toward an unnamed tributary of Village Creek and prevent flooding of the haul road. This dirt road had been used to access a propane tank storage area. At the completion of construction, site restoration was implemented. Vegetation was established on the north side of the South CKD Landfill, stormwater diversion berms, and other areas of disturbance, as necessary. All CKD, sediment, and debris removed during perimeter ditch excavation was placed and disposed in the then active portion of SWMU 17, which is located on the north side of the Haul Road. Final closure of this portion of SWMU 17 was being conducted during implementation of the stabilization plan.

After the stabilization was completed in 1999, small amounts of leachate continued to seep from the base of the east slope of the South CKD landfill, impacting residual material and mixing with clean stormwater. Two recovery trenches (east and west) were then constructed to intercept the flow of leachate. The purpose of the west and east leachate collection trenches included the following: collect and contain leachate before seepage into the drainage ditch; minimize the contact of stormwater run-off and leachate to allow the routine off-site discharge of non-impacted stormwater; restore landfill cover system disturbed by stabilization activities; properly dispose of leachate collected in the interceptor trench; implement record keeping to ensure proper operation of the leachate collection trench; and collect leachate-impacted solids within the impoundment and place in the South CKD Landfill.

To optimize the performance of the interceptor trenches and prevent collection of unimpacted perched shallow groundwater, it was necessary to define the extent of leachate. This was done before the installation of the interceptor trenches by digging a number of test pits and screening the pH of the perched shallow groundwater. Based on these results, the locations of the sumps were determined in the field. The west leachate collection trench was constructed in July 2000. The east leachate collection trench was constructed from November 2000 through April 2001.

In addition, before beginning construction at the east trench, several preparatory activities were conducted to address leachate impacts. The floor of the basin downgradient of the Landfill consisted of exposed Paola Limestone covered in small areas with several inches to approximately 1 foot of sediment. This sediment and the cover material at the base of the Landfill had been impacted by leachate seeps. Before beginning construction, the impacted material was pushed onto the side slope of the landfill directly above the proposed trench location. Following the removal of the impacted material, clean clay
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fill was placed on the floor of the temporary basin to facilitate drainage towards a collection point in the southeast corner of the basin.

As installed, the west interceptor trench is approximately 600 ft long and located adjacent to the quarry haul road ditch. A short wing wall approximately 20 ft long extends up slope (south) on the west end of the trench to prevent leachate from bypassing the trench. The east interceptor trench consists of the main trench of approximately 400 ft extending from the quarry wall on the south to the haul road ditch on the north, and a wing wall beginning at the north end of the main trench and extending 100 ft west, parallel to the haul road.

The trench depths varied based on location, but in general were installed through the fill material, limestone unit, and coal seam, and terminated in the basal portion of the shale unit. This allows the trenches to intercept leachate flow at the fill/limestone interface and throughout the upper portion of the shale including the coal seam. The west trench ranged from 5 to 7 ft deep and was approximately 40 inches wide. The east trench ranged from 6 to 9 ft deep and was approximately 40 inches wide. The soil at the west trench was stripped to bedrock, a depth of 1 to 3 ft bgs, while the soil at the east trench was stripped to bedrock, a depth of 2 to 4 ft bgs. Limestone was removed by breaking with a hydraulic hammer mounted on a trackhoe excavator. The fractured limestone, coal, and shale were then removed using a rock bucket mounted on a trackhoe excavator.

Following the completion of the excavations, corrugated polyethylene drain pipe was installed along the bottoms of the trenches to convey leachate to collection sumps located near the center and at the west end of the west trench and near the south end and at the north end of the east trench. Following the placement of the drain pipe, the trenches were backfilled with a coarse aggregate material to approximately level with the top of bedrock. Because much of the perched shallow groundwater flow takes place along the surface of the bedrock, it was important that the aggregate be placed to intercept the perched shallow groundwater/leachate flow. Following the placement of the aggregate material, a layer of geotextile was placed above the aggregate. A clay barrier was then placed above the aggregate within the excavated trench and compacted to construct a clay barrier plug above the aggregate.

Installation of the collection sumps began approximately 15 days after the completion of the west interceptor trench. Approximately 30,000 gallons of leachate that had collected in the west trench was removed before completing the sump excavation.

During the installation of the east trench, sumps were installed at the north end of the main trench and approximately 60 ft from the south end of the main trench. An area of approximately 15 ft square and 8 to 9 ft deep was excavated in the same manner as the trench.

After the excavations were completed, 5-foot-long, 6-inch-diameter, 304 stainless steel 0.060-inch slot, v-notch, continuous wire-wrapped, prepacked screens with a 5-foot-long PVC casing were installed in the excavations adjacent to the polyethylene drain pipe. The excavations were then backfilled with coarse aggregate to the top of the screen. After the aggregate material was placed in the sump, a geotextile layer was placed on top of the aggregate. A clay barrier was then placed above the geotextile to prevent infiltration of precipitation.

Three-foot-diameter subsurface steel vaults were installed to protect the horizontal piping and to serve as valve vaults to allow for future automation of the system. The walls of the vaults rested on concrete blocks set in the aggregate. The floors of the vaults were aggregate, allowing any release from the future discharge piping to drain into and be contained by the interceptor trenches and collection sumps. A hole was drilled in the vault walls and the recovery well PVC casings to install a 1-inch pitless adaptor. A 6-
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A foot-square concrete pad was poured flush with the ground surface at each sump location. Concrete walls approximately 3.5 ft high were constructed on the south, east, and west sides of both concrete pads at the west trench. Concrete walls approximately 3.5 ft high were constructed on the south, west, and north sides of both concrete pads at the east trench.

During excavation, leachate was encountered on top of bedrock, at depths of 1 to 2 ft bgs at the west trench and 2 to 4 ft bgs at the east trench. Therefore, most of the material excavated during the construction of the trench had contacted leachate. In accordance with the stabilization plan, all of the excavated impacted material was placed in low spots or spread on the upper portion of the South CKD Landfill and covered with clean fill. Following construction, the topsoil was replaced, seeded, and straw mulch was placed and secured over the seeded area as temporary stabilization until vegetation was established.

In 2002, an elementary neutralization treatment system was constructed on the east side of the South CKD Landfill. The system was designed and constructed in a fashion similar to the treatment unit at the North CKD Landfill. Neutralized leachate is pumped to the raw mill and used in the cement manufacturing process or as make-up water at the active CKD slurry landfill.

Additional stabilization measures were proposed in March 2007 to further reduce the amount of leachate collected from the leachate collection trenches. Investigation activities had indicated that the existing soil cover of the South CKD Landfill has a relatively low permeability and limits infiltration into the landfill. Thus, while storm water infiltration was determined to be a likely component of the groundwater recharge, it was determined that there was a comparable horizontal component coming from the bedrock along the south side of the landfill.

The additional stabilization measures conducted in 2008 consisted of the following:

- An extension of the existing west groundwater collection trench installed adjacent to, but upgradient from, the location of seeps along the southwest corner of the South CKD Landfill. The extension was approximately 200 ft long and was connected to the existing west groundwater collection trench via underground piping. The depth of the trench extension terminated just below the coal seam, but not completely penetrating the shale.

- Lining portions of the drainage ditch located between Highway 39 and the southernmost extent of the South CKD landfill to minimize the potential for surface water infiltration via the drainage ditch. Visual observation of the ditch indicated that the bedrock is near or at the surface in portions of the ditch. Also, one of the newly observed seeps is located near the ditch.

1.1.4.4 SWMU 23 - Inactive Kiln Dust Landfill

The Inactive Kiln Dust Fill Area (SWMU 23) was a one-time disposal area for CKD (Figure 5). The CKD was reportedly placed in the area in 1975 at the request of the City of Chanute to fill a “swampy” area. This unit is located east of the Plant and east of North Santa Fe Street. A railroad spur serving the Plant bisects the SWMU. The area is estimated to contain about 35,000 tons of CKD. No historical releases have been reported from this unit.

Within the SWMU boundaries, the waste thickness ranges from 0.5 to 3.0 ft, with the greatest depths of waste concentrated at the southern edge of the unit. No waste was encountered in any of the shallow RFI borings along the eastern edge of the SWMU. The extent of the CKD covers approximately 314,953 square ft and has an estimated volume of 21,640 cubic yards.
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The waste material encountered at SWMU 23 was generally homogeneous and consisted of light gray to tan CKD covered by up to 2 ft of fine-grained topsoil. No other waste material besides CKD was encountered at SWMU 23. The CKD was generally overlying a dark brown silty clay soil horizon.

1.1.4.4.1 Summary of Completed Interim Corrective Measures
To date, no maintenance issues or visible releases have been documented at SWMU 23; therefore, no interim corrective measures or stabilization efforts have been warranted, other than occasional minor repairs to address damage to the cover caused by animal burrows.

1.1.5 Summary of Selected Corrective Measures
After consideration of the Corrective Measures Alternatives evaluated in the Corrective Measures Study (Arcadis 2012), USEPA selected Corrective Measures to be implemented at the Plant. These Corrective Measures were stipulated in the revised Permit for the Ash Grove Plant (USEPA 2017).

The Corrective Measures selected by USEPA are summarized below:

**SWMU 1 – Paraffin Waste Landfill**
- Upgrade existing cover to prevent exposed waste, prevent erosion, minimize infiltration of water, and support vegetative growth
- Perform annual inspections to evaluate erosion and stressed/dead vegetation
- Perform annual sampling, including:
  - Downgradient groundwater sampling
  - Soil/sediment sampling
- Surface water sampling, if standing water is observed
- Implement land controls to prevent future exposure, including fencing, access restrictions, and deed notice.

**SWMU 16 – Industrial Waste Landfill**
- Maintain the existing low-permeability clay cover, overlying soil cover, and established vegetation to promote runoff, minimize run-on, and prevent erosion of the covers and underlying waste
- Maintain the existing IRC leachate collection system
- Install controls to prevent trespass, livestock use, or any other activity that could potentially damage the cover system over the waste
- Implement a monitored natural attenuation program to monitor impacted groundwater at SWMU 16.

**SWMU 17 North – North Cement Kiln Dust Landfill**
- Maintain the existing low-permeability clay cover, overlying soil cover, and established vegetation to promote runoff, minimize run-on, and prevent erosion of the covers and underlying waste
- Maintain the existing IRC leachate collection system
- Implement a monitoring program to monitor groundwater at SWMU 17 North
• Install controls to prevent trespass, livestock use, or any other activity that could potentially damage the cover system over the waste.

**SWMU 17 South – South Cement Kiln Dust Landfill**

• Design, install, and maintain a low-permeability cover over the waste portion of the SWMU
• Design, install, and maintain an overlying layer of soil cover sufficient to protect the low-permeability cover from infiltration, prevent erosion, and support and maintain vegetation
• Plant and maintain vegetation in the soil layer to prevent erosion of the soil and underlying low-permeability cover
• Maintain the existing IRC leachate collection system
• Implement a monitoring program to monitor groundwater at SWMU 17 South
• Install controls to prevent trespass, livestock use, or any other activity that could potentially damage the cover system over the waste.

**SWMU 23 – Inactive Kiln Dust Landfill**

• Maintain the in-place native soil cover to minimize infiltration and promote vegetative growth
• Perform annual Inspections to evaluate erosion and stressed/dead vegetation
• Perform annual sampling, including:
  o Downgradient groundwater sampling
  o Soil/sediment sampling
• Surface water sampling, if standing water is observed
• Implement land controls to prevent future exposure, including fencing, access restrictions, and deed notice.

The plans, construction designs and specifications, and supporting technical material necessary to implement the Corrective Measure required by the revised RCRA Permit are discussed in this Corrective Measures Implementation (CMI) Work Plan.

### 1.2 Document Organization

This document has been prepared to meet the CMS requirements of the 1994 USEPA RCRA Corrective Action Plan document (USEPA 1994) and the requirement contained in the Plant’s Permit. This CMI Work Plan contains 14 sections, including:

• **Section 1, Introduction** – Discusses the objectives and organization of the Report, and presents Site background and regulatory history.
• **Section 2, Corrective Measures Requirements** - Presents the Corrective Action Objectives and media-specific cleanup standards that guide the monitoring and evaluation of the effectiveness of the corrective measures implemented at the Plant.
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- **Section 3 – Construction Activities** - Summarizes the construction activities that will be completed to implement the corrective measures at the Plant. This section will discuss the basis of design, sequence of work, and will present an overview of the specific activities that will be completed during construction.

- **Section 4 – Public Involvement** – Presents a program of public involvement activities designed to keep the public fully informed about the CMI process and CMI activities to be completed at the Plant.

- **Section 5 – Groundwater Monitoring Plan** – This section describes the groundwater monitoring activities that will be performed as part of the ongoing operations and maintenance of the corrective measures following implementation. The stand-alone Groundwater Monitoring Plan also includes discussions on laboratory quality control and describes activities and procedures that will be implemented to manage the data collected during sampling.

- **Section 6 – Institutional Controls** – This section describes the institutional and engineering controls that will be implemented to restrict access and development of impacted areas.

- **Section 7, Construction Quality Control/Quality Assurance** – Presents the stand-alone Construction Quality Control/Construction Quality Assurance Plan that contains procedures to be implemented during construction to ensure that the corrective measures are being constructed in accordance with the design drawings and specifications. Additional quality control activities, such as dust control and site restoration, are included in this section.

- **Section 8, Health and Safety** – Discusses the stand-alone site-specific Health and Safety Plan (HASP) that has been prepared as a guide for construction oversight, inspection, and sampling.

- **Section 9, Environmental and Safety during Construction** – Discusses additional environmental controls that will be implemented during Removal Action construction, including dust control measures and activities to prevent erosion and sedimentation.

- **Section 10, Operations and Maintenance** – presents the stand-alone Operations and Maintenance Plan that includes the inspection, data collection, reporting, and corrective action activities that will be conducted to ensure that the implemented corrective measures are performing as designed and that the integrity of the constructed covers are maintained.

- **Section 11, Permitting** – Summarizes the permits that will be obtained to comply with local, state, and federal requirements to during active construction.

- **Section 12, Project Closeout** – Describes the post-construction certification inspection and the Corrective Measures Implementation Report (CMI Report) that will summarize the construction activities and present the data collected during construction as part of Construction Quality Control.

- **Section 13, Reporting** – Discusses the meetings, call, and progress reports that will be completed during active construction.

- **Section 14, References** - Contains the literature references that were used to develop this Work Plan.
1.3 Companion Documents

This CMI Work Plan also includes associated documents that provide detailed information on the Corrective Action design, health and safety, sampling, and quality assurance procedures, which are attached as follows:

- Appendix A – Design Drawings
- Appendix B – Technical Specifications
- Appendix C – Groundwater Monitoring Plan
- Appendix D – Quality Assurance Project Plan/Data Management Plan
- Appendix E – Construction Quality Assurance/Construction Quality Control Plan
- Appendix F – Health and Safety Plan
- Appendix G – Operations and Maintenance Plan
- Appendix H – Corrective Action Objective Goals
- Appendix I – Cost Estimates to implement the Corrective Measures.
- Appendix J – Model Deed Notice and Restrictive Covenant

Arcadis will use the Site-Specific HASP included in Appendix F to guide safety procedures and documentation during the project. The construction Contractor will be required to develop and submit a HASP as part of their pre-mobilization activities.
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2 CORRECTIVE MEASURES REQUIREMENTS

A Baseline HHRA (Arcadis 2011) quantified potential risks and hazards associated with chemicals of concern (COCs) for completed exposure pathways at each SWMU at the Plant. Conceptual site models for exposure routes were developed and evaluated for each SWMU. The conceptual site models reflect the actual data available and the unique receptors and exposure pathways evaluated in the HHRA, and were based on communications between Ash Grove and USEPA Region 7 (Arcadis 2012).

2.1.1 Corrective Action Objectives

Corrective Action Objectives (CAOs) are site-specific clean-up objectives established for protecting human health and the environment. CAOs specify constituents and media of concern, potential exposure pathways, and receptors. CAOs indicate a constituent level and an exposure route rather than a constituent level alone, because protection of human health may be achieved by reducing or eliminating exposure pathways as well as by reducing contaminant concentrations (USEPA 1988). The CAOs were developed based on the results of the USEPA-requested HHRA (Arcadis 2011) and with additional consideration of Applicable or Relevant and Appropriate Requirements (ARARs), as discussed in the CMS.

Remedial Action Objectives were developed in the CMS (Arcadis 2012) for the SWMUs at the Ash Grove facility. These include:

- Mitigate exposure to COCs in soil, waste, groundwater, sediment, and surface water to achieve an individual excess lifetime cancer risk no greater than $1 \times 10^{-5}$ and a non-cancer hazard quotient less than 1.

- Use Environmental Use Controls to limit land use at SWMUs to non-residential uses, and prohibit the installation of potable water wells in the immediate vicinity of the SWMUs.

- Prevent ingestion and dermal contact (hypothetical future site excavation workers) with on-site soil, waste, and groundwater exceeding the risk-based Corrective Action Objective Goals (CAOGs, discussed below) for the identified COCs developed for a hypothetical future site excavation worker exposure scenario.

- Prevent ingestion and dermal contact (hypothetical future youth trespasser) with on-site sediment and surface water exceeding the risk-based CAOGs (discussed below) for the identified COCs developed for a hypothetical future youth trespasser exposure scenario.

2.1.2 Media Clean-up Standards

Numerical CAOGs are a subset of the CAOs and provide the measurable goals that drive corrective actions for each medium. In the preamble to the final National Contingency Plan (NCP), the USEPA explained that these remediation goals are based on ARARs. In addition, risk-based numerical CAOGs can be developed following the USEPA guidance (USEPA 1991a, 1991b). Chemical-specific CAOGs were developed using the following procedure:

- Assemble the list of COCs identified in the HHRA for each impacted medium at each SWMU.
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- Using the list of COCs, summarize ARARs for each impacted medium at each SWMU. The ARARs (where available) will serve as a point of general reference to computed site-specific health-based CAOGs.

- Determine the appropriate current and/or future human exposure scenario for each medium at each SWMU.

- Calculate site-specific health-based goals (HGBs) for cancer and non-cancer risks at the Ash Grove SWMUs using the findings of the EPA-approved HHRA, standard risk assessment methods, and:
  - A potential cancer risk of $1 \times 10^{-5}$ for the individual COCs
  - A non-carcinogenic target-organ-based hazard quotient of 1.

- Evaluate HBGs and ARARs to select appropriate CAOGs for each impacted medium at each SWMU. The CAOGs for each SWMU evaluated in the CMS are presented in Appendix H.
3 DESIGN PLANS AND SPECIFICATIONS

Design and Construction Plans are included in Appendix A. Technical Specifications for the scope of work to be implemented are included in Appendix B. This section summarizes the corrective measures that will be implemented at the Plant, and provides details regarding construction, quality assurance, and health and safety.

3.1 Basis of Design

As described in the Final Remedy Decision for the Statement of Basis included in the Permit (USEPA 2017), the following tasks were selected as the final remedy for the Ash Grove Chanute Cement Facility:

- Maintenance of existing landfill caps
- Hydraulic control of landfill leachate
- Monitored natural attenuation of groundwater contamination
- Implementation of land use controls
- Groundwater, surface water, and sediment monitoring

The scope of work required for each SWMU is detailed in Section 1.1.5 of this report, but can be summarized in broad terms below:

<table>
<thead>
<tr>
<th>CMI Component</th>
<th>SWMU 1</th>
<th>SWMU 16</th>
<th>SWMU 17 N</th>
<th>SWMU 17 S</th>
<th>SWMU 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain existing landfill covers</td>
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<tr>
<td>Cover exposed waste and repair distressed vegetation in existing covers</td>
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<tr>
<td>Upgrade landfill cover</td>
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<tr>
<td>Maintain existing IRC leachate collection system</td>
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<tr>
<td>Perform annual groundwater sampling (and sediment and surface water sampling at SWMUs 1 and 23)</td>
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<tr>
<td>Monitored natural attenuation</td>
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<td></td>
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<tr>
<td>Upgrade security fencing¹</td>
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<td></td>
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<tr>
<td>Implement Access and Institutional Controls</td>
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</tbody>
</table>

¹ Additional fencing is not required for SWMUs 16, 17 North, and 17 South, since the SWMUs reside fully within the boundaries of the active Plant. Signs will be posted at these SWMUs to prohibit storage of equipment or vehicles on the landfill cover footprint.
3.1.1 Cover Construction – SWMU 17 South

The final remedy for SWMU 17 South includes the installation of a low-permeability cover over the waste portion of the landfill. The design and construction details for SWMU are presented in the Design Drawings in Appendix A and include:

- Clear and grub existing vegetation from the waste portion of the landfill area.
- Import and compact clay soil to create an 18-inch low-permeability layer.
- Import and place topsoil to a depth of 6 inches.
- Seed disturbed area and establish vegetation.

3.1.2 Fill Low and Exposed Areas – SWMUs 1 and 23

Active construction at SWMUs 1 and 23 is shown on the Design Drawings (Appendix A) and include:

- SWMU 1 – Cover existing exposed waste with a minimum of 6 inches of topsoil. Grade topsoil to match existing grade and promote drainage. Reseed disturbed areas and establish vegetation. Install security fence.
- SWMU 23 – Place top soil over distressed vegetation, reseed, and establish vegetation. Install security fence.

3.2 Sequence of Work

The CMI construction activities will be completed by the Construction Contractor and will follow the general project construction sequence of flow described below:

- Obtain necessary approvals, permits, and easements.
- Mobilize equipment and personnel.
- Prepare and install Plant controls.
- Improve/install access entrances, if needed.
- Install erosion and sediment control devices in accordance with the approved Stormwater Pollution Prevention Plan (SWPPP).
- Prepare SWMU 1 and SWMU 23 for cover placement over low and bare spots. Import soil to cover and fill as needed and grade to promote drainage.
- Prepare SWMU 17 South for engineered cover. Import low permeability clay, place, and compact in accordance with Construction Specifications. Import topsoil fill, place, and compact in accordance with Construction Specifications.
- Perform final site grading and restoration, including temporary erosion control removal and access road maintenance.
- Establish vegetation at all disturbed areas.
- Demobilize equipment and personnel.
3.3  Construction Activities

Active construction will occur primarily at SWMU 17 South and, to lesser extents, SWMU 1 and SWMU 23. The following sections discuss some common elements that will apply to all areas with active construction as part of implementing the corrective measures.

3.3.1  Construction Methods and Equipment

At SWMUs with active construction, common excavation equipment (e.g., dozers, graders, track hoes) will be used to move and compact cover material. The extents and depths of the cover material will be located in the field by surveying methods, and in-place cover thicknesses will be confirmed in the field using measuring tapes or surveying equipment.

The earth-moving, loading, and hauling equipment will be maintained and refueled in a manner that prevents releases of oil and fuel to the ground.

3.3.2  Soil Transportation

Low-permeable clay and topsoil will be imported to SWMUs with active construction. The clay and topsoil may come from existing Ash Grove sources or may be obtained from other local sources.

Trucks traveling between the backfill source and the landfill construction areas will follow a direct route using major roadways and avoiding neighbourhood streets to the extent practicable. The final transportation route will be identified after selection of an acceptable backfill source.

The loads of all haul trucks will be covered with a secured tarp or other device if traveling on public roads. Any materials spilled during transport will be removed and cleaned up as soon as practicable.

Hauling operations will be performed to minimize interference with local traffic on city streets to the extent practicable. Flag persons and signage will be employed as necessary to provide for public safety. At a minimum, warning signs such as “Construction Area” or “Men Working” will be placed on the streets where work is being performed and haul trucks are being loaded. “Trucks Entering” or “Trucks Turning” signs will be used at secondary and primary street intersections as necessary. Any other signage required by local or state regulations, laws, or ordinances also will be used to provide for public safety.

Hauling operations that occur on Plant property will follow all Ash Grove safety and traffic protocols and radio communication procedures.

3.3.3  Site Preparation

Site preparation includes the mobilization of equipment, supplies, and personnel to the Plant. Other tasks planned as part of mobilization include:

- Establish earth-moving equipment storage areas and supply laydown areas (applies to construction at SWMU 17 South).
- Identify general imported clean soil fill and topsoil stockpile staging areas.

Earth-moving equipment will typically remain at the work site. Utility services are available at the Ash Grove buildings. The Contractor will be required to provide a project trailer and support facilities at the
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SWMU 17 construction site. The Contractor will be required to provide sanitation facilities in the active work areas.

Access to SWMU 17 South during construction will be through the Plant main entrance and the primary haul road. Access to SWMU 1 and SWMU 23 will be on public streets. Construction traffic may traverse North Santa Fe Street to the east of the Ash Grove Plant, and traffic control measures will be implemented as appropriate. The Contractor will improve the roads as needed for site access by grading and placement of rock.

At SWMU 17 South, the existing landfill surface will be cleared of all vegetation including shrubs and trees. Grubbed vegetation will be placed on Plant property.

3.3.4 Dust Control

All Corrective Measures construction will be performed in a manner that minimizes visible dust. The primary method of dust control will be by water spray from a water truck. The Contractor will determine the source of water, which may be obtained from the Chanute public water supply, on-site Ash Grove supply, or other equivalent clean source.

3.3.5 Erosion and Sediment Controls

Site work will be performed in a manner that provides erosion and sediment controls as necessary to minimize sediment runoff from disturbed areas during construction and before the establishment of vegetation. Applicable best management practices (BMPs) will be implemented to provide sediment control and prevent erosion. BMPs will be used as appropriate on or around excavations, stockpiles, borrow areas, staging areas, and loading areas. These BMPs may include installation of one or more of the following: sedimentation basins, earth berms, drainage swales, silt fencing, temporary vegetation, straw bale barriers, and riprap outlet protection. The BMPs will be installed under a construction storm water permit, which requires a Notice of Intent for construction activities to be submitted by the Construction Contractor to KDHE at least 60 days before construction.

The erosion and sediment controls will be installed before major earth-moving is conducted. The silt fences will be maintained until the final grading has been completed and vegetation has been established. Per the KDHE guidelines, weekly inspections will be completed by the Construction Contractor to evaluate the condition and the effectiveness of the stormwater erosion controls, and all repairs will be completed in 24 hours.

Earth berms or shallow ditches will be constructed to divert stormwater run-on where practical. Drawings typical of BMPs and cross sections are included in the Design Drawings in Appendix A.

3.3.6 Borrow Soil Criteria

Soil fill material used to provide the upgraded covers in backfill excavated areas will come from two main sources:

- Imported clean low permeability fill and topsoil from an off-site source (to be determined by the Contractor)
- Appropriate clean low permeability fill and topsoil identified by Ash Grove, existing on Ash Grove-owned property.
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All fill and topsoil will meet the soil quality acceptance criteria outlined in the Technical Specifications (Appendix B) for both chemical and engineering properties. The sampling requirements and frequency of sampling required to evaluate acceptance are also presented in the Technical Specifications.

3.3.7 Site Restoration

Site restoration for Corrective Measure construction will include grading the edges of the soil cover areas to create a smooth transition and seeding disturbed areas to prevent erosion. Disturbed areas will be seeded with a grass seed mix. The grading and seeding will prevent erosion of the backfilled soils into undisturbed areas.

3.3.8 Seeding and Establishment of Vegetation

All non-road areas disturbed by Corrective Measures construction will be vegetated to prevent erosion. Seed, fertilizer, and mulch will be applied using methods suitable to site conditions. Where warm season grasses are used, the seed types, seed application rates, lime requirements, mulch type, and fertilizer rates recommended by the local extension office of Kansas State University (described further in the Technical Specifications included in Appendix B) will be employed.

3.3.9 Construction Quality Assurance/Construction Quality Control

Construction quality assurance/Construction quality control (CQA/CQC) will be implemented to ensure proper construction and compliance with the construction plans and specifications. Components of the QA/QC program are described Section 7 and in the CQC/CQA Plan included as Appendix E.
4 PUBLIC INVOLVEMENT

This Section describes a program of public involvement (PI) activities to be conducted during implementation of the RCRA Corrective Measures at the Plant. The activities have been developed to identify and anticipate community questions regarding CMI activities at the Plant.

The purpose of the PI program described in this section is to inform the local public officials, commercial interests, the community, and other interested or affected groups of the activities associated with implementation and operation of the Corrective Measures. In addition, the PI program is designed to anticipate questions and comments from and provide responses to the community regarding environmental issues arising from the Ash Grove's SWMUs addressed during the CMI. Public participation in the RCRA process (including the CMI) is an integral objective of the PI activities described in this section, which were prepared to be consistent with the most recent RCRA Public Participation Guidance (USEPA 2016).

In the past, the Chanute community has expressed an interest in environmental, health, and safety issues at the Plant. The community has had experience with Ash Grove through information dissemination and public meetings as a result of required public comment on the HWSA Part II Permit and appears to have knowledge of Ash Grove's operations. As the public continues to be informed about environmental issues and the CMI activities, it is anticipated that public interest will remain relatively high.

4.1 Community Profile

Chanute, the largest town in Neosho County with a population of approximately 9,500 people, is situated immediately south of the Plant. Land use immediately south of the Plant is residential and recreational, while land use north, east, and west of the Plant is primarily agricultural.

The Neosho River is located approximately 1.5 to 2 miles northeast of the Plant. Village Creek occurs along the northern margin of Ash Grove's property and discharges into the Neosho River, approximately 2 miles northeast of Chanute. Sport fishing and hunting enthusiasts frequent the floodplains of both the Neosho River and Village Creek.

4.2 Public Involvement Activities

All communications activities are designed to provide the public with current information during the CMI process. PI activities are described below.

4.2.1 Information Dissemination

To ensure that the community and other interested parties are informed of the CMI activities, the following information sources are provided:
# CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
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<table>
<thead>
<tr>
<th>Public Involvement Group</th>
<th>Contact Information</th>
</tr>
</thead>
</table>
| Site Contact for Community/Media Questions | Alan Finch, Plant Manager  
1801 Santa Fe  
Chanute, Kansas  
Telephone: 316-431-4500 |
| USEPA Region 7 Project Manager | Brian Mitchell  
RCRA Corrective Action Officer  
EPA Region 7  
AWMD/WRAP  
2.3 – P44  
11201 Renner Blvd  
Lenexa, Kansas 66219  
913-551-7633 work  
816-304-4158 cell |
| Kansas Department of Health and Environment Contact | Miles Stotts  
Environmental Program  
Bureau of Waste Management  
Kansas Department of Health and Environment  
Curtis State Office Building  
1000 SW Jackson  
Topeka, Kansas 66612  
785 296 1609 |
| Kansas Department of Health and Environment Contact | Steve Sellmeyer  
Hazardous Waste Permits Section  
Engineering Group  
Kansas Department of Health and Environment  
Curtis State Office Building  
1000 SW Jackson  
Topeka, Kansas 66612  
785 296 1236 |
| Information Repository | Chanute Public Library  
111 North Lincoln Avenue  
Chanute, Kansas 66720  
Telephone: 620-431-3820 |
| Public Meeting Sites (to be scheduled as needed) | Central Park Pavilion Community Building  
101 South Forest Street  
Chanute, Kansas 66720  
Capacity: 250  
Contact: Community Services  
Telephone: 620-431-5232 |
| | Neosho County Community College  
800 West 14th Street  
Chanute, Kansas 66720  
620-431-2820 |
| Mailing List (maintained by USEPA, Region 7) | To be included on the facility mailing list maintained by the USEPA or KDHE. Contact Brian Mitchell, USEPA, Region 7 or Steve Sellmeyer, KDHE, at the addresses listed above. |
| Media Contacts (for press releases and other information dissemination) | Chanute Tribune  
26 West Main Street  
Chanute, Kansas 66720  
www.chanute.com  
620-431-4100 |
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4.2.2 PI Activities during the CMI

The following PI activities will be conducted during the CMI:

- Update established information repositories when necessary. Publicize the availability and location of the information repositories.
- Publicize the name, address, and telephone number of the designated primary contact person who will respond to all inquiries about the CMI activities and process in a timely manner. The designated Ash Grove contact is Alan Finch, Plant Manager.

4.2.3 Activities upon Completion of the CMI

The following PI activities will be conducted at the conclusion of the CMI:

- Update and publicize information repositories, if necessary.
- Inform community leaders of the status and completion of the CMI.
5 GROUNDWATER MONITORING PLAN

A Groundwater Monitoring Plan (GWMP) is included as Appendix C, and contains details about the post-construction sampling required by the Permit. As discussed in the Permit, groundwater sampling is required to evaluate the effectiveness of the selected remedies to protect or restore groundwater to below the site-specific cleanup goals developed in the HHRA and presented in the CMS. Additionally, the sampling requirements contained in the USEPA Statement of Basis include soil/sediment and surface water monitoring at SWMUs 1 and 23. The GWMP describes the sampling program (including soil/sediment and surface water, where appropriate) that will meet the requirements outlined in the USEPA Statement of Basis.

5.1 Sampling and Analysis Plan (including Field Sampling Plan)

The GWMP includes a Sampling and Analysis Plan (SAP), which summarizes the sampling procedures and analytical methods that will be employed to collect and analyze the samples. The SAP also includes a field sampling discussion describing the specific field data collection techniques, protocols, and documentation requirements. All sampling will be performed according to the protocols specific to each medium and parameter of interest.

5.2 Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) has been prepared for the CMI and is included in Appendix D. The QAPP presents policies, project organization, objectives, functional activities, and specific quality assurance/quality control procedures that will be employed by Ash Grove to ensure that all technical data generated are accurate, representative, and of known and documented quality. The QAPP will be implemented to ensure that all environmental monitoring data meet data quality objectives applicable to the project.

5.3 Data Management Plan

The Data Management Plan (DMP, included in the QAPP) is an important component of the overall quality assurance system for data collection and management activities for the CMI. The purpose of the DMP is to ensure that all data collected in support of the RCRA corrective action process are properly documented, recorded, and distributed. As outlined in USEPA guidance (USEPA 1994), the DMP consists of a plan to document and track monitoring data and results; therefore, this DMP contains guidance regarding:

- Data documentation
- Project file requirements
- Progress reporting (as required by the Permit)
- Presentation of raw data and conclusions.
6 INSTITUTIONAL CONTROLS

The primary mechanism for implementing institutional controls to maintain the integrity of the corrective measures implemented throughout the Ash Grove Plant is a restrictive covenant and associated survey of the SWMU placed in the deed file with the Neosho County Register of Deeds. A model deed notice and restrictive covenant is attached as Appendix J. Deed notices will be prepared for each SWMU and will be in place and effective by the time the Corrective Measures construction activities are completed.

At the time of sale of any parcel of land within the boundaries of any of the SWMUs addressed by the Permit, a similar restrictive covenant will accompany the real estate sale documents, and will be executed by the buyer and Ash Grove as the seller. Subsequent transfers of ownership of the property must be accompanied by the restrictive covenant, so that the integrity of the corrective measures implemented throughout the SWMUs is maintained.

The provisions of any restrictive covenant placed on a property within the boundaries of each SWMU must contain the following specific requirements:

- The property will not be used for the installation and/or use of domestic, irrigation, and other water wells of any type except for groundwater monitoring wells and temporary dewatering wells for construction purposes.
- The property will not be used for residential uses unless the corrective measures are fully implemented and concentrations of constituents of concern in the groundwater meet the residential groundwater cleanup goals.
- No subsurface or other intrusive construction is permitted for areas where the worker cleanup goals are exceeded unless engineering controls are implemented to protect worker exposure. In addition, the work must be completed in conformance with a KDHE and/or USEPA-approved Work Plan.
- The deed notice and restrictive covenant for SWMU 1 must state that paraffin wax is buried on the property. The deed notice and restrictive covenant for SWMU 23 must state that CKD is present on the property.

The institutional controls that will be implemented at the Chanute Plant are summarized in Table 1.

6.1 Restrictions on Development

The restrictive covenant will contain requirements pertaining to activities that may occur following redevelopment of the property, including:

- Groundwater Use Limitations – The property owner will not use or allow others to use the groundwater underlying the property for human consumption or the irrigation of gardens or other domestic use, or install or cause to be installed new wells for human consumption or domestic purposes. This groundwater use restriction will not limit the use of existing monitoring wells on the property (if any) or installation of new wells on the property to monitor groundwater quality.
- Surface Water Body Limitations – The property owner will not create or allow others to create water features such as ponds, lakes, streams, or other water features that have the potential to be affected by groundwater. These surface water body limitations will not include the use of stormwater conveyance ditches or stormwater retention basins that are constructed above the typical water table elevation for that portion of Plant area contained in the SWMU boundaries.
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- Disturbance Limitations - In order to maintain worker safety, no person will dig, excavate, trench, or otherwise disturb the subsurface in areas identified to contain waste or impacted groundwater unless they follow the required environmental sampling and health and safety procedures outlined in this CMI Work Plan.

6.2 Restrictions on Worker Access and Intrusive Construction Work
Ash Grove is committed to ensuring the safety and health of its employees.

As part of the CMI process, Ash Grove will revise its existing Hazard Communication Program to include work performed in the SWMUs, including incidental contact with waste materials and intrusive work near the landfills. The primary mechanism for preventing worker exposure is avoiding intrusive work in the landfill areas. The written communication plan will be made available for review by all Plant employees, and will include the following information:

- List of hazardous constituents with a potential for employee exposure at the landfills
- Employee training on chemical hazards associated with exposure during intrusive activities, including:
  - Hazardous chemicals present in the landfills
  - Steps taken to prevent or reduce exposure to waste
  - How employees can protect themselves from exposure to waste through engineering controls, work practices, or use of personal protective equipment (PPE).

6.2.1 Informing Employees who do Work in the Landfill Areas
Before employees or contractors perform special (non-routine) tasks that may expose them to landfill waste, the Ash Grove Supervisor will inform them about specific chemical hazards associated with the work. The Supervisor also will inform them about how to control exposure and what to do in an emergency. Ash Grove will evaluate the hazards of these tasks and provide appropriate controls including PPE and all additional training as required.

Examples of special tasks that may expose employees to landfill waste include: cover repair and maintenance, repair of leachate collection piping, and collection of performance monitoring samples.

6.2.2 Informing Contractors and other Employees who do Work in the Landfill Areas
If employees or contract workers may potentially be exposed to landfill waste at the Plant (for example, during repair of the leachate collection piping or excavation near the landfill waste), Ash Grove will provide the contractors and their employees with pertinent safety information, including:

- The identity of the chemical constituents potentially included in the landfill waste
- Safe worker practices to prevent exposure.
7 CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

CQA/CQC will be implemented to ensure proper construction and compliance with the construction plans and specifications. The CQA/CQC Plan, included as Appendix E, contains additional details regarding the quality assurance and quality control measures that will be implemented during CMI construction. Additional components of the CQA/CQC program are described below.

7.1 Erosion and Dust Control

Erosion control measures will be inspected, and reports prepared documenting the function of erosion control features including silt fences and the graveled construction entrance. Use of dust control actions (e.g., water spraying) will be documented in field notes and with photographs. All inspection and reporting requirements of the SWPPP will be conducted by the Construction Contractor.

7.2 Cover Construction

The following elements will be verified to be consistent with Design Drawings and Technical Specifications:

- The lateral extent of cover placement will be staked by the Contractor using surveying equipment.
- Low permeability barrier and topsoil depths will be measured in the field using construction survey equipment or other appropriate means. Additionally, the extent of the cover will be documented with global positioning system (GPS) coordinates and photographs. Excavation depths will be field-verified with GPS-aided surveying.

7.3 Restoration

Restoration will be inspected and documented to confirm that the completed work is consistent with Design Drawings and Technical Specifications.

- Photographs will be taken to document that finished grades are smooth and gradual.
- Photographs will be taken to document that disturbed areas are seeded and mulched.
- Post-construction inspections will be conducted to confirm that the vegetation has been re-established and is healthy.
8 HEALTH AND SAFETY

Implementation of the Corrective Measures, Operation and Maintenance (O&M), and CMI sampling includes potentially hazardous activities that will be addressed by a HASP. These activities include:

- Physical hazards associated with construction of the cover at SWMU 17 South and the cover upgrades/maintenance on all SWMUs
- Direct contact with impacted soil or waste or inhalation of dust during construction of the covers
- Annual inspection and sampling required by the Permit.

A HASP (included in Appendix F) has been prepared as a guide for construction oversight, inspection, and sampling. The Corrective Measures Contractor will be required to prepare a HASP to govern their on-site activities.
9 ENVIRONMENTAL AND SAFETY DURING CONSTRUCTION

The following environmental controls will be implemented by the Construction Contractor during Corrective Measures construction activities:

9.1 Emissions, Dust, and Spills

Low permeability clay and topsoil placement will require disturbance of soil using petroleum-fuelled, hydraulically controlled equipment. The following BMPs will be implemented to reduce emissions, reduce potential environmental impacts, and control dust:

- Equipment will be well-maintained.
- Equipment refueling will not occur within 100 feet upgradient of surface water.
- The Corrective Measure Contractors will be required to maintain a spill kit for immediate response in the event of a release of fuel or hydraulic fluid.
- Dust control will be used as needed on disturbed areas with exposed soil. Dust control will include wetting of fill areas and haul roads and covering or lightly wetting stockpiles as needed. Dust control will be used to maintain a standard of no visible dust outside the work area and no visible dust in the breathing area of workers.

9.2 Erosion and Sedimentation

Landfill upgrade construction has the potential to cause erosion or sedimentation problems. Silt fence will be installed on the downgradient sides of all areas that will be disturbed during construction for the entire length of the work area. Any soil stored temporarily on site before placement will be maintained in a manner that limits run-on, run-off, and erosion of the stockpiles. Erosion control will be maintained per the KDHE Stormwater Construction Permit and a SWPPP, which will be prepared and implemented by the Construction Contractor prior to beginning active construction.
10 OPERATIONS AND MAINTENANCE

An O&M Plan has been prepared that outlines procedures for the operation, long-term monitoring, and maintenance of the Corrective Measures (Appendix G). Consistent with RCRA Corrective Action Plan guidance (USEPA 1994), the O&M Plan contains sections that describe the management approach, personnel training requirements, inspection schedules and forms, O&M contingency/corrective action procedures, and reporting requirement for the ongoing operation of the Corrective Measures implemented at the Plant.

10.1 Effectiveness and Performance Monitoring

Once the active construction and other corrective measures have been implemented, several elements of CMI performance will be monitored and are summarized in Table 2. These performance monitoring activities include:

- Annual collection of groundwater samples to assess extent and movement of impacted groundwater
- Annual collection of samples at SWMUs 1 and 23 to assess potential exposure to impacted sediment and surface water
- Regular inspections of the landfills for signs of erosion or exposed waste
- Collection of total leachate flow from the IRC systems in place at SWMUs 16, 17 North, and 17 South

The results of the sampling and evaluation detailed in Table 2 will be transmitted to USEPA in the Annual Report as required by the Permit (USEPA 2017).

10.2 Monitoring and Recordkeeping

The DMP (included as part of the QAPP (Appendix D) describes procedures that will be implemented during CMI construction and during long-term sampling and O&M to document and track monitoring data and results. The DMP will be maintained during the project life of the CMI and will be incorporated into the O&M Plan by reference. Documentation and data to be maintained during long-term O&M include:

- Progress report information
- Monitoring and laboratory data
- Personnel, maintenance, and inspection records.
11 PERMITTING

Permits required to implement the Ash Grove Corrective Measures include:

- Section 402 of the Clean Water Act, NPDES, KDHE General Permit for Stormwater Runoff
- Floodplain permitting for Neosho County.

A Notice of Intent for construction activities must be filed with the KDHE at least 60 days before construction, followed by an application for a Construction Stormwater Permit (KDHE 2017). The primary requirement of the general Construction Stormwater Permit is to develop and implement a SWPPP. Before construction, a SWPPP will be prepared in accordance with the requirements of the KDHE Pollution Control and NPDES Storm Water Runoff for Construction Activities General Permit. The SWPPP will be finalized upon selection of the Corrective Measures Contractor.

SWMU 23 exists within the Federal Emergency Management Agency (FEMA) 100-year floodplain. Before construction, the need for a floodplain permit will be assessed in consultation with the appropriate Neosho County agencies and the Kansas Department of Agriculture, Division of Water Resources.
12 PROJECT CLOSEOUT

Closeout for the Ash Grove Corrective Measures construction will consist of the preparation and submittal of the Corrective Measures Implementation Report, documenting the completion of the construction activities in accordance with the design documents. An O&M Plan has been prepared (Appendix G to this CMI Work Plan) presenting the ongoing inspection, maintenance, and reporting activities to be conducted at the SWMUs addressed by this Corrective Measures Implementation.

12.1 Pre-Certification Inspection

Upon completion of the Corrective Measure construction, the Project Consultant will conduct a pre-certification inspection to confirm that the work has been completed in accordance with the Design and Construction Specifications. The Contractor will document and remedy any deviations from the design before acceptance of the work.
13 PROGRAM MANAGEMENT, SCHEDULE, AND REPORTING

This section will describe the project team members that will implement the Corrective Measures, present a project schedule for implementing the Corrective Measures, and summarize the reporting and documentation that will be completed during active construction of the Corrective Measures at the Plant.

13.1 Project Team Members

The following key roles are identified for this project:

- **Project Owner** – Ash Grove is the Property Owner and is the party for which the work is being completed.
- **Project Consultant** – Arcadis is the engineering consultant responsible for preparing the design and the CMI Work Plan.
- **USEPA** – The United States Environmental Protection Agency is the oversight agency.
- **Contractor** – The Corrective Measures will be implemented by a Construction Contractor, to be selected through a competitive procurement process.

13.2 Cost Estimate

The estimated costs to implement the Corrective Measure, originally presented in the CMS, have been updated and are presented in Appendix I. The scope of CMI components included in estimated costs has been revised, where applicable, to reflect remedies contained in the Final Remedy Decision for the Statement of Basis, included in the Permit (USEPA 2017). Costs are included for initial construction of the Corrective Measures, where appropriate, with additional costs for annual sampling, reporting, and O&M.

The costs presented in Appendix I are intended to be used for financial assurance under RCRA. Costs should be accurate to within ± 20 percent, and were developed using local material unit rates, where available, supplemented by standard pricing data obtained found in RSMeans databases or experience with similar projects.

13.2.1 Construction and Capital Costs to Implement Corrective Measures

Capital costs to construct the Corrective Measures contained in the design drawings are presented in Appendix I and conform to the USEPA guidance on developing costs (USEPA 2000). The capital cost elements presented in Appendix I include labor, equipment, and material costs associated with expenditures required to construct the Corrective Action. The Ash Grove Permit condition III.Q.1.c allows Ash Grove to request, and the Director to grant, select expense, to not be included in the closure and post-closure expenses.

Ash Grove plans to begin construction of capital costs the year the implementation plan is approved, making their inclusion in the closure costs unnecessary to ensure the work is performed. So, Ash Grove developed the cost estimates using “capital costs” for the expenses with construction starting up at plan approval, and reserving closure costs for the RCRA TSDF units. Post-closure is treated in the typical
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
Ash Grove Cement Company, Chanute, Kansas

manner. The capital costs also include expenditure for professional/technical services that are necessary to support the Corrective Action.

Ash Grove is committed to implementing the Corrective Measures described in this work plan immediately upon approval by USEPA. Since construction of the remedies will be substantially complete and in place within 12 months of approval of the CMI Work Plan, Ash Grove is leaving out of the initial closure cost estimate the capital costs, to avoid the need to update the financial assurance mechanism for Estimated Costs and then the need to update the Estimate again to remove the addition in the same year; thus, saving company and Agency time reviewing and releasing documents serving no environmental benefit. Consequently, Ash Grove requests USEPA to approve the initial cost estimate, with the capital costs provided as informational values, and not for use in calculating the closure and post-closure cost estimate used to update the Financial Assurance. Instead, Ash Grove will update the initial post-closure information using the post-closure data, only supplying the capital cost for information purposes. The indicated information is presented in Appendix I. Ash Grove intends to maintain financial assurance by updating the total amount in the existing Financial Assurance Instrument, and is therefore not including a new document, but instead directs the reader to the current instrument on file for the facility.

13.2.2 Post-Closure O&M Costs
Appendix I presents post-closure and O&M costs for sampling, reporting, system operation, and maintenance activities for a 30-year project life. These post-closure and O&M costs will be included in the financial assurance.

13.3 Schedule
A schedule for implementation of the Corrective Measures is shown in Table 3. A revised detailed schedule will be prepared after selection of the Corrective Measures Contractor.

This schedule for implementing the components of the Corrective Measures requiring construction will supersede any schedule provided in the Permit.

13.4 Reporting
Reporting will include updates on construction in the quarterly progress reports and the final CMI Report. The CMI Report will describe the construction activities, present the results of quality assurance observations and quantities of low permeability material and topsoil placed, and will also summarize the progress of other components of the implemented Corrective Measures.

13.4.1 Construction Progress Meetings and Reports
During active construction, weekly progress meetings or calls will be held between the Contractor, the Project Consultant, and Ash Grove. This meeting will be used to discuss current progress, planned activities for the following week, and any new business or revisions to the work. The Contractor will log any problems, decisions, or questions arising at this meeting in their daily reports. Any matter requiring action that is raised in this meeting will be reported to the appropriate parties.
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
Ash Grove Cement Company, Chanute, Kansas

The Project Consultant will summarize in a Weekly Field Report the activities recorded on the Daily Field Reports. This report will be submitted each week to Ash Grove, and will include, at a minimum, the following information:

- The date, project name, location, and other information
- A summary of work activities during the reporting period
- A summary of construction situations, deficiencies, and/or defects occurring during the reporting period
- A summary of test results, failures, and retests.

13.4.2 Corrective Measures Implementation Report

At the completion of the work, the Project Consultant will submit a CMI Report to Ash Grove. This report will certify that the work has been performed in compliance with the Construction Drawings, the Project Specifications, and any revisions to these documents, except as properly authorized and implemented, and that the document provides the necessary information to support the certification. This CMI Report will also be submitted to USEPA as part of the requirements of the Hazardous Waste Management Facility Permit – Part II.

At a minimum, this report will include: (a) summaries of all construction activities; (b) observation logs; (c) a discussion of any changes from design and material specifications; and (d) Record Drawings.

The Record Drawings (as-builts) will include scale drawings depicting the location of the construction and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses). The Contractor will prepare these documents and include them as part of the CMI Report.
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
Ash Grove Cement Company, Chanute, Kansas

14 REFERENCES


### TABLES
<table>
<thead>
<tr>
<th>SWMU</th>
<th>Impacted Media</th>
<th>Engineering Controls</th>
<th>Cleanup Objective</th>
<th>Use Restrictions/IC Objective</th>
<th>Condition for Termination</th>
<th>Institutional Controls Planned or Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWMU 1 - Paraffin Waste Disposal Landfill</td>
<td>Waste/soil</td>
<td>Maintain existing cover, annual inspections</td>
<td>Prevent ingestion and dermal contact Limit future land use to non-residential uses Prevent damage to cover</td>
<td>No residential development Excavation performed only under controlled circumstances</td>
<td>ICs needed in perpetuity - levels allowing for unrestricted use will not be met by corrective action.</td>
<td>Plant excavation policies will include restrictions on excavation in SWMU</td>
</tr>
<tr>
<td></td>
<td>Groundwater/Surface Water/Sediment</td>
<td>Annual sampling</td>
<td>Prevent installation of potable water wells in vicinity of SWMU</td>
<td>No potable water supply wells may be installed at this parcel</td>
<td>Once MCLs or cleanup goals are met</td>
<td>Environmental Covenant recorded with Neosho County</td>
</tr>
<tr>
<td>SWMU 16 - Industrial Waste Landfill</td>
<td>Waste/soil</td>
<td>Maintain existing cover</td>
<td>Prevent ingestion and dermal contact Limit future land use to non-residential uses Prevent damage to cover</td>
<td>No residential development Excavation performed only under controlled circumstances</td>
<td>ICs needed in perpetuity - levels allowing for unrestricted use will not be met by corrective action.</td>
<td>Plant excavation policies will include restrictions on excavation in SWMU</td>
</tr>
<tr>
<td></td>
<td>Groundwater/Surface Water/Sediment</td>
<td>Maintain existing leachate collection system, MNA</td>
<td>Prevent installation of potable water wells in vicinity of SWMU</td>
<td>No potable water supply wells may be installed at this parcel</td>
<td>Once MCLs or cleanup goals are met</td>
<td>Environmental Covenant recorded with Neosho County</td>
</tr>
<tr>
<td>SWMU 17 North - North CKD Landfill</td>
<td>Waste/soil</td>
<td>Maintain existing cover</td>
<td>Prevent ingestion and dermal contact Limit future land use to non-residential uses Prevent damage to cover</td>
<td>No residential development Excavation performed only under controlled circumstances</td>
<td>ICs needed in perpetuity - levels allowing for unrestricted use will not be met by corrective action.</td>
<td>Plant excavation policies will include restrictions on excavation in SWMU</td>
</tr>
<tr>
<td></td>
<td>Groundwater/Surface Water/Sediment</td>
<td>Maintain existing leachate collection system</td>
<td>Prevent installation of potable water wells in vicinity of SWMU</td>
<td>No potable water supply wells may be installed at this parcel</td>
<td>Once MCLs or cleanup goals are met</td>
<td>Environmental Covenant recorded with Neosho County</td>
</tr>
<tr>
<td>SWMU 17 South - South CKD Landfill</td>
<td>Waste/soil</td>
<td>Install low-permeability cover</td>
<td>Prevent ingestion and dermal contact Limit future land use to non-residential uses Prevent damage to cover</td>
<td>No residential development Excavation performed only under controlled circumstances</td>
<td>ICs needed in perpetuity - levels allowing for unrestricted use will not be met by corrective action.</td>
<td>Plant excavation policies will include restrictions on excavation in SWMU</td>
</tr>
<tr>
<td></td>
<td>Groundwater/Surface Water/Sediment</td>
<td>Maintain existing leachate collection system</td>
<td>Prevent installation of potable water wells in vicinity of SWMU</td>
<td>No potable water supply wells may be installed at this parcel</td>
<td>Once MCLs or cleanup goals are met</td>
<td>Environmental Covenant recorded with Neosho County</td>
</tr>
<tr>
<td>SWMU 23 - Inactive Kiln Dust Landfill</td>
<td>Waste/soil</td>
<td>Maintain existing native soil cover, annual inspections</td>
<td>Prevent ingestion and dermal contact Limit future land use to non-residential uses Prevent damage to cover</td>
<td>No residential development Excavation performed only under controlled circumstances</td>
<td>ICs needed in perpetuity - levels allowing for unrestricted use will not be met by corrective action.</td>
<td>Plant excavation policies will include restrictions on excavation in SWMU</td>
</tr>
<tr>
<td></td>
<td>Groundwater/Surface Water/Sediment</td>
<td>Annual sampling</td>
<td>Prevent installation of potable water wells in vicinity of SWMU</td>
<td>No potable water supply wells may be installed at this parcel</td>
<td>Once MCLs or cleanup goals are met</td>
<td>Environmental Covenant recorded with Neosho County</td>
</tr>
<tr>
<td>Applicable System Performance Metric</td>
<td>Performance Assessment Method</td>
<td>Assessment Frequency</td>
<td>Parameter</td>
<td>Corrective Response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------------------</td>
<td>----------------------</td>
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<td></td>
</tr>
</tbody>
</table>
| Adequate control of impacted groundwater (plume not migrating off Plant property) | • Groundwater quality sampling  
• MNA evaluation  
• Groundwater level measurements and potentiometric surface mapping | Annual | • Metals, semi-volatiles  
• groundwater surface mapping | • Improve landfill cover  
• Improve leachate collection |
| No pathway for exposure via contact with waste | • Sediment and surface water sampling | Annual | • Metals, semi-volatiles | • Improve landfill cover/ check for exposed waste |
| Integrity of landfill covers | • Inspections of landfill cover | Quarterly | • Inspection and documentation | • Repair Landfill cover |
| Confirmation of IRC leachate collection system operation | • Collection of leachate volume | Quarterly | • Leachate volume | • Maintain and operate system  
• Improve leachate collection |
| Adequate security maintained | • Inspections of fencing and access controls | Quarterly | • Visual inspections | • Repair/maintain fence  
• Retrain staff on Plant security/access procedures |
## Table 3
Project Schedule
Corrective Measures Implementation Work Plan
Ash Grove Cement Plant
Chanute, Kansas

<table>
<thead>
<tr>
<th>Task</th>
<th>Duration</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit Work Plan to USEPA</td>
<td></td>
<td>December 22, 2017</td>
</tr>
<tr>
<td>USEPA Reviews and Approves Work Plan</td>
<td></td>
<td>TBD</td>
</tr>
<tr>
<td>Subcontractor Procurement</td>
<td>60 days</td>
<td>Completed within 60 days of USEPA Approval of CMI Work Plan</td>
</tr>
<tr>
<td>Contractor Mobilization - Preliminary Activities</td>
<td>30 days</td>
<td>45 days of Contract Award and Notice to Proceed</td>
</tr>
<tr>
<td>Implement stormwater BMPs and mobilize equipment</td>
<td>10 days</td>
<td>10 days following Contractor mobilization</td>
</tr>
<tr>
<td>SWMUs 1 and 23 cover fill and grading</td>
<td>30 days</td>
<td>Commence immediately following installation of BMPs at SWMUs 1 and 23</td>
</tr>
<tr>
<td>Site Clearing and Grading at SWMU 17 South</td>
<td>30 days</td>
<td>Commence immediately following installation of BMPs at SWMU 17 South</td>
</tr>
<tr>
<td>SWMU 17 South import and compact low-permeable fill</td>
<td>60 days</td>
<td>Immediately following site clearing</td>
</tr>
<tr>
<td>SWMU 17 South import and place topsoil</td>
<td>30 days</td>
<td>Following placement of low-permeable fill</td>
</tr>
<tr>
<td>Landfill final grading and re-vegetation</td>
<td>30 days</td>
<td>Following placement of topsoil</td>
</tr>
<tr>
<td>Watering and establish vegetation</td>
<td>60 days, as seasonal planting permits</td>
<td>Following final grading and seeding</td>
</tr>
<tr>
<td>Implement Engineering Controls and Deed Notices/Restrictive Covenants (including surveys, if needed)</td>
<td>90 days</td>
<td>Task can begin following USEPA approval of CMI Work Plan. Task will be completed by end of construction</td>
</tr>
<tr>
<td>Prepare and Submit Corrective Measures Implementation Report</td>
<td>90 days</td>
<td>Following completion of construction activities</td>
</tr>
<tr>
<td>Project Closeout</td>
<td></td>
<td>Following USEPA approval of CMI Report</td>
</tr>
</tbody>
</table>
FIGURES
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 16 - Industrial Waste Landfill

Notes:
1) All locations are approximate

Legend
- Drainage Ditch
- Surface Water Feature
- Solid Waste Management (SWMU) Area

GRAPHIC SCALE

0 200 400 Feet

FIGURE 3

City: Div/Group: Created By: Last Saved By: DHolmes
Z:\GISProjects\_ENV\Ash_Grove_Chanute_KS\MXD\2017\Corrective Measures Implementation Work Plan\Fig 3 - SWMU 16 Site Map_Zoom.mxd 12/21/2017 11:05:59 AM
APPENDIX A

Design Plans
APPENDIX D
Quality Assurance Project Plan
APPENDIX E
Construction Quality Assurance/
Construction Quality Control Plan
APPENDIX H
Corrective Action Object Goals from 2012 Ash Grove Chanute Plant Corrective Measures Study
APPENDIX I
Corrective Measures Implementation Cost Estimates
APPENDIX J
Model Deed Notice and Restrictive Covenant
CORRECTIVE MEASURE IMPLEMENTATION WORK PLAN

ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

DATE
DECEMBER 2017

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2 GENERAL NOTES AND LEGEND
3 OVERALL SITE PLAN
4 SWMUs #1 - PARAFFIN WASTE DISPOSAL LANDFILL
5 SWMUs #17 - SOUTH EXISTING CONDITIONS
6 SWMUs #17 - SOUTH SUBGRADES
7 SWMUs #17 - SOUTH FINAL GRADES
8 SWMUs #17 - SOUTH CROSS SECTIONS
9 SWMUs #23 - INACTIVE KILN DUST LANDFILL
10 DETAILS I
11 DETAILS II

KEY CONTACTS:
OWNER:
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SURVEYOR:

ENGINEER:

ARCHITECT/ENGINEER:

LOCATION MAP

ARCADIS U.S., INC.

PROJECT LOCATION

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4030 N. EAGLE WAY, SUITE 300
BEND, OREGON 97703
TEL.: 541-388-3100
FAX.: 541-388-3130

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BEVINGTON, KAYLEIGH

ARCADIS U.S., INC.

DECEMBER 2017
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LOCATION MAP

ARCADIS U.S., INC.

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BY:
BEVINGTON, KAYLEIGH

LOCATION MAP

ARCADIS U.S., INC.
GENERAL NOTES:

1. BASEMAP INFORMATION FROM THE FOLLOWING SURVEYS:
   a. SURVEY TITLED "ASH GROVE KILN DUST LANDFILL SOUTH EXISTING TOPOGRAPHY" BY AGRICULTURAL ENGINEERING ASSOCIATES, DATED 11-06-2017 AT A SCALE OF 1"=80' FOR SWMU #17 - SOUTH.
   b. SURVEY PROVIDED BY ASH GROVE CEMENT, DATED 2005.

2. HORIZONTAL DATUM IS KANSAS SOUTH STATE PLANE COORDINATE SYSTEM OF THE WORLD GEODETIC SYSTEM (WGS) 1984, US SURVEY FEET.

3. ALL ELEVATIONS ARE IN FEET AND ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).

4. ALL LOCATIONS INCLUDING PROPERTY LINES ARE APPROPRIATE, REFLECT AVAILABLE INFORMATION, ARE PROVIDED FOR REFERENCE ONLY, AND ARE SUBJECT TO FIELD VERIFICATION. EASEMENTS MAY NOT BE SHOWN.

5. THE CONTRACTOR WILL COMPLY WITH ALL REQUIREMENTS OF ANY ISSUED PERMITS AND ANY APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS. CONTRACTOR SHALL ACQUIRE ALL NECESSARY PERMITS TO COMPLETE THE WORK INCLUDING BUT NOT LIMITED TO A STORMWATER POLLUTION PREVENTION PLAN (SWPPP).

6. THE CONTRACTOR SHALL CALL "KANSAS ONE-CALL" (811) A MINIMUM OF 3 BUSINESS DAYS IN ADVANCE OF ANY EXCAVATION, BORING, AND/OR DIGGING TO DETERMINE THE LOCATION OF UNDERGROUND UTILITIES.

7. THE CONTRACTOR SHALL PROMPTLY NOTIFY THE OWNER AND ENGINEER, UPON DISCOVERY, AND BEFORE CONSTRUCTION ON THE SITE WHICH DIFFERS MATERIALLY FROM THOSE INDICATED ON THE CONSTRUCTION DOCUMENTS AND CONTRACT DRAWINGS. THE CONTRACTOR SHALL PROMPTLY, AFTER DISCOVERING, GIVE WRITTEN AND ORAL NOTICE TO THE OWNER AND ENGINEER OF DELAYS IN PROJECT SCHEDULE DUE TO EQUIPMENT MALFUNCTION, WEATHER, OR GENERAL FAILURE TO MEET PRODUCTION STANDARDS.

8. THE CONTRACTOR SHALL AT ALL TIMES KEEP THE CONSTRUCTION AREA FREE FROM ACCUMULATIONS OF WASTE MATERIALS OR RUBBISH; AND PRIOR TO COMPLETION OF THE WORK, REMOVE ANY RUBBISH FROM THE PREMISES AND ALL TOOLS, EQUIPMENT, AND MATERIALS.

9. ALL EQUIPMENT THAT COMES IN CONTACT WITH EXCAVATED MATERIALS SHALL BE DECONTAMINATED BEFORE REMOVAL FROM THE SITE. ALL EQUIPMENT DELIVERED TO THE SITE SHALL BE INSPECTED PRIOR TO ARRIVAL AND DAILY BEFORE USE BY EACH OPERATOR.

10. ALL TEMPORARY STOCKPILES AND EXCESS MATERIAL SHALL BE REMOVED TO AN APPROVED SPOIL SITE. ALL BORROW MATERIAL SHALL BE OBTAINED FROM AN APPROVED SOURCE.

ACRONYMS AND ABBREVIATIONS:

- AMSL: ABOVE MEAN SEA LEVEL
- APPROX: APPROXIMATE
- BGS: BELOW GROUND SURFACE
- CV: CUBIC YARDS
- E: EXISTING
- EL: ELEVATION
- FT: FEET
- H:V: HORIZONTAL: VERTICAL
- IN: INCHES
- MAX: MAXIMUM
- MNL: MEAN SEA LEVEL
- N: NORTHING
- NAD83: NORTH AMERICAN DATUM, 1983
- NAVD: NATIONAL GEODETIC VERTICAL DATUM, 1988
- TEMP: TEMPORARY
- TYP: TYPICAL

LEGEND:

- EXISTING GROUND SURFACE CONTOUR
- PROPOSED GRADE MAJOR CONTOUR
- PROPOSED GRADE MINOR CONTOUR
- EXISTING EDGE OF PAVEMENT
- EXISTING FENCE LINE
- EXISTING TREELINE
- LIMITS OF EXISTING CAP
- EXISTING INFILTRATION TRENCH

ACRONYMS AND ABBREVIATIONS:

- AMSL: ABOVE MEAN SEA LEVEL
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- EXISTING FENCE LINE
- EXISTING TREELINE
- LIMITS OF EXISTING CAP
- EXISTING INFILTRATION TRENCH

[Diagram of existing ground surface contours, proposed grade major and minor contours, existing edge of pavement, existing fence line, existing tree line, limits of existing cap, existing infiltration trench, with corresponding legend keys and notes.]

[Diagram showing contour lines and noted features with appropriate labels.]

[Diagram indicating existing ground surface contours with approximate existing edge of pavement, existing fence line, existing tree line, limits of existing cap, and existing infiltration trench, with relevant notes about surveys and reference systems.]
NOTES:

1. Cover all exposed waste areas with a minimum of 6 inches of topsoil. Grade topsoil to match existing grade such that positive drainage is provided. Install permanent seeding in accordance with the technical specifications.
NOTES:

1. INSTALL NEW CLAY CAP WITHIN LIMITS SHOWN. GRADING PLANS AND DETAIL ARE SHOWN ON SUBSEQUENT SHEETS.

2. THIS AREA IS CURRENTLY LEASED TO A PROPANE SUPPLIER. THE LEASE EXPires IN FEBRUARY 2018 UPON WHICH TIME THE SUPPLIER WILL REMOVE ALL TANKS AND FOUNDATIONS. OWNER WILL REMOVE ELECTRICAL SERVICE TO POWER POLE AT PROPANE TANK.

3. REMOVE EXISTING FENCE EXCEPT THE SOUTHERN BOUNDARY.

4. CLEAR AND DEBRIS ALL VEGETATION WITHIN LIMITS OF THE NEW CAP.

5. CONTRACTOR SHALL TAKE PRECAUTIONS IN THE AREA OF THE EXISTING INFILTRATION TRENCHES. EXACT DEPTH OF TRENCHES AND CONDUIT LINES ARE UNKNOWN.

6. REMOVE AND DISPOSE STEEL CASING AND CONCRETE FOUNDATION. CUT INNER CASING THREE (3) FEET BELOW THE EXISTING GROUND SURFACE ELEVATION. TRENCH GROUT WELL STARTING AT BOTTOM OF WELl AND MOVE UPWARDS UNTIL ENTIRE WELL DEPTH IS GROUTED. FOR BIDDING PURPOSES CONTRACTOR SHALL ASSUME MONITORING WELLS ARE EACH APPROXIMATELY 35 FEET DEEP.
NOTES:

1. STRIP EXISTING TOPSOIL AND GRADE TO THE GRADES SHOWN. FOR GRADING PURPOSES ENGINEER HAS ASSUMED 6 INCHES OF EXISTING TOPSOIL WITHIN THE PREVIOUSLY CAPPED AREA AND 2 INCHES OF TOPSOIL EVERYWHERE ELSE. EXTENT OF EXISTING CAP IS SHOWN ON SHEET 5.
UNPAVED HAUL ROAD
B
A
APPROXIMATE LIMITS OF EXISTING CAP
CAP OVER EXISTING CAP
ROADSIDE DITCH
CAP OVER NON-CAPPED AREA
DIVERSION BERMS (TYP.)
NOTES:

1. COVER ALL EXPOSED WASTE AREAS WITH A MINIMUM OF 6 INCHES OF TOPSOIL. GRADE TOPSOIL TO MATCH EXISTING GRADE SUCH THAT POSITIVE DRAINAGE IS PROVIDED. INSTALL PERMANENT SEEDING IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.

2. LOCATION OF FENCE AND GATES IS APPROXIMATE. EXACT LOCATION SHALL BE FIELD DETERMINED BY OWNER AND CONTRACTOR BASED ON LOCATION OF UTILITIES, RIGHT-OF-WAYS AND OWNER’S PREFERENCE.

3. THE WOODED AREA OF THE EASTERN SIDE OF SWMU #23 WILL SERVE AS A NATURAL BOUNDARY. CONTRACTOR SHALL TIE FENCE INTO THE WOODED AREA.
3-WIRE FENCE

NOT TO SCALE

NOTES:
1. POSTS AND HARDWARE SHALL MEET THE REQUIREMENTS OF KANSAS DEPARTMENT OF TRANSPORTATION SPECIFICATION 2302.2.
2. PROVIDE BARBED WIRE MEETING THE REQUIREMENTS OF KANSAS DEPARTMENT OF TRANSPORTATION SPECIFICATION 1620.2.
3. ATTACH STEEL "NO TRESPASSING" SIGN TO FENCE POST AT A SPACING OF NO MORE THAN 250 FEET.

DOUBLE PIPE TUBING SWING GATE

NOT TO SCALE

NOTES:
1. PROVIDE DOUBLE 12' PRE-FABRICATED PIPE TUBING GATE WHERE INDICATED.
2. PIPE SHALL BE 2" DIAMETER, 18-GAUGE STEEL TUBING WITH PAINTED FINISH.
3. CONTRACTOR SHALL INSTALL ALL NECESSARY HARDWARE.
4. CONTRACTOR SHALL SUBMIT SHOP DRAWING FOR APPROVAL BY THE ENGINEER.
NOTES:

1. SEE SHEET 7 FOR PERIMETER DITCH GRADES
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section is intended to provide a general description of the Scope of Work only and is not to be regarded by the CONTRACTOR as a complete listing of construction activities necessary.

B. The CONTRACTOR shall provide all necessary labor, materials, equipment, tools, utilities, and protective equipment as required to complete the Work acceptable to the ENGINEER and OWNER and in compliance with all applicable local, state and federal codes.

C. This Work is being performed in accordance with the Corrective Measures Implementation Work Plan approved by the United States Environmental Protection Agency (USEPA), EPA ID # KSD031203318.

D. Work under this CONTRACT Document includes but not limited to the following:

1. SWMU #1 – Installation of a new perimeter 3-wire fence at the location shown on the Construction Drawings. Cover all exposed waste and denuded areas with 6 inches of topsoil as directed by the ENGINEER and install permanent seeding in accordance with these Technical Specifications.

2. SWMU #17 South – Installation of a new soil cover system consisting of 18 inches of clay and 6 inches of topsoil. Construction activities will include, but not limited to, installation of erosion and sediment controls, abandonment of existing monitoring wells, removal of woody vegetation, stripping existing topsoil, site grading, importation and backfilling of clay soil and topsoil and permanent seeding.

3. SWMU #23 – Installation of a new perimeter 3-wire fence at the location shown on the Construction Drawings. Cover all exposed waste and denuded areas with 6 inches of topsoil as directed by the ENGINEER and install permanent seeding in accordance with these Technical Specifications.

1.02 CONTRACTOR USE OF SITE

A. Time Restrictions for Performing Work on OWNER’s Chanute Facility is 7:30 a.m. to 5:30 p.m., Monday through Friday.
B. CONTRACTOR shall not extend operations beyond assigned work areas.

C. CONTRACTOR shall be responsible for repairing damages caused to client property at CONTRACTOR’s expense.

1.03 HEALTH AND SAFETY PROVISIONS

A. CONTRACTOR shall be responsible for full compliance with applicable health and safety provisions by its employees and by subcontractors and their employees assigned to work in or near the designated work area. Underground utilities in or near the designated work area are the primary threat to worker health and safety. CONTRACTOR is responsible for locating and field verifying all utilities before excavation begins.

B. CONTRACTOR shall conform to the requirements of OWNER’s Contractor Safety Management System (CSMS) Documents (see Attachment 1). These requirements include implementation of OWNER’s Risk Exposure & Project Expectations Assessment Tool (REPEAT), provision of CONTRACTOR health and safety performance history (including company injury data and MSHA/OSHA citations), conformance with OWNER’s expectations as summarized in the Contractor Health and Safety Manual template, completion of the facility’s Site-Specific Hazard Awareness Training (SSHAT), and effective daily/weekly job site safety performance checks.

C. CONTRACTOR is required to achieve and maintain “compliant” status under the safety and insurance program administered for OWNER by Browz, LLC. Failure to maintain “compliant” status is failure to perform the work as required by the parties’ agreement. CONTRACTOR has up to 120 hours to address changes in “compliant” status.

D. All work performed shall conform to the building, fire, and safety codes, the ordinances, and the rules and regulations of any legal body having jurisdiction.

E. Because OWNER sources raw materials from an on-site quarry through surface mining operations, the Chanute facility falls under the jurisdiction of the Mine Safety & Health Administration (MSHA). This MSHA jurisdiction includes the downstream cement production operations and all supporting activities on-site, whether these are conducted by OWNER or by CONTRACTOR. Hence, the CONTRACTOR's compliance shall include compliance with the MSHA regulations codified in Title 30 of the Code of Federal Regulations (CFR). These regulations are electronically available at the following web-link: http://www.msha.gov/regs/30cfr/. CONTRACTOR shall be responsible for full compliance with applicable health and
safety provisions by its employees assigned to work in or near the designated work area. CONTRACTOR shall bear sole responsibility for any penalties and down time charges imposed for noncompliance.

F. All workers shall have 24-hour new miner training per Part 46.5 of the MSHA regulations. CONTRACTOR shall submit to OWNER training certificates for all workers prior to mobilizing to the site.

G. CONTRACTOR shall maintain a copy of their Health and Safety Plan on-site and shall ensure that all on-site personnel have reviewed and are familiar with the plan.

H. CONTRACTOR shall be responsible for directing the use of personal protective clothing and equipment to minimize employee exposure in accordance with MSHA standards. CONTRACTOR’s site-specific Health and Safety Plan shall include provisions for emergency conditions and information concerning local emergency facilities.

I. CONTRACTOR shall acknowledge receipt of the Ash Grove Contractor On-Site Health and Safety Procedures (see Attachment 1).

J. The work is located in an active cement plant and all plant-specific safety and work-permit requirements shall be adhered to.

END OF SECTION
ATTACHMENT 1

Owner’s Contractor Safety Management System (CSMS) Documents
Receipt of Contractor Safety Packet

Contractor: ________________________________

Project: ________________________________

I acknowledge receipt of the Ash Grove Cement Company Contractor Safety Packet which consists of the following items:

✓ Completed Job Planning Form
✓ Contractor Health & Safety Performance History
✓ Contractor Health and Safety Manual

Print Name: ___________________________ Signature: ___________________________

Title: ________________________________ Date: ________________________________
# Job Planning Form

## Contractor Safety Management System

### Appendix A

### Section 1 - These questions are for Ash Grove to answer:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A. Is the contractor Browz-compliant?</td>
<td>B. As of what date?</td>
</tr>
<tr>
<td></td>
<td>A.</td>
<td>B.</td>
</tr>
<tr>
<td>2.</td>
<td>A. Has the contractor received, signed and returned acknowledgment of receipt of the Contractor Safety Manual?</td>
<td>B. Do the people doing the work have a copy of the Safety Manual with them?</td>
</tr>
<tr>
<td></td>
<td>A.</td>
<td>B.</td>
</tr>
<tr>
<td>3.</td>
<td>What is the job? What must be accomplished?</td>
<td>Description:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>What hazards pose a risk to the safety of workers if the job is <strong>not</strong> done?</td>
<td></td>
</tr>
</tbody>
</table>
5. When is the best time to do this job when there might be less risk?

6. What unique constraints does this job have, such as completion deadlines, to avoid shutting down operations?

7. Is this job:
   - Routine?
   - Repetitive?
   - Non-routine?
   - Emergency
   - Never been done before?

   (If the job is Non-routine, Emergency, or Never been done before, you must do a baseline risk assessment in the Risk Register. If the risk score is greater than or equal to 800, the plant manager must approve the work.

   Indicate the nature of the job:

   Baseline Risk Score, if needed:

   Plant Manager approval, if Risk Score is ≥ 800:

     Plant Manager Signature / Date

8. A. What other jobs will be taking place in the area or nearby that may affect, or be affected by, this job?
    B. How will you notify others about this job?

9. A. Does this work require the use or replacement of parts / equipment that are different from OEM specifications and therefore requires advanced approval?
    B. If yes, who must grant approval and by when?
10. A. What Standard Operating / Maintenance Procedures, JSAs, or H&S policies are available that are specific to this job?  
B. If there are procedures available, who will provide them to the contractor and by when?  

11. By whom and how often must this job have a safety inspection?  

**NOTE:** Return safety inspection forms to the AGC Project Manager / Coordinator during the same shift on which the inspections are completed.  

<table>
<thead>
<tr>
<th>Contractor Employee (Name or Title):</th>
<th>Ash Grove Cement Employee (Name or Title):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of Inspection:</td>
<td>Frequency of Inspection:</td>
</tr>
</tbody>
</table>

12. Who within Ash Grove is responsible for completing and posting the post-job evaluation?  

---

**Section 2 - These questions must be answered by the Contractor and Ash Grove:**

1. List the expected steps to complete this job.  
2.  
3.  
4.  

---

3
<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>How long will this job take and during what hours will the work be done?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>How many hours:</td>
<td>How many hours:</td>
</tr>
<tr>
<td></td>
<td>How many days:</td>
<td>How many days:</td>
</tr>
<tr>
<td></td>
<td>How many weeks:</td>
<td>How many weeks:</td>
</tr>
<tr>
<td></td>
<td>What hours will be worked:</td>
<td></td>
</tr>
</tbody>
</table>

|   | How many people are needed to do the job?                                |
| 3 |                                                                         |

|   | A. Will a supervisor be present whenever workers are present?           | A.                                                                         |
| 4 | B. If the answer is No, explain how the project will be staffed.        | B.                                                                         |

| 5 | If all workers are not English-speaking, will an interpreter be present at all times? |

| 6 | Can you, the contractor, provide task training records for all personnel assigned to this job, including subcontractors? |

<p>| 7 | What large mobile equipment (loaders, dozers, dump/haul trucks, excavators, skid steer loaders, cranes, etc.) will be used on this job? |</p>
<table>
<thead>
<tr>
<th></th>
<th>A.</th>
<th>B.</th>
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</thead>
</table>
| 8. | Will you, the contractor, need Ash Grove to supply any tools / equipment / personnel or operators for this job?  
  B. If yes, specify what is needed.  
  | A. | B. |
| 9. | Is the job to take place indoors or outdoors?  
  | A. | B. |
| 10. | Will weather (hot, cold, raining, snow/ice, wind, etc.) adversely affect the ability to complete the job safely?  
  B. What controls will be in place to manage the effect of adverse weather?  
  | A. | B. |
| 11. | Does this work involve confined space entry?  
  B. If yes, you, the contractor, must have a CSE program and employees trained in CSE procedures.  
  | A. | B. |
| 12. | Does this work involve working at heights using a Personal Fall Arrest System (PFAS) or Fall Restraint System?  
  B. If yes, you, the contractor, must provide the PFAS or fall restraint system and employees must be trained in the safe, correct use of that equipment.  
  **Note that a Working at Height Permit may be required.**  
  | A. | B. |
| 13. | Will the work involve removing hand or guard rails, or the removal of walkway sections (grating, diamond plate, etc.), or the removal of roofing, equipment, ducts, etc. that will create an opening through which a person could fall?  
  B. If yes, you, the contractor must obtain a Hazardous Opening Permit and meet or exceed Ash Grove requirements for personnel protection.  
<p>| A. | B. |</p>
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</thead>
<tbody>
<tr>
<td>13.</td>
<td>C. Will the work take place where other people (Ash Grove employees / contractors) are working that you may need to coordinate with or work around?</td>
<td>A.</td>
<td></td>
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<tr>
<td></td>
<td>D. If yes, list who must be coordinated with and when.</td>
<td>B.</td>
<td></td>
<td></td>
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<tr>
<td>14.</td>
<td>A. Is additional lighting needed for night work or for work in less well-lit areas?</td>
<td>A.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>B. If yes, who will supply the additional lighting?</td>
<td>B.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>A. Will insects, animals, reptiles be present?</td>
<td>A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B. If yes, how will this hazard be managed?</td>
<td>B.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Does this work involve any of the following (circle all that apply)?</td>
<td>How will you prevent harm to people, property, the environment, or reputation should there be an unexpected or unwanted release of energy from any of these activities?</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Use of internal combustion engines (e.g. generators, welders, pressure washers, etc.) in enclosed areas</td>
<td></td>
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<tr>
<td></td>
<td>• Material handling / flatbed off-loading</td>
<td></td>
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<td></td>
<td>• Chemical use or application</td>
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<td></td>
<td>• Welding / Cutting / Arc Gouging</td>
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<td></td>
<td>• Crane lift</td>
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<td></td>
<td>• Energized electrical work</td>
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<td></td>
<td>• Use of high pressure water system</td>
<td></td>
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<tr>
<td></td>
<td>• Use of explosives, blasting agents, Cardox tubes</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Work on or around elevators</td>
<td></td>
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<td></td>
<td>• Work on or over water</td>
<td></td>
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<tr>
<td></td>
<td>• Vacuum truck operation</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Quarry activities</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Hauling / dumping at or onto a stockpile</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Operating tools or equipment with exposed rotating parts or shafts
- Work on a live rail line
- Excavation(s) more than 4 ft. deep
- Noise ≥ 90 dBA
- Steel erection
- Demolition
- Lay-down yard or similar area for temporary staging of materials or equipment?

17. Are any of the following permits required?
   - Confined Space
   - Hazardous Opening
   - Working at Height
   - Crane Lift Plan / Critical Lift Plan
   - Hot Work
   - Energized Work
   - Other

   If yes, the contractor must obtain the permit(s) before beginning the work.

   List the permits required for this job:
   -
   -
   -
   -
   -
   -
   -

18. What are the specific Stop-the-Job Triggers for this work?
   1.
   2.
   3.
   4.
   5.

19. What are the signals for a Stop-the-Job Trigger?
   (Verbal, hand signals, horn blast, etc.) – Specify:
This Job Planning Form was completed by:

______________________________________________  ______________________________________

Name and Title (Contractor Representative)  Date

______________________________________________  ______________________________________

Name and Title (Ash Grove Representative)  Date
b) Appendix B: Contractor Health and Safety Performance History

Please provide the information requested below. Accurate answers are required. Inaccurate information may disqualify you from work at Ash Grove Cement Company.

Company Name: _______________________________ Date: ________________

Project: _____________________________________________________________________

Submitted by: ___________________________ Phone: _______________________

1. Describe any fatalities¹ your company has experienced during the previous five (5) years:

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

¹ Any fatalities in last five years requires Ash Grove Vice President to approve contractor use.

2. Provide the following information for the last three years:

<table>
<thead>
<tr>
<th></th>
<th>20__ (e.g. 2012)</th>
<th>20__</th>
<th>20__</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of OSHA / MSHA Citations¹</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of hospitalizations (1 or more nights)²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of amputations³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of injuries involving 5 or more days away from work⁴</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ 25 or more citations in any year requires plant manager approval.
² 1 hospitalization - requires plant manager to approve contractor use; 2 or more require Vice President approval.
³ 1 amputation - requires plant manager to approve contractor use; 2 or more require Vice President approval.
⁴ 1-2 cases – requires plant manager to approve contractor; 3 or more require Vice President approval.

Audited by: _______________________________ Date: ________________
Appendix C: Contractor Health and Safety Manual

Contractors working on Ash Grove Cement Company premises are expected to work safely and follow the conventional health and safety practices and regulations outlined in this manual. These are not an exhaustive listing of every applicable health and safety rule, regulation, or practice that may apply to your work. However, they do represent a baseline of expected performance.

The manual consists of three sections:

1. **Contractor On-Site Health and Safety Procedures**

2. **Summary of Applicable MSHA Regulations**

3. **Ash Grove Cement Company Plant Safety Rules**

It is your responsibility as a contractor working on Ash Grove premises to know and understand the contents of this manual. If you have health and safety practices that exceed those provided here, you are most welcome to follow those. However, you may not use any health and safety practices that provide less protection than those identified here.

If at any time you have questions or are unsure about potential risks, it is your responsibility to stop working, contact your assigned Ash Grove project manager / coordinator and have the issue resolved.

We welcome you to Ash Grove and anticipate that you will meet or exceed the high health and safety expectations we have for you as a contractor or subcontractor working for our company.
Index

Section 1: Contractor On-Site Health and Safety Procedures................................. 2 – 14

Section 2: Summary of Applicable MSHA Regulations........................................ 15 – 19

Section 3: Ash Grove Cement Company Plant Safety Rules............................... 20 - 23
Section 1
Contractor On-Site Health and Safety Procedures
Section 1: Contractor Health and Safety Manual

Contractor Log and Sign-In

You must sign-in daily when arriving at the plant. Provide the names of each employee you have on site. Also, provide your Ash Grove representative with emergency contact information.

Injury and Illness Reporting

 Contractors must immediately report all work-related injuries and illnesses occurring on Ash Grove property to an Ash Grove representative and the appropriate regulatory agency if warranted.

Training

Contractors must receive proper safety training in order to work on Ash Grove Cement property.

If you as a contractor or contractor employee meet the MSHA definition of a miner, your company must provide you the following training prior to arriving at the plant site:

- New Miner Training (24 hours) or Experienced New Miner Training before being assigned to work in the plant or quarry
- Task Training appropriate to assigned work
- Annual Refresher Training (8 hours)

All contractors must arrive at the site with proper documentation of your training, as is described in 30 CFR Part 46, and which is on the correct MSHA-approved form in a legible format.

All contractors, service workers, vendors, visitors and others must receive Site Specific Hazard Awareness Training before any work can take place.

Personal Protective Equipment

Required Personal Protective Equipment for Contractors performing work on Ash Grove property:

- Hard hat
- Safety glasses with side shields
- Safety-toed footwear
Contractors must use other PPE such as respirators, hearing protection, gloves, welding helmets, face shields, goggles, chemical resistant coveralls, personal flotation devices, etc., as conditions warrant.

**Airborne Contaminants**

Contractors must take steps to protect themselves from dust and dust containing crystalline silica or asbestos; welding fume; chemical vapors and gases, and other airborne contaminants. When working in conditions where exposures may occur, you must use an approved respirator and you must be fit-tested and medically approved to use the respirator. Contractors must use work practices that will prevent or minimize dust generation. In some cases air monitoring for airborne contaminants may be required.

**Workplace Examinations**

Contractors must perform daily workplace examinations in the area the contractor is working. Documentation of the daily workplace examinations must be kept. The documentation must have the date of the examination, the time the examination was performed, and the name of the person performing the examination. When hazards are found you must:

- Correct the hazard, or
- Barricade the hazard to protect other workers from the hazard, and
- Notify your immediate supervisor about the hazard and/or an Ash Grove representative.

**Control of Hazardous Energy**

Contractors working on machinery or equipment that can start up or move unexpectedly must protect themselves and others from hazardous energy by:

- Locking out the energy source, bleeding any retained energy or blocking against hazardous movement, and
- Tagging the energy source with your name, the date, and reason for the lockout,
- Testing to ensure that the lockout is effective, and by
- Notifying others who may be affected by the energy control procedures
- Knowing, understanding, and following Ash Grove’s group lockout procedures. You must talk with your Ash Grove representative about the plant’s procedures before you undertake any group lockout.

**Fall Protection**

Contractors must use fall protection where there is a danger of falling. The fall protection used must include:
• A fall protection plan developed for the project detailing the fall exposures and controls,
• An approved anchor point,
• Full body harness, and
• Appropriate connecting device such as a shock absorbing lanyard or self-retracting lifeline.
• Contractors using fall prevention systems must be able to provide task training documentation on the use of a fall arrest system.
• Fall protection is required when using mobile aerial lifts

Confined Spaces

Contractors must protect themselves when entering a confined space by:
• Determining if the entry requires a permit and obtaining a permit when needed
• Testing the atmosphere for hazardous gases, vapors, dusts, or fumes
• Taking steps to control or eliminate sources of hazardous atmospheres
• Locking out all supply and discharge points into the space
• Removing materials that could cause engulfment
• Isolating or removing other physical hazards
• Using appropriate fall protection
• Having an Attendant watch at all times during the entry
• Use a harness with an attached lifeline that is attended continuously by another person when entering bins, tanks, silos, hoppers, or surge piles

Mobile Equipment

Contractors must inspect each piece of mobile equipment before it’s put into service and document the inspection. Things to inspect for include but are not limited to:

• Functioning lights
• Windshield wipers
• Audible backup alarm
• Functioning service and parking brakes
• Proper oil, hydraulic and fuel levels
• Crack-free windshields
• Tire condition
• Steering condition

Any defects identified during the inspection that affect the safe operation of the mobile equipment must be corrected prior to placing the equipment into service. You must never approach mobile equipment without first getting the attention of the operator. You must never park mobile equipment in the blind spot of other mobile equipment. All parked
mobile equipment must be chocked. An audible warning must be given prior to placing mobile equipment into operation.

All mobile equipment operators must be appropriately task trained for the equipment they will operate, including equipment owned by Ash Grove.

Contractors wishing to use Ash Grove and/or rental mobile equipment on site (e.g. a forklift; loader; aerial lift; etc.) must receive approval from Ash Grove management / supervision before use.

Contractors must ensure that their employees are task trained on the specific piece of equipment before use and are responsible for providing necessary training, in accordance with their own Part 46 training plan. Documentation of training is required. You must have a record of the training available to provide to your Ash Grove representative upon request.

Ash Grove is not responsible for task training of contractor employees.

**Crane Safety**

Contractors using cranes on Ash Grove property must:

- Provide a certified operator; be ready to provide a copy of the certification to the assigned Ash Grove representative
- Supply personnel qualified to conduct set-up, maintenance, signaling, rigging and dismantling
- Supply equipment that has an up-to-date inspection and that is free of mechanical defects
- Conduct and document a pre-use inspection each shift before use
- Complete a pre-lift checklist and conduct a planning meeting prior to each lift
  - Use your own pre-lift checklist
  - Alternatively, use Ash Grove’s checklist if the contractor does not have one available.
  - Use of Ash Grove’s checklist does not constitute supervision or approval by Ash Grove
- Develop a lift plan or critical lift plan, as conditions dictate
- Coordinate lifts with the assigned Ash Grove representative

**Electrical Safety**

All electrical work must be done by a competent person if the work involves opening electrical enclosures such as breakers, motor starters, and knife switches; in some states you must meet state-specific requirements for electrical work. You must wear prescribed arc flash and/or voltage-rated protective gear, per NFPA 70E, when working on energized electrical circuits. De-energize and lockout electrical circuits before doing
work on them; obtain an electrical hot work permit if your work must be done on energized circuits. It is your responsibility to keep others out of harm’s way while you perform electrical work.

All power and extension cords must be continuity tested and checked. They must be of the correct gauge wire and in serviceable condition. Ground prongs must be in place and there can be no cuts in the external jacket and no exposed copper showing anywhere. You must use GFCI-protected electrical cords when working in wet environments and cords must be protected from damage by mobile equipment. Extension cords cannot be passed through doors, windows or other openings where the cord could become crimped, cut or otherwise damaged.

Thermography Safety

Contractors, and anyone assisting a contractor, must wear arc flash protective equipment when doing thermography work on electrical switchgear and components. You must keep others out of the area while this work is performed.

Fire and Explosion Prevention

Contractors must prevent fires and explosions by:

- Completing a Hot Work Permit when required for the work. Designate a Fire Watch as appropriate to the conditions.
- Testing the air for the presence of flammable gases, vapors or dusts before doing work involving open flames or the production of sparks in areas where these gases, vapors or dusts may be, or are, present. Contractors must not perform hot work when LEL readings are more than 10%.
- Removing or covering with a nonflammable tarp all flammable or combustible materials where hot work will be done
- Providing a readily available fire extinguisher in the immediate area where hot work is taking place;
- Using explosion-proof lighting when working in areas where waste fuel or coal dust is handled, stored, or processed.

Working in Heat

Good work practices for contractors working in areas with high temperatures, high humidity and/or hot surfaces, are:

- Have plenty of cool water or other hydrating drinks available and drink them often
- Use forced ventilation to provide cooling air flow when possible
- Allow the hot area to cool to the point that a supervisor or manager authorizes work in the area
- Monitor employees for signs of heat stress
- Schedule work for cooler portions of the day
• Inspect areas carefully for crusted over hot, dusty material that could flow, become airborne or fall on you. If such materials are found you must either remove / cover the material, wear appropriate PPE or not do the work until a safe environment can be provided.

• Contact an Ash Grove representative whenever questions arise about heat, hot surfaces, or hot materials.

**Scaffolding**

Good work practices for contractors using scaffolding are:

• Assign a competent person to oversee and inspect scaffold erection and use

• Inspect the scaffolding components for signs of damage; do not use scaffolding that is damaged.

• Use only scaffolding parts that are designed to fit together; do not use scaffolding erected from mis-matched parts.

• Ensure that the scaffold has appropriate handrails, toe boards and access ways (that is, ladders or steps)

• Ensure that the scaffold is stable and properly braced

• Ensure that the scaffold is anchored if it is four or more times higher than it is wide

• Use fall protection if there is a danger of falling.

**Excavation, Trenching and Shoring**

Contractors working in a trench or excavation that is four feet deep or greater must:

• Have an excavation competent person on-site for daily inspection of excavations

• Have ladder access within 25 feet of travel

• Enter only if the trench is properly benched, sloped, shored or shielded through the use of bracing or a trench box and the spoil pile is a safe distance from the edge of the excavation

• Ensure that there is no hazardous atmosphere present and no exposed utilities

• Stay out of the trench if water is seeping or running into it.

• Ensure that mobile equipment maintains a safe operating distance from the edge

• Erect fencing or other barricading to keep persons or equipment out of the excavation

**Housekeeping / Safe Access**

Contractors must keep their work areas clean and orderly. It is your responsibility to:

• Keep walkways and aisles free of tripping hazards; route extension cords, hoses, and cables under, to the side, or above walkways

• Clean up spilled materials

• Store tools, equipment, supplies in their appropriate storage area

• Dispose of boards with protruding nails
• Ensure ladders are in good condition with no splits or cracks in side rails and the ladder feet are in place
• Provide steps for any climbing point that is 19 inches or more above the walking surface and provide steps with handrails for access to any area requiring three or more steps
• Ensure that ladders or steps to mobile equipment are free of defects / not damaged and are in good condition

Hazard Communication

Contractors must provide health and safety information regarding the materials and chemicals brought onto Ash Grove property. That information must include:
• Safety Data Sheets (SDS or MSDS)
• Proper labels on containers
• Written Hazard Communication Program

Hazardous Openings – Holes in walkways; removed sections of handrails; other openings that a person could fall through

Contractors removing handrails or flooring must:
• Require that, in areas where handrails are removed to allow the passage of tools, equipment or materials, persons who are exposed to the fall hazard wear appropriate fall protection and tie off to a proper anchor point.
• Prohibit people without fall protection from passing through the area while the fall hazard exists.
• Close immediately, by some temporary means (e.g. chain, cable, rope, 2x4, etc.), the opening once the tools, equipment or materials have been moved through the opening created by the removal of handrails. You must pull the device used tightly enough to prevent anyone from falling due to the swinging of the chain, cable or rope. You must tie hazard tape (yellow or red) to the chain, cable or rope to clearly mark its presence and to indicate that handrail has been removed.
  NOTE: Hazard tape alone is not sufficient to protect or cover hazardous openings such as removed sections of handrail or floor openings.
• Protect employees working around holes created in flooring or walking surfaces by placing substantial barricades around the opening or through the use of fall protection and suitable anchor points.
• Ensure that holes in floors or walkways are not left unattended. You must either barricade the opening or place a ¾” thick piece of plywood or metal grating across the opening and clearly mark “HOLE” on both sides of the plywood or grating. You must require the use of fall protection when barricades or hole covers are removed.
• Notify all persons affected by the removal of handrails or flooring before removal begins
• Keep areas in the vicinity of the removed handrails or flooring free of any clutter or debris that would present tripping hazards.
Contractor Parking

- Agree upon designated parking areas for contractor personal vehicles prior to the construction start date
- Park only in the designated area
- Follow posted speed limit signs at all times while on the plant site
- Notify personnel that Ash Grove is not responsible for lost or stolen property from personal vehicles
- Set parking brakes and chock wheels when parking vehicles in any non-designated parking area in the plant or quarry

Laydown areas

- Agree on a laydown area, for the temporary storage of equipment and supplies related to construction activities prior to the construction start date
- Secure all mobile equipment with wheel chocks, set parking brakes, and blades or buckets set on the ground
- Establish a laydown area site plan for large construction when needed
- Ensure that delivery services know to place deliveries in the designated laydown area
- Ensure safe work practices are followed (e.g. remain out of the line-of-fire; keeping unnecessary personnel away) while off-loading materials, equipment or other supplies
- Identify an area for the storage of materials that may possess a particular hazard, such as gasoline, diesel fuel, epoxies, etc.
- Follow fire department regulations regarding how and how much of a hazardous or flammable material may be stored onsite.
- Provide containment for spills of certain liquids. Evaluate the location of storm drains and put in place the proper safe guards to protect them from contaminants entering
- Minimize hazards by limiting the height items, such as steel beams, are stacked or by revising the way they are stacked.
- Organize laydown areas to maintain clear driving and walking areas. Store materials in racks or on pallets whenever possible.
- Restore the laydown area to its original condition after the construction project is complete.

Sanitation (Hygiene)

Ash Grove offices, restrooms, locker rooms, and lunchrooms are reserved for Ash Grove personnel. Discuss the availability of sanitation services with your Project Manager prior to work commencing. Basic requirements for your employees include:
• Toilet and hand washing facilities sufficient for the anticipated number of employees on site
• Potable water
• Covered break and rest areas

**Machine Guarding**

Fixed guards are required on all moving equipment, including on exposed engine parts in mobile equipment that have the potential to cause injury and are less than seven feet away from walking or work areas: Gears, sprockets, chain drives, pulleys, shafts, flywheels, couplers, fan blades, etc. Specific requirements include:

• Construct guards of durable materials (expanded metal and steel), secured with proper fasteners, with minimal movement (less than ½ inch) potential
• Maintain tool guards in place. They must not be removed, obstructed or “pinned back”
• Equip hand operated power tools with a constant pressure switch
• Use only right angle / portable grinders that have the guard attached
• Adjust pedestal / bench grinders so that the tool rest is adjusted within 1/8” of the abrasive wheel; adjust the tongue guard to ¼”; and they must have a complete spindle guard
• Cut keyed / non keyed shafts to extend no more than half the shaft diameter or put an end cap on them
• Use only table saws equipped with original safeguards in place
• Use all powered saws with the guards in place, including on skilsaws, band saws, and similar equipment

**Illumination**

You must ensure your employees have sufficient illumination to conduct general and detail work for the conditions and work hours anticipated. This includes: surface structures, paths, walkways, stairways, lay down areas, excavation, storage and other work areas. Ash Grove has interior and exterior operational lighting; however that may not be sufficient for your project. Be prepared to provide light plants / bars, drop lights and other temporary direct illumination.

General illumination guidelines are:

<table>
<thead>
<tr>
<th>Area</th>
<th>Illumination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction / general task</td>
<td>5 footcandles</td>
</tr>
<tr>
<td>Walkways, storage</td>
<td>5 footcandles</td>
</tr>
<tr>
<td>Task and detail work</td>
<td>10 – 15 footcandles</td>
</tr>
<tr>
<td>Office</td>
<td>25 footcandles</td>
</tr>
</tbody>
</table>
Emergencies / Evacuations

Contractors must know what is expected of them in the event of an emergency. Emergencies could be due to injuries, fires, explosions, equipment or property damage, or from weather related causes.

Follow these procedures:

- Know the plant’s emergency / evacuation signal
- Follow any directions given to you by an Ash Grove representative
- Contact the Control Room Operator at 620.433.3552 or off-site emergency assistance (e.g. fire, EMS, police). The Control Room Operator will contact these agencies for you.
- Evacuate to the designated areas if directed to do so. At this plant those areas are:
  - West of Cement Dome if wind from East or South
  - West of Limestone Dome if wind from North or West.
- Be prepared to account for all personnel at the evacuation point
- Notify your Ash Grove representative immediately for any accident that may be immediately reportable to MSHA (see 30 CFR Part 50 for the definition of what qualifies as an “accident.”) Immediately reportable accidents must be communicated to MSHA within 15 minutes of discovery in order to avoid mandatory fines.

Explosives / Blasting

To bring or use explosives on Ash Grove property you must:

- Possess a current and valid Bureau of Alcohol, Tobacco, Firearms and Explosives (ATFE) license or permit
- Have permission from Ash Grove management
- Use only properly trained and experienced personnel
- Store explosives and detonators in a safe and secure manner
- Placard vehicles used to transport explosives or detonators
- Have the proper fire extinguishers
- Work under written procedures designed to prevent premature detonation, fly rock, or other damage to property, equipment, or injury to personnel. Do not over-charge drill holes.
- Notify Ash Grove what your warning system is before you set off a blast

Unless you are a blasting contractor, while you are on Ash Grove property you must stay out of designated blasting areas within the quarry and you must follow all instructions given to you regarding blasts and explosives.
Ash Grove and various railroad companies operate locomotives, switch engines and railcars on the property. To work safely around this equipment you must:

- Stop at posted railroad crossings and look both ways to ensure the track is clear before proceeding; give the train traffic the right-of-way
- Comply with train crossing signals
- Follow directions given to you by locomotive engineers, trainmen, or switchmen; these may be given visually with hand signals or blue flags or audibly by voice or signal horns
- Park vehicles and equipment at least 20 feet from tracks to avoid collisions
- Walk across tracks, not down them
- Cross tracks quickly; get in the clear as soon as possible
- Go around rail car strings – do not cross between or under railcars
- Do not walk between two pieces of on-track equipment unless they are separated by at least 50 feet
- Keep at least 25 feet from the end of standing trains, cars, or locomotives. This will give you time to react safely to any movement of the equipment.
- Give railcars and engines a wide berth when crossing tracks to ensure that you are not struck should the railcars be bumped; rail equipment may move in either direction

If you are working on tracks or rail equipment, you must:

- Have one roadway worker designated to provide on-track safety for all members of the work group
- Use a Federal Railroad Administration (FRA) qualified flagman or watchman when working in the FRA Red Zone (within 4 feet from the outside rail on each side of the track)
- Be trained to recognize and respond to the hazards of railways; to understand the signals given by engineers, trainmen, and switchmen
- Expect movement of on-track equipment at any time
- Know how to detect and recognize approaching trains
- Know how to warn other workers about approaching trains
- Stop all work while trains are passing within the work zone
- Wear reflective vests or high visibility clothing to make you more visible
- Know the train traffic on adjacent tracks
- Place a blue flag 25 feet from the end of the last car on the track to warn others that work is taking place on rail equipment or track and that nothing on that track should be moved
- Place a blue flag on the control stand of a locomotive or in front of a locomotive or cut of railcars to indicate someone is working on the equipment and it is not to be moved
• Use blue lanterns at night, rather than blue flags
• Set the hand and air brakes on all cars in a string of cars
• Chock the wheels of cars being worked on, and/or on strings of cars on or adjacent to the track being worked on
• Provide adequate lighting when working before sunrise or after dusk

Environmental Controls (spills / emissions / waste generation and disposal)

As part of our ISO 14001 Environmental Management System, Ash Grove’s policy is to operate in compliance with environmental laws and regulations, minimize pollution and creation of waste, and retain vendors and contractors committed to responsible environmental management.

You must:

• Comply with all applicable federal, state, and local environmental laws and regulations.
• Consult with an Ash Grove representative to aid in identifying potential environmental impacts associated with your work activities and responsibilities.
• Aid in controlling fugitive dust, to minimize and manage hazardous and universal waste and be familiar with and follow Ash Grove’s spill prevention and control plan.
• Dispose of general waste, that is, wood, paper, cardboard, plastics, and scrap metal in designated dumpsters.
• Minimize the use of hazardous materials. When using hazardous material, you are responsible for maintaining control of those materials and for the proper storage of hazardous material when it’s not in use.
• Identify hazardous waste that you may generate before work begins. All containers must be properly labeled as hazardous waste.
• Contact the Environmental Manager if you have any questions or concerns regarding Ash Grove’s Environmental Policy or refer to our external web site at: http://www.ashgrove.com/about_environment.asp
Section 2
Summary of Applicable MSHA Regulations
Section 2: Summary of Applicable MSHA Regulations

The Mine Safety and Health Administration (MSHA) enforces safety and health regulations at all cement and lime plants operated by Ash Grove Cement Company. It is the responsibility of contractors, their employees and subcontractors as well as vendors to be aware of, and comply with, all MSHA regulations.

The following is a brief overview of some of the pertinent MSHA regulations. It is YOUR responsibility to be aware of all the specific MSHA rules and regulations that apply to your work on Ash Grove Cement Company property. Applicable regulations can be found in 30 Code of Federal Regulations (CFR), Parts 45, 46, 47, 50, 56, 62, 100, and 104.

Part 45 Independent Contractors

This Part describes how independent contractors can obtain an MSHA identification number and the information they are required to provide to Ash Grove Cement Company. It also establishes the mechanism by which independent contractors can receive citations and orders from MSHA.

Part 46 Training Regulations

You must have a Training Plan, approved by MSHA, and an individual named to be in charge of training. “Competent” individuals must deliver the training and the training must be given in a language understood by those receiving it. Depending on the situation, your training must include provisions for the following:

- comprehensive new miner training (24 hours)
- newly-hired, experienced miner training
- annual refresher training (8 hours)
- task training
- site-specific hazard awareness training

OSHA training that is relevant to work at a mine site can be substituted to meet some or all of the training requirements.

You must certify on MSHA Form 5000-23, or an equivalent form, that the required training has been given; this applies to OSHA training that you might substitute. NOTE: falsification of training records is a criminal offense! You must pay your employees while they are being trained. You must notify the appropriate Ash Grove Cement Company representative of any hazards created by the work you do on Ash Grove property.
Part 47 Hazard Communication

This part requires you to have a written hazard communication program, have an inventory of hazardous chemicals, maintain material safety data sheets (MSDSs), label containers of hazardous chemicals, and train employees. You must notify your Ash Grove representative about any hazardous chemical you bring on Ash Grove property and provide him or her with the appropriate MSDSs.

Part 50 Notification, Investigation, Records and Reports of Accidents, Injuries, Illnesses

Under this Part, you must:

- Report accidents immediately to MSHA. The term “accident” is defined by MSHA in Part 50.2.
- Investigate all reportable injuries, illnesses and accidents.
- Preserve evidence at an accident scene until released by an MSHA representative.
- Notify MSHA of reportable injuries and illnesses using Form 7000-1.
- Report quarterly employment information to MSHA using Form 7000-2.

Part 56 Safety and Health Standards

This Part contains MSHA’s enforceable safety and health rules for surface metal and nonmetal mines. Contractors, their employees and subcontractors are required to know and follow all MSHA rules contained in this Part. Part 56 is divided into the following subparts:

<table>
<thead>
<tr>
<th>A – General</th>
<th>B – Ground Control</th>
<th>C – Fire Prevention and Control</th>
<th>D – Air Quality and Physical Agents</th>
<th>E – Explosives</th>
</tr>
</thead>
<tbody>
<tr>
<td>F – Drilling and</td>
<td>G – Reserved</td>
<td>H – Loading, Hauling and Dumping</td>
<td>I – Aerial Tramways</td>
<td>J – Travelways</td>
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<tr>
<td>Rotary Jet Piercing</td>
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<tr>
<td>K – Electricity</td>
<td>L – Compressed Air and Boilers</td>
<td>M – Machinery and Equipment</td>
<td>N – Personal Protection</td>
<td>O – Materials Storage and Handling</td>
</tr>
<tr>
<td>P – Illumination</td>
<td>Q – Safety Program</td>
<td>R – Personnel Hoisting</td>
<td>S – Miscellaneous</td>
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</table>

Again, it is the responsibility of contractors, their employees and subcontractors to know the details of each of these subparts and to comply with them. Below are listed just a few of the requirements from these subparts. Contractors or subcontractors must:
• Conduct workplace examinations once each shift. The examination must be documented with the person’s name, date and area inspected.
• Conduct pre-operational inspections of all mobile equipment. Remove from service until repaired any equipment that does not pass inspection.
• Provide safe access to all working areas.
• Provide fall protection whenever there is a danger of falling.
• Provide a safety harness, lifeline and attendant when entering a bin or silo.
• Prevent the use of any tool, equipment or machinery beyond its design capacity.
• Correct any defect in tools, equipment, machinery or materials that affects safety. Remove from service anything that cannot be immediately repaired and keep a record of those items.
• Prevent work on electrically energized equipment unless it has been locked out and each person working on the equipment has placed his or her lock on the shutoff mechanism.
• Ensure that all electrically operated equipment, including extension cords, is grounded.
• Implement a hearing conservation program for employees who are exposed to noise above 85 dBA on an 8-hour, time-weighted average basis.
• Test the atmospheres of confined spaces before entry to ensure safe entry conditions.
• Establish rules governing speed, right-of-way, direction of movement and the use of headlights for mobile equipment and vehicles used on the mine site.
• Ensure that compressed air is not directed at any person, in particular for cleaning off clothing.
• Ensure that moving machine parts are guarded.
• Ensure that the operators of mobile equipment wear seat belts.
• Ensure that horns and backup alarms are functional.
• Ensure that someone trained in CPR and first aid is available on all shifts.
• Ensure that all working areas are sufficiently illuminated.
• Use trashcans with covers wherever food is disposed.
• Prohibit the consumption of food or beverages in areas exposed to toxic substances.

Part 62 Occupational Noise Exposure

This part requires employee noise monitoring to determine if exposures equal or exceed the Action Level of 85 dBA, the Permissible Exposure Level (PEL) of 90 dBA, or the dual hearing protection level of 105 dBA over an 8-hour period. Employees exposed at or above the Action Level must be enrolled in a hearing conservation program that includes annual hearing tests. For employees exposed at or above the PEL, feasible engineering or administrative controls must be implemented. Hearing protection can be used but the other controls must be attempted and used where feasible. Exposures above the dual hearing protection level require that affected employees wear both muffs and plugs.
Part 100 Criteria and Procedures for Proposed Assessment of Civil Penalties

This section describes how MSHA assesses penalties for violation of Mine Act regulations.

Part 104 – Pattern of Violations

This section describes how the Agency decides whether a pattern of significant and substantial violations of Mine Act regulations exists at a particular site.
Section 3
Plant Safety Rules
Section 3: Plant Safety Rules

Rule 1

Fighting, horseplay and/or threats of violence against others are not allowed.

Rule 2

Employees, contractors and visitors may not possess, use or be under the influence of illegal drugs or alcohol while in or on Owner's property.

Rule 3

Firearms and other deadly weapons are not allowed in or on Owner's property. Any firearm or deadly weapon displayed on Owner's property shall result in the immediate removal of the offending employee, contractor or visitor.

Rule 4

All employees working on mine property who meet applicable MSHA criteria must receive 8 hours of documented MSHA refresher training each year, at Contractor and/or its Associates' expense. Newly employed, inexperienced miners will receive 24-hour MSHA-required training, at Contractor and/or its Associates' expense. Contractors and visitors will receive site specific hazard awareness training, as appropriate, by Owner's personnel. Except for site specific hazard training, Contractor and/or its Associates will be responsible for training, and documenting the training, of their employees. Such employees will receive documented “task” training as needed, at Contractor and/or its Associates' expense.

Rule 5

Fall protection will be used where there is a danger of falling. Owner's employees may not use body belts. Full body fall protection harnesses with appropriate lanyards will be used. Drivers will use fall protection platforms or fall arrest systems to access the tops of their trucks.

Rule 6

Personal protective equipment (PPE) will be used as job requirements demand, at Contractor and/or its Associates' expense. Minimum mandatory PPE required for work: hard hat, safety toe footwear, and safety glasses. Other PPE, such as respirators, hearing protection, gloves, welding helmets, face shields, goggles, chemical resistant coveralls, personal flotation devices, etc. will be used as required.
Rule 7

All incidents involving injuries (no matter how minor), equipment and/or property damage will be reported to Contractor and/or its Associates as well as to Owner. All MSHA reportable injuries/illnesses will be thoroughly investigated by Contractor and/or its Associates and a written report, meeting MSHA requirements, will be prepared and submitted to the plant manager at Owner's facility involved. All incident reports must be signed by the supervisor of the injured/ill employee.

Rule 8

All employees requiring doctor attention for job-related injuries may, based on the nature of the incident, receive a drug and alcohol test at the time of the doctor visit. All employees directly involved in equipment or property damage or causing injury to another employee that requires doctor treatment may be required to have a drug and alcohol test as part of the incident investigation.

Rule 9

All work areas will be maintained in as clean, dry and orderly a manner as is practicable. Tools, equipment, hoses, ropes, extension cords, pallets, etc. will not be left in pathways. All employees are responsible for picking up after themselves. Spills will be cleaned up as quickly as possible or the area will be barricaded to prevent access; corrections for causes of spills will be sought and implemented.

Rule 10

All employees are personally responsible for reporting to their supervisors unsafe conditions or unsafe work practices they observe. When it is appropriate (e.g., employees have the necessary skills, knowledge, direction, equipment or manpower, etc.) to directly intervene, all employees will immediately correct the unsafe situation.

Rule 11

All employees will control potentially hazardous energy (electrical, mechanical, pneumatic, hydraulic, suspended load, etc.) by means of appropriate energy control procedures. These procedures will be used when employees are working on, around or under equipment or machinery that could release energy and cause injury, property or equipment damage. Such procedures may include lockout, blocking, line blanking and draining, etc. Contractor and/or its Associates shall not disengage any power source without prior authorization from Owner's personnel on site.

Rule 12

Hazard control procedures and systems for confined spaces will be followed by Contractor and or its Associates. This includes the issuance of entry permits, hazard identification and establishment of rescue plans, which plans include the presence of an attendant and the use of lifelines. Contractor and/or its Associates shall be responsible for making their own arrangements for any necessary rescue services.
Appendix E: CONTRACTOR SAFETY PERFORMANCE CHECK

Contractor: 

Project Description: 

<table>
<thead>
<tr>
<th>SAFETY REQUIREMENT</th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>COMMENTS</th>
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<tbody>
<tr>
<td>All workers have received SSHAT</td>
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<tr>
<td>All PPE is adequate, maintained, and worn</td>
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<tr>
<td>Work site barricaded, access / traffic controlled</td>
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<tr>
<td>Work areas orderly and with adequate lighting</td>
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<tr>
<td>Workers protected from fall exposures</td>
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<tr>
<td>LOTO according to proper procedures</td>
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<td>Mobile equipment: back up alarms, chocks</td>
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<tr>
<td>Cranes / hoists inspected and used safely</td>
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<tr>
<td>Workers safe distance from suspended loads</td>
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<td>Ladders: inspected and secure</td>
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<td>Electrical cords are in good condition</td>
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<td>Confined space: Hazards evaluated &amp; controlled</td>
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<td>Scaffolding: inspected, stable, secured</td>
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<tr>
<td>Power tools properly guarded and grounded</td>
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<tr>
<td>Chemicals / materials properly labeled</td>
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<tr>
<td>Gas cylinders are labeled and secured</td>
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<tr>
<td>First Aid / CPR certified person on site</td>
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<tr>
<td>Flammables / combustibles are properly stored</td>
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<tr>
<td>Fire extinguishers available and inspected</td>
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<tr>
<td>Excavations: Proper shoring, set back</td>
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<tr>
<td>Hot work permit completed when required</td>
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<tr>
<td>Daily safety / tool box meeting held</td>
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</table>

Were the MSHA required Daily Workplace Examinations completed? Yes____ No ____

Were the MSHA required Pre-Use Mobile Equipment Inspections completed? Yes____ No ____

Describe any incidents that have occurred during the project: (medical treatment, near miss, property or equipment damage) ____________________________________________________________

__________________________________________________________

Additional safety concerns or comments: ____________________________________________________________

__________________________________________________________

Report Completed by: ______________________________________ Date: ______________________

A copy of this report must be submitted to the Ash Grove Cement Company Project Coordinator
PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:
   1. The items listed in Article 1.03 of this Section refer to and are the same pay items listed in the Bid Schedule and constitute all pay items for completing the Work.
   2. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, plant or facility services, CONTRACTOR’s field offices, testing, safety provisions and safety devices, submittals and record drawings, water supplies, power and fuel, maintenance of traffic, coordination with OWNER’s operations required during construction, or other requirements of the Contract Documents.
   3. Compensation for all services, items, materials, and equipment shall be included in prices stipulated for the lump sum and unit price pay items listed in this Section and included in the Contract.

B. Each lump sum and unit price shall include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR’s overhead and profit for each separately identified item.

1.02 ENGINEER'S ESTIMATE OF QUANTITIES

A. ENGINEER’s estimated quantities for items of Unit Price Work, as included in the Contract, are approximate only and are included solely for purpose of comparing Bids and pricing. OWNER does not expressly or by implication agree that nature of materials encountered below the ground surface, or actual quantities of material encountered or required, will correspond with the quantities included in the Contract at the time of award and reserves right to increase or decrease quantities, and to eliminate quantities, as OWNER may deem necessary. Unless indicated elsewhere, CONTRACTOR or OWNER will not be entitled to adjustment in price of Unit Price Work items as a result of change in estimated quantity and agree to accept the unit prices accepted in the Bid as complete and total compensation for additions caused by changes or alterations in the Unit Price Work directed by OWNER.
1.03  **BID ITEMS**

A.  Item A-1 – Mobilization:

1.  Payment will be made at the lump sum price shown in the Bid Schedule and shall be full compensation for all mobilization, site access and preparatory work. Services required by this Section include, but are not limited to: all mobilization of equipment and personnel; property preparation activities; materials, any permits necessary for the CONTRACTOR to perform the services specified by the Contract Documents; work area security and traffic control; and other activities incidental to these services.

B.  Item A-2 – Demobilization:

1.  Payment will be made at the lump sum price shown in the Bid Schedule and shall be full compensation for all demobilization of equipment, personnel, and remaining materials.

C.  Item A-3 – Construction Facilities and Temporary Controls:

1.  Payment will be made at the lump sum price shown in the Bid Schedule and shall be full compensation for all temporary sanitary facilities, construction fencing, water control, dust control, protection of installed work, office trailer, utilities, parking facilities and maintenance of the CONTRACTOR’s work area.

D.  Item A-4 – Surveying:

1.  Payment will be made at the lump sum price shown in the Bid Schedule and shall be full compensation for all surveying required to complete the Work and any measurement of quantities for payment purposes.

E.  Item B-1 – Cover Exposed Waste:

1.  Measurement for the covered exposed waste will be the actual area covered with topsoil and seed as measured by the CONTRACTOR’S independent surveyor and confirmed by the ENGINEER.

2.  Payment under this bid item shall be made at the contract unit price shown in the Bid Schedule per square foot of area covered. Payment shall be full compensation for procuring, delivering, preparing topsoil and seed, and
maintenance and other activities incidental to this service for which payment is not specifically provided for by a separate bid item.

F. Item B-2 – 3-Wire Fence:

1. Measurement for the 3-wire fence will be made of the actual length of 3-wire fence installed based on field measurements.

2. Payment under this bid item shall be made at the contract unit price shown in the Bid Schedule per linear foot of 3-wire fence. Payment shall be full compensation for installing 3-wire fence at the locations indicated including procuring, delivering, preparing the 3-wire fence and other activities incidental to this service for which payment is not specifically provided for by a separate bid item.

G. Item B-3 – Gates:

1. Measurement for gates will be made of the actual number of gates installed based on field measurements.

2. Payment under this bid item shall be made at the contract unit price shown in the Bid Schedule per each gate. Payment shall be full compensation for installing gates at the locations shown or indicated including procuring, delivering, preparing the gates and other activities incidental to this service for which payment is not specifically provided for by a separate bid item.

H. Item C-1 – Remove Existing Fence:

1. Payment will be made at the lump sum price shown in the Bid Schedule and shall be full compensation for all efforts to remove and properly dispose off-site of the existing fence as indicated.

I. Item C-2 – Abandon Existing Monitoring Wells:

1. Payment will be made at the lump sum price shown in the Bid Schedule and shall be full compensation for all efforts to abandon and properly dispose off-site of the well casing as indicated.
J. Item C-3 – Clearing and grubbing:
   1. Payment will be made at the lump sum price shown in the Bid Schedule and shall be full compensation for all clearing, grubbing, and disposing of trees, snags, logs, brush, stumps and shrubs from the Site.

K. Item C-4 – Site grading:
   1. Measurement for site grading will be made at the lump sum price shown in the Bid Schedule and shall be full compensation for all grading, scarifying and other activities incidental to this service.

L. Item C-5 – Roadside Ditch:
   1. Measurement for the roadside ditch will be made of the actual length of roadside ditch constructed based on field measurements.
   2. Payment under this service item shall be made at the contract unit price shown in the Bid Schedule per linear foot of roadside ditch. Payment under this bid item shall be full compensation for excavation and grading to grades shown and other activities incidental to this service for which payment is not specifically provided for by a separate bid item. Installation of clay, topsoil and seeding shall not be paid under this bid item but rather under bid items C-7, C-8 and C-9, respectively.

M. Item C-6 – Diversion Berm:
   1. Measurement for the diversion berm will be made of the actual length of diversion berm constructed based on field measurements.
   2. Payment under this service item shall be made at the contract unit price shown in the Bid Schedule per linear foot of diversion berm. Payment under this bid item shall be full compensation for grading the diversion berm to grades shown and other activities incidental to this service for which payment is not specifically provided for by a separate bid item. Installation of clay, topsoil and seeding shall not be paid under this bid item but rather under bid items C-7, C-8 and C-9, respectively.
N. Item C-7 – Clay Barrier:

1. Measurement for the clay barrier soil will be made of the actual in-place cubic yards of material incorporated into the Work based on pre- and post-backfill surveying measurements performed by the CONTRACTOR’S independent surveyor and confirmed by the ENGINEER.

2. Payment under this service item shall be made at the contract unit price shown in the Bid Schedule per in-place cubic yard. Placement of clay barrier soil shall include procurement, soil management and laboratory testing, transport, placement, compaction, and other activities incidental to this service.

O. Item C-8 – Topsoil:

1. Measurement for topsoil will be made of the actual in-place cubic yards of material incorporated into the Work based on pre- and post-backfill surveying measurements performed by the CONTRACTOR’S independent surveyor and confirmed by the ENGINEER.

2. Payment under this service item shall be made at the contract unit price shown in the Bid Schedule per in-place cubic yard. Placement of topsoil shall include procurement, soil management and laboratory testing, transport, placement, compaction, and other activities incidental to this service.

P. Item C-9 – Permanent Seeding:

1. Measurement for permanent seeding will be made of the actual area based on field measurements performed by the CONTRACTOR’S independent surveyor and confirmed by the ENGINEER.

2. Payment under these service items shall be made at the contract unit price shown in the Bid Schedule per acre. Acres shall be rounded to one significant digit. Payment under this bid item shall be full compensation for procuring, delivering, preparing, seeding and maintaining the areas and other activities incidental to this service for which payment is not specifically provided for by a separate service item. No separate payment will be made for topsoil and seeding within the exposed waste areas, payment for topsoil and seeding the exposed waste areas shall be paid under Bid Item B-1.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

CONTRACTOR shall provide temporary services as described in this Section.

A. Temporary Utilities: Sanitary facilities.

B. Temporary Controls: Enclosures and fencing, silt fencing, water control and dust control.

C. Construction Facilities: Office trailer, parking and cleaning.

D. Permits: Construction permits.

1.02 TEMPORARY SANITARY FACILITIES

A. Provide and maintain separate facilities and enclosures. Existing facilities within OWNER’S buildings shall not be used.

1.03 CONSTRUCTION FENCING

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities from damage from construction operations.

B. Description: 4 ft. high durable HDPE fence, with 1-1/2" by 3" mesh opening, and melt-in reflective glass beads, between "T" posts not more than 6 feet apart, and connected support posts for traffic gates.

C. Accessories:
   1. 6' rigid "T" fiberglass posts.
   2. 7-1/2" long UV treated plastic cable ties.
   3. Polycarbonate plastic drive cap.

1.04 WATER CONTROL

A. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
1.05 **DUST CONTROL**

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

C. Dust control measures shall be employed at all times. Soil at the site, disturbed by the CONTRACTOR’S operations shall be sprinkled or treated with dust suppressers as necessary to control dust.

1.06 **PROTECTION OF INSTALLED WORK**

A. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.

1.07 **OFFICE TRAILER**

A. CONTRACTOR shall supply individual air-conditioned and heated office trailer with sufficient space for a conference table to allow for meetings with the CONTRACTOR, OWNER and ENGINEER.

B. CONTRACTOR shall coordinate with OWNER for the exact location of the office trailer. For bidding purposes CONTRACTOR shall assume electrical hookup is not available and a generator will be required.

1.08 **PARKING**

A. Construction personnel shall park only in areas designated by OWNER.

1.09 **PROGRESS CLEANING**

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove waste materials, debris, and rubbish from each day and dispose off-site.

1.10 **PERMITS**

A. CONTRACTOR shall acquire all necessary permits to complete the work including but not limited to a Storm Water Pollution Prevention Plan (SWPPP).

**END OF SECTION**
PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work covered by this Section consists of furnishing all materials, labor, tools, equipment and transportation necessary for all construction, complete, as it pertains to the excavating, grading, filling, and compacting of the clay barrier as indicated on the Drawings. Specifically, the Work includes all clearing and grubbing, excavating, hauling, covering, wetting or drying, dewatering, compacting and other operations pertaining thereto for preparing the site and conducting earthwork activities complete in accordance with these Specifications and the Drawings, or as otherwise directed by the ENGINEER.

B. The Work shall include, but not be limited to the following activities:

1. Clearing, grubbing, and disposal of existing vegetation on the side slope;
2. Excavating saturated and stained soils from the perimeter drainage ditch and along the toe of the landfill to the top of bedrock;
3. Transporting and disposing of excavated materials to within the limits of SWMU #17 South, or as otherwise directed by the ENGINEER
4. Scarifying the top surface of the existing topsoil layer;
5. Foundation preparation and site grading of the existing topsoil layer;
6. Testing, hauling, placing and compacting clay barrier materials;
7. Tie-in of the clay barrier material with the existing grades to maintain smooth, continuous slopes, as indicated by the Drawings;
8. Testing, hauling and placing topsoil materials; and,
9. Revegetation of all disturbed areas.

C. No soils or wastes shall be removed from the site unless otherwise instructed by the ENGINEER.

D. All soils to be incorporated into the Work shall consist of material approved by the ENGINEER from on-site or off-site sources which have previously been accepted for use by the ENGINEER, and/or approved materials removed from excavation.

Construction shall not proceed until all Construction Quality Control (CQC) tests required by these Specifications are complete, the data submitted to the ENGINEER, and the material accepted.

E. The CONTRACTOR shall install the clay barrier in accordance with all requirements specified in this Section.
1.02 REFERENCES

A. ASTM D-422 Particle-Size Analysis of Soils
B. ASTM D-1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
D. ASTM D-2216 Standard Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures
E. ASTM D-2487 Classification of Soils for Engineering Purposes
F. ASTM D-2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
G. ASTM D-3017 Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
H. ASTM D-4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.03 QUALITY ASSURANCE

A. All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications, and shall be subject to strict quality control monitoring by the ENGINEER. The placed fill soils shall conform exactly to the Drawings and Specifications, except as otherwise authorized in writing by the ENGINEER.

B. The CONTRACTOR shall comprehend and anticipate Construction Quality Assurance (CQA) activities and account for these activities in the installation schedule.

1.04 SUBMITTALS

A. For the clay barrier material, the CONTRACTOR shall comply with all submittal requirements defined in this Section.

B. The CONTRACTOR shall submit the location of any proposed off-site borrow pits to the ENGINEER no less than two weeks prior to the anticipated placement of any clay barrier materials.

C. The CONTRACTOR shall submit a 50-pound sample for each off-site borrow pit
proposed to furnish the required quantity of clay barrier materials. The samples shall be submitted to the ENGINEER no less than two weeks prior to the anticipated placement of any soil barrier materials.

D. The CONTRACTOR shall submit the results of the ASTM tests listed in Sections 2.01 and 2.02 for each borrow pit location. The test results shall be submitted to the ENGINEER no less than one week prior to the anticipated placement of any soil barrier materials furnished from off-site.

**PART 2 - MATERIALS**

2.01 **CLAY BARRIER**

A. Clay material shall be substantially free of organics, loam, wood, trash, and other objectionable materials which may be compressible or which cannot be properly compacted. The soil incorporated into the clay barrier layer shall be classified as CL or CH as defined by ASTM D-2487. Soil blending will be permitted to achieve this classification, as approved by the ENGINEER. The soil shall exhibit a minimum plasticity index of 10 percent and a minimum 50 percent passing the No. 200 U.S. Standard Sieve, with a minimum 25 percent classified as "clay" under ASTM D-422.

B. The clay barrier layer will be constructed over a subbase after stripping existing topsoil material. The clay barrier layer shall be established by placing maximum 9-inch thick loose lifts and compacting utilizing conventional compaction equipment to achieve a minimum of 90 percent of the Modified Proctor (ASTM D-1557) density and within 0 percent to +3 percent of the optimum moisture content for that material, and shall achieve a permeability no greater than 5\times10^{-7} \text{ cm/sec} (ASTM D-5084). A maximum of 5 percent of the permeability tests may be above 5 \times 10^{-7} \text{ cm/sec}, but in no case above 1 \times 10^{-6} \text{ cm/sec}. All areas that do not meet the established performance criteria for density, moisture content and permeability shall be reworked, recompacted and retested as directed by the ENGINEER at no additional cost to the OWNER. The clay barrier layer shall not contain debris, such as rock, blocks, broken concrete, masonry rubble, stones or clods greater than 2 inches in diameter, or other similar materials. It shall have physical properties such that it can readily be spread and compacted during filling. Snow, ice, and frozen material shall not be utilized.
2.02 VEGETATIVE LAYER

A. Vegetative soil shall consist of loose, friable, and loamy soil material (loam, sandy loam, silty loam, sandy clay loam, clay loam) exhibiting an organic content of 3 percent minimum to 20 percent maximum, a pH within the range of 6.0 to 7.5, and shall be free of debris, trash, stumps, rocks, tree and shrub roots, weeds and high concentrations of deleterious organic matter. Agricultural lime shall be added as directed by the ENGINEER if the pH is less than 6.0. Vegetative soil shall be able to support healthy vegetation and shall not contain substances which may be toxic to humans or plants. Topsoil which is stripped from the side slopes of the landfill shall be reused for this layer, to the greatest extent possible, supplemented with material stripped from active on-site quarries, or designated on-site topsoil borrow areas, if necessary. Soil amendments may be mixed with the available vegetative soils, at the direction and with the approval of the ENGINEER, to assure compliance with this Specification.

PART 3 - EXECUTION

3.01 GENERAL

A. During construction, the area shall be well drained. No materials shall be backfilled when either the material or the surfaces on which it is to be placed is wet or frozen. When the Work is interrupted by heavy rain, fill operations shall not be resumed until the ENGINEER determines that the moisture content and density of the previously placed materials are as specified. Wet, soft, frozen or otherwise unsuitable subgrade shall be excavated and backfilled with clay materials so that clay barrier layer will ultimately be placed on a firm foundation. All roots, stumps, rocks and other foreign matter in the existing cover system shall be removed.

B. Off-site structures, utilities, roadways, Village Creek, and other facilities shall be protected from damage caused by settlement, lateral movement, undermining, washout and other hazards created by the earthwork operations or delivery of fill materials.

C. Pumping and Drainage

1. At all times during construction and up to the point of actual turnover to OWNER, the CONTRACTOR shall provide and maintain proper equipment and facilities to remove all water entering excavations or ponded
in temporary berms, ditches, and ponds, and shall keep such excavations and surface water management structures dry so as to obtain a satisfactory undisturbed foundation condition until the clay barrier has been completed. Where required, design of an appropriate dewatering system will be the responsibility of the CONTRACTOR, submitted to the ENGINEER for review prior to commencing work.

2. All precautions necessary to preclude the accidental discharge of fuel, oil, etc., shall be taken in order to prevent adverse effects on surface water or groundwater quality. All precautions and corrective measures, if necessary, shall be in accordance with the OWNER’s Spill Prevention Control and Countermeasure (SPCC) Plan.

D. If the moisture content of the fill material is outside the accepted range, the soil shall be re-worked and wetted or dried, as appropriate, utilizing techniques selected by the CONTRACTOR and approved by the ENGINEER.

1. Fill material that is too wet to permit compaction shall be removed and stockpiled or spread and allowed to dry. Drying may be assessed by diskng, harrowing, or pulverizing until moisture content is reduced to a satisfactory level.

2. Fill material that is too dry shall be wetted uniformly and disked or similarly re-worked so as to prevent free water surfacing during or subsequent to compaction operations.

E. Any delays in the progress of the construction necessitated by wetting or drying of soil shall be the responsibility of the CONTRACTOR.

F. Fill materials shall be placed in such a manner so as to facilitate drainage at all times. Ponding of surface water run-off shall not be permitted on the Work. Surface-water flows from the operating landfill phases shall be prevented from entering the completed Work.

G. If CQC or CQA tests indicate that any portion of the work does not meet the specified requirements, the CONTRACTOR shall remove that section, replace and recompact the material at no additional cost to the OWNER. Determinations of the extent of removal and the acceptability of the in-place fill materials will be made by the ENGINEER.

H. If significant precipitation causes wet conditions, placement and compaction
activities shall be suspended until weather conditions improve and the materials have dried sufficiently to continue, as approved by the ENGINEER.

I. Equipment or vehicles shall not be allowed to travel in a single track or form ruts across the Work. Any ruts or irregularities formed shall be scarified and recompacted by the CONTRACTOR at its expense, as required and directed by the ENGINEER.

3.02 EXCAVATION

A. Care shall be exercised when stripping vegetation so as to prevent damage of the existing cover system.

B. If unsuitable saturated and/or stained materials are uncovered during excavation or otherwise, clay materials shall be placed and compacted to establish an adequate foundation layer upon which to construct the clay barrier layer.

C. The perimeter drainage ditch shall be excavated and graded to the grades shown on the Drawings. Any saturated and/or stained soils shall be removed from the perimeter drainage ditch to the top of the bedrock layer, as determined by the ENGINEER. Any loose shale or rocks shall be excavated and disposed properly. Material from such excavations shall be placed within the landfill and blended into the subgrades.

D. Excavation activities shall be conducted in compliance with all applicable MSHA regulations.

3.03 BACKFILLING

A. Clay Barrier

1. Clay barrier material shall meet the requirements of Part 2.01 of this Section.

2. CONTRACTOR shall place and compact the clay barrier material in maximum 9-inch thick loose lifts, resulting in approximately 6-inch thick compacted lifts. The clay barrier shall be placed to the grades shown on the Drawings.

3. The clay barrier shall achieve a permeability of no greater than $5 \times 10^{-7}$ cm/sec. A maximum of 5 percent of the permeability tests may be above 5
x $10^{-7}$ cm/sec, but in no case above $1 \times 10^{-6}$ cm/sec. Compaction shall be accomplished using a vibratory segmented pad roller, or similar equipment, with an equivalent applied pressure of 40,000 lbs. A minimum of 6 passes shall be completed on each lift.

4. Clay barrier shall be compacted to 90 percent of the maximum dry density obtainable, or greater if necessary to achieve the required permeability standard ($5 \times 10^{-7}$ cm/sec), as determined by ASTM D-1557 (Modified Proctor). This layer shall be compacted within a range of optimum to 3 percent above the optimum moisture content, as determined by ASTM D-1557.

5. A maximum 5 percent of all field moisture content test results are permitted outside the specified range. The outliers are, however, not permitted to be concentrated in one lift or one area, and no moisture content shall be less than 1 percent or more than 4 percent of the optimum moisture content. The acceptable areal distribution of outliers is at the discretion of the ENGINEER.

6. A maximum 5 percent of all field dry density test results are permitted outside the specified range. The outliers are, however, not permitted to be concentrated in one lift or one area, and no dry density less than 87 percent as determined by ASTM D-1557 is permitted. No outliers shall result in permeabilities at any accepted location greater than $1 \times 10^{-6}$ cm/sec. The acceptable areal distribution of the outliers is at the discretion of the ENGINEER.

7. If the criteria set forth in (4) through (6) of this part are not met, the CONTRACTOR shall remove the failing barrier material and replace, compact and grade new, acceptable material at no cost to the OWNER. The CONTRACTOR shall retest the compacted material to ensure compliance with the permeability requirements set forth in (3) of this Part. If after retesting, the CONTRACTOR believes that the requirements cannot be achieved, the ENGINEER shall be notified immediately for evaluation.

8. The CONTRACTOR shall test the in-place density and moisture content of clay barrier material utilizing nuclear density methods in accordance with these Specifications and ASTM D-2922 and ASTM D-3017, respectively.
Tests will be conducted at a rate of not less than one test per 1,500 square feet, or a minimum of 2 tests, per lift.

9. Clay barrier material shall be continuously tied into the existing cover system so as not to exhibit an identifiable interface. Scarifying and recompacting the interface of the existing cover system shall be accomplished prior to placement of the clay barrier to assure a continuous layer.

B. Vegetative Soil

1. Vegetative soil shall meet the requirements of Part 2.02 of this Section. Soil mixing and soil amendments, approved by the ENGINEER, are permitted to achieve the desired characteristics. Soil mixing shall be conducted prior to placing the material, and the mixed material shall be tested in accordance with this Section.

2. Vegetative soils for the cover system shall consist of a minimum 6-inch thick soil layer. This layer shall be placed and graded to achieve a smooth, continuous slope and tie-in with the existing grades at the edge of the cap system. Scarifying the interface of the existing grades shall be accomplished prior to placement of the topsoil to assure a continuous layer. The soil shall be capable of supporting vegetation on a continuing basis with a perennial stand of native grasses.

3. All ground areas disturbed by construction shall be covered with vegetative soil.

4. Prior to placing vegetative soil in peripheral areas, vegetation shall be removed from the area and the ground surface cleared of all other materials that would hinder proper grading, tillage or subsequent maintenance operations.

5. Subsequent to grading, areas to be covered with vegetative soil shall be thoroughly scarified by approved means to a depth of at least 3 inches to assure the bonding of vegetative soil with the underlying clay barrier. The work shall be performed only during periods when beneficial results are likely to be obtained; when conditions are such, by reason of drought, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the work may be stopped by the ENGINEER and resumed only when directed. Undulations or irregularities in the surface that would
interfere with further construction operations or maintenance shall be leveled before the next specified operation.

6. The vegetative soil layer shall be uniformly distributed on the designated areas and evenly spread to a minimum loose thickness of 6 inches. The spreading shall be performed in such a manner that planting can proceed with little additional soil preparation or tillage. The surface resulting from placing vegetative soil shall meet the final grades indicated on the Drawings. Vegetative soil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or the proposed planting.

3.04 EXCESS MATERIALS

A. No excavated materials shall be removed from the site, except for disposal in designated plant facilities or as otherwise specified by the ENGINEER. All general refuse or debris generated by construction operations shall be placed in containers located adjacent to the plant area. Vegetation (yard waste) shall be segregated and stockpiled in an area designated by the OWNER for subsequent burning.

B. Topsoil or other soils suitable for reuse, as determined by the ENGINEER, shall be classified and stockpiled in areas designed by the OWNER for future use.

C. Stockpiles shall be graded to drain; no surface water ponding is permitted on stockpiles. Stockpiles may be required by the ENGINEER to be covered with plastic sheeting or other material to preserve soil integrity.

3.05 GRADING

A. Uneven areas and low spots which may develop in the backfill operations shall be eliminated using minor excavations or placement of supplemental clay material. The existing level, profile and contours of the existing cover system configuration shall be maintained on the top surface of the landfill.

B. The areas to be backfilled shall be uniformly graded to within the limits of grading designated on the Drawings and under this Section, including adjacent transition areas. A smooth-finished surface shall result within specified tolerances, compacted to uniform levels or slopes between points where elevations are indicated and meeting existing grades to the satisfaction of the ENGINEER.
C. Constructed slopes shall be blended into the existing grade gradually in order to provide neat, clean transition zones. Feathering of constructed slopes into existing grades shall promote natural drainage and eliminate possible surface water ponding.

D. The right is reserved by the ENGINEER to make minor adjustments or revisions in lines or grades, if found necessary as the Work progresses, due to discrepancies identified in the field with respect to the Drawings or in order to obtain satisfactory construction. CONTRACTOR shall report any suspected discrepancies to the ENGINEER as soon as detected.

3.06 CRITERIA AND TOLERANCES

A. Compaction density and moisture content criteria and tolerances are discussed in Part 3.03 of this Section.

B. In recognition of the moisture-density relationship of soils, the ENGINEER may direct that the compaction density and moisture content tolerances be modified if required by variabilities in the soils. This decision, if required, will be based solely on the ENGINEER's interpretation of the laboratory analyses for each soil.

3.07 FIELD QUALITY CONTROL

A. CONTRACTOR shall test the in-place density and moisture content of the clay barrier layer in accordance with ASTM D-2922 and ASTM D-3017, respectively. CONTRACTOR density and moisture testing shall be conducted at a frequency of one test per 10,000 square feet of in-place material per lift. Every 25th nuclear density test on a given day, or at a minimum once per day, shall be verified in accordance with ASTM D-1556 and ASTM D-2216, respectively, and shall be performed by designated CQC personnel.

B. CONTRACTOR shall obtain Shelby tube samples of the in-place clay barrier material for CONTRACTOR permeability testing, in accordance with ASTM D-5084. CONTRACTOR permeability testing shall be conducted at a frequency of one test per 2 acres of in-place material.

C. Retests for failed samples and/or in-place tests shall be performed as directed by the ENGINEER at no additional cost to the OWNER. The OWNER-designated CQA personnel will confirm these test results through independent testing.
D. CONTRACTOR shall provide field control, i.e., grade stakes, to determine layer thickness during placement and an independent survey before and after layer placement to confirm thickness.

E. The CONTRACTOR shall repair any damage to the subgrade caused by correctly performed CQA tests, and cooperate in other ways necessary to permit the ENGINEER to conduct confirmation testing when and where desired and as expeditiously as possible.

F. Fill material shall not be placed over a lift which has not been tested and approved by the ENGINEER.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall furnish all equipment, tools, materials, and labor necessary for establishing permanent vegetative cover; e.g., seeding, fertilizing, and mulching, on all areas disturbed at the site by performance of the Work.

1.02 RELATED WORK

A. Section 02201 Clay Barrier

1.03 REFERENCES

A. The following publications of the issues listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

1. U.S. DEPARTMENT OF AGRICULTURE (USDA)
   Federal Seed Act of 9 August 1939 (53 Stat. 1275)

2. RAINWATER AND LAND DEVELOPMENT

3. SEEDING STANDARDS AND SPECIFICATIONS
   Neosho County SCS

1.04 QUALITY ASSURANCE

A. All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications, and shall be subject to strict quality control monitoring as detailed herein.

1.05 GENERAL REQUIREMENTS

A. The specified seed varieties and quantities shall be uniformly distributed over the disturbed area in such a manner that will produce an even stand of grass over the entire area seeded. The CONTRACTOR shall notify the ENGINEER at least ten (10) days prior to seeding operations.
02936  
SEEDING  

B. The CONTRACTOR shall use shallow rooted grasses to establish the vegetative cover, as specified herein.

1.06 SOIL TEST  
A. The CONTRACTOR shall perform agricultural soil tests to determine fertilizer requirements for seeding. Test reports shall be submitted to the ENGINEER or their representative in accordance with Part 1.07 of this Section.

1.07 SUBMITTALS  
A. CONTRACTOR shall submit the following items:

1. Certificates of Compliance or Reports:
   a) Seed;  
   b) Fertilizer;  
   c) Agricultural Lime; and,  
   d) Agricultural Soil Test Report.

1.08 DELIVERY, STORAGE, AND HANDLING  
A. Delivery:

1. During delivery, seed shall be protected from any drying or contamination by detrimental material.

2. Seeding material shall be inspected upon arrival at the site; unacceptable material shall be immediately removed from the site by the CONTRACTOR.

3. Fertilizer shall be delivered to the site in the original, unopened containers bearing the manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance with State of Kansas and federal law.

4. Pesticides and herbicides shall be delivered to the site in the original unopened containers. Containers without labels and USEPA registration numbers and the manufacturer's registered uses will be rejected by the ENGINEER.

B. Storage:

1. Seed and fertilizer shall be stored in cool, dry locations away from contaminants.
2. Pesticides and herbicides shall not be stored with other landscape materials and shall be handled and stored following manufacturer's directions.

3. Materials shall be stored in areas designated or approved by the ENGINEER.

**PART 2 - MATERIALS**

2.01 MATERIALS

A. Seed shall be of the latest season's crop and shall be delivered in original, sealed packages bearing the producer's guaranteed analysis for percentages of mixtures, purity, germination, weed-seed content, and inert material. Labels shall conform with USDA Federal Seed Act, Rules & Regulations and applicable State of Kansas seed laws. Wet, moldy, or otherwise damaged seed will be rejected.

B. The permanent seed mixture of each lot shall be as described in Table 02936-1: Seeding Requirements, or as directed by the ENGINEER.

C. Fertilizer shall be controlled-release, commercial grade, granular free flowing, uniform in composition, delivered in fully labeled sealed containers, and shall conform to applicable State of Kansas and federal regulations. Fertilizer shall bear the manufacturer's guaranteed statement of analysis. Granular fertilizer shall contain a minimum percentage by weight of the following elements: 40% Nitrogen, 60% Phosphoric Acid, and 40% Potassium.

1. Agricultural lime shall contain not less than 85% of total carbonates and ground to such fineness that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100-mesh sieve.

D. Topsoil

Topsoil shall contain a sufficient amount of organic material to promote the growth of vegetation. Topsoil shall meet the requirements of vegetative soil in Section 02201 – Clay Barrier. Soil amendments or additives, which may be deemed necessary by the CONTRACTOR, shall be submitted to the ENGINEER for review and approval prior to use.

E. Mulch

1. Straw Mulch shall be unrotted stalks from oats, wheat or rye that are free from noxious weeds, mold, or other objectionable material. The straw mulch shall
contain at least 50 percent by weight of the material to be ten (10) inches or longer. Straw shall be in an air-dry condition and suitable for placing with blower equipment.

2. Hydro-Mulch Overspray Tackifier shall be the same as, or equal to, a recycled slick paper (containing wood cellulose and kaolinite clay), shall not contain any growth or germination-inhibiting factors, and shall be dyed an appropriate color to facilitate visual metering during application. Slick paper composition on air-dry weight basis: 8 percent moisture maximum, pH 4.5 - 6.5. When added to water, it shall form a homogenous slurry specifically for use in hydraulic mulching equipment. This material when sprayed on the straw mulch becomes a tackifier/binder and provides a stable bed for seed germination.

F. Water shall be of a quality suitable for irrigation.

G. Chemical Treatment Material shall be USEPA-registered and approved herbicides and pesticides. These materials shall comply with all applicable State of Kansas and federal laws and regulations.

PART 3 - EXECUTION

3.01 DATES FOR SEEDING

A. Permanent seeding shall be performed upon completion of final grading activities for Work detailed herein.

1. From December 1 through April 15, and August 6 through October 1, and February 1 to May 15, permanent seeding shall occur in accordance with Table 02936-1.

2. From July 15 through August 15, the CONTRACTOR shall prepare the seedbed, add the required amounts of agricultural lime and fertilizer, and mulch and anchor. The CONTRACTOR may utilize dormant seeding or apply sodding practices at the site in place of mulch.

B. From May 16 to July 14, and October 2 to November 30, a cover crop shall be seeded to prevent soil erosion. Once the cover crop dies, drilling may occur for the permanent seeding.
3.02  PREPARATION OF SEEDBED

A.  Tillage

1.  The soil shall be tilled to a depth of at least 3 inches by plowing, diskimg, harrowing, or rototilling. When drought, excessive moisture, or other unsatisfactory conditions prevail, the Work shall be stopped. The seeded area shall be free of large clods, stones, and other objects that would hamper planting and maintenance operations. The soil surface shall be leveled to meet finish grade requirements before seeding. Seedbed preparation shall be performed on the contour to reduce soil loss.

B.  Application of Fertilizer and Agricultural Lime

1.  Fertilizer shall be incorporated into the soil to a depth of 3 inches during seedbed preparation.

2.  The fertilizer shall be applied uniformly prior to seeding and mulching.

C.  Fertilizer and Agricultural Lime Rate

1.  Fertilizer and agricultural lime shall be applied at the rate determined by the results of the CONTRACTOR's Agricultural Soil Test. The following rates are provided as a comparison to the Agricultural Soil Test results.

   a.  For permanent seeding, the fertilizer shall be applied at a rate of 12 pounds per 1000 square feet or 500 pounds per acre of 10-10-10 or 12-12-12 analysis, or equal.

3.03  PLANTING SEED

A.  Prior to seeding, any previously prepared seedbed areas compacted or damaged by interim rains, traffic, or other cause, shall be reworked to restore the ground condition previously specified. Seed shall be planted at the rate specified herein.

B.  Seed planting shall be accomplished by:

1.  Broadcast Seeding

   The CONTRACTOR shall broadcast seed by hand or with approved gravity or cyclone types of spreading equipment. Broadcast seedings shall be covered
to an average depth of ¼ to ½-inch. Completed seeding shall be mixed into soil with a harrow or rake and compacted with a cultipacker-type roller providing 60 to 90 pounds weight per linear foot of roller, or by equivalent approved hand rolling or compacting methods. Broadcast seeding will not be permitted when wind velocity is such as to prevent uniform seed distribution.

2. Drill Seeding

The CONTRACTOR shall plant seed with a Brillon-type grass seed drill equipped with seeding mechanisms, agitator, double disk furrow openers and packer wheels. The seed drill shall plant, cover and compact the seedbed in the same operation. The distance between drill rows shall not be more than 3 to 4 inches apart with planting depth of 1/4 - 1/2-inch. Drill seeding is recommended over broadcast for large areas of seeding.

3. Hydroseeding

If hydroseeding is used and the seed and fertilizer is mixed, they shall be mixed on site and the seeding shall be immediate and without interruption.

4. Mulching

The CONTRACTOR shall perform mulching on the same day as planting seed.

a. Applying Mulch

Straw mulch shall be spread uniformly in a continuous blanket over the seeded areas, using a minimum of 2 tons per acre, or as directed by the ENGINEER. The mulch shall be spread in such manner as to prevent bunching.

b. Securing Mulch

Immediately following (the same day) the spreading of the mulch, the material shall be anchored securely to the soil by use of the Hydro-Mulch Overspray Tackifier material. The material shall be applied by a hydroseed blower, or as approved by the ENGINEER. The material shall be applied in a raining technique to prevent bunching and displacement of the straw mulch.
3.04 **PROTECTION AND CLEAN UP**

After seeding and mulching operations have been completed, barricades and approved warning signs shall be erected by the CONTRACTOR as required to provide protection against traffic and trespass. Excess material from seeding and mulching operations, and all debris, shall be cleaned up and disposed off-site by CONTRACTOR, unless otherwise directed by the ENGINEER.

3.05 **ESTABLISHMENT AND MAINTENANCE PERIOD**

A. Establishment Period

The CONTRACTOR is responsible for the establishment and maintenance of permanent seeding for a minimum period of one year from the date of application.

B. Maintenance Period

The CONTRACTOR shall be responsible for maintenance of permanent seeding until receiving the Certificate of Final Acceptance. Maintenance activities performed by the CONTRACTOR shall include:

1. The CONTRACTOR shall repair and re-seed patches of dead vegetation which are the result of improper seeding practices.

2. Eroded or damaged seeding shall be repaired and re-seeded by the CONTRACTOR. Watering of seeding is not required.
Table 02936-1

Permanent Seeding Requirements

<table>
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<tr>
<th>SEEDING DATES</th>
<th>SEEDING MIXTURES²</th>
<th>SEED DEPTH</th>
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<tr>
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<td>INCHES</td>
<td>PER ACRE</td>
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<td>December 1 to April 15 and</td>
<td>Western Wheat Grass or Suddane Grass</td>
<td>1/2 - 3/4</td>
<td>10 - 12 lbs.</td>
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<td>August 16 to October 1</td>
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<td>1/2 - 3/4</td>
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<tr>
<td>February 1 to May 15</td>
<td>Fide Oat Grama with El Reno or Switch Grass with Blackwell or Cheyenne</td>
<td>1/2 - 3/4</td>
<td>8 - 10 lbs.</td>
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<td></td>
<td>1/2 - 3/4</td>
<td></td>
</tr>
<tr>
<td>May 16 to July 14 and October 2 to November 30</td>
<td>Cover Crop – Sudangrass or Cover Crop – Spring Oat Grass</td>
<td>1/2 - 3/4</td>
<td>60 lb/ac</td>
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<td></td>
<td>1/2 - 3/4</td>
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Notes:

1. From July 15 to August 15: No Planting, use mulches only, sodding practices or dormant seeding.

2. For all seeding mixtures, there is a ten-day grace period of the seeding dates listed.


United States Department of Agriculture (USDA)
Soil Conservation Service-Neosho County, Kansas

END OF SECTION
Appendix C

GROUNDWATER MONITORING PLAN

Ash Grove Cement Company
Chanute, Kansas
EPA ID #KSD031203318

December 21, 2017
# VERSION CONTROL

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ACRONYMS AND ABBREVIATIONS

°C      degrees Celsius
CKD    Cement kiln dust
CMI    Corrective Measures Implementation
CMS    Corrective Measures Study
DO     Dissolved oxygen
DQ     Double Quantification
ft      Feet
GPS    global positioning system
GWMP   Groundwater Monitoring Plan
HBG    health-based goal
HHRA   Human Health Risk Assessment
IDW    Investigative-Derived Waste
KDHE   Kansas Department of Health and Environment
LPL    lower prediction limit
MCL    maximum contaminant level
ml/min Milliliters per minute
MNA    monitored natural attenuation
MS/MSD Matrix spike/matrix spike duplicate
NTU    nephelometric turbidity unit
ORP    Oxidation Reduction Potential
QA/QC  Quality Assurance/Quality Control
QAPP   Quality Assurance Project Plan
RCRA   Resource Conservation and Recovery Act
RFI    RCRA Facility Investigation
SSI    statistically significant increase
SVOCs  Semi-Volatile Organic Compounds
SWFPR  site-wide false positive rate
SWMU   Solid waste management unit
TB     Trip Blank
UPL    upper prediction limit
USEPA  United States Environmental Protection Agency
VOCs   Volatile Organic Compounds
1 INTRODUCTION

On behalf of Ash Grove Cement Company (Ash Grove), Arcadis U.S., Inc. (Arcadis) has prepared this Groundwater Monitoring Plan (GWMP), as part of the Corrective Measures Implementation (CMI) Work Plan (Work Plan), to be implemented at the Ash Grove Cement Plant in Chanute, Kansas (Figure 1).

Groundwater and other monitoring is required during the CMI to evaluate the effectiveness of the corrective actions in monitoring and protecting and groundwater to the health-based goals (HBGs) developed in the approved Human Health Risk Assessment (HHRA) (Arcadis 2011). The corrective measures are being implemented as part the requirements contained in the Resources Conservation and Recovery Act (RCRA) Operating Permit (HSWA, Part II), EPA ID# KSD031203318 (Permit), as modified and effective July 19, 2017 (USEPA 2017). This document has been prepared consistent with the Final Remedy Decision for the Statement of Basis and Response to Comments, the Corrective Measures Decision (included in the Permit as Attachment 8). These documents are collectively referred to as the “Permit” through this GWMP.

This GWMP was developed to outline monitoring requirements associated with the (CMI) at the following four solid waste management units (SWMUs) (see Figure 1).

- SWMU 1 – Paraffin Waste Disposal Landfill
- SWMU 16 – Industrial Waste Landfill
- SWMU 17 – Cement Kiln Dust (CKD) Landfill (consists of North and South CKD Landfills)
- SWMU 23 – Inactive Kiln Dust Landfill

The existing monitoring well networks, installed during the RCRA Facility Investigation (RFI) (Arcadis 2000, 2003, 2007) at each SWMU, provide adequate coverage for the monitoring program and will be used in part during the groundwater quality monitoring program at the four SWMUs. No additional monitoring wells are planned to be added to the existing monitoring networks at the four SWMUs. A summary of the existing monitoring wells at each SWMU is provided in Table 1 and Figures 2 through 5. It is noted that, the monitoring of all wells at each SWMU is not needed to meet the requirements outlined in the USEPA Statement of Basis.

This GWMP also outlines soil/sediment and surface water monitoring at SWMUs 1 and 23. Soil/sediment and surface water samples required during the CMI will be collected from select locations previously sampled during the RFI. The monitoring programs for the four SWMU’s are described below.

The USEPA Region 7 and Kansas Department of Health and the Environment (KDHE) will be notified at least seven days prior to the start of monitoring events.
2 SAMPLING AND ANALYSIS PLAN

Annual monitoring will be conducted at the four SWMUs. The annual monitoring events are anticipated to be conducted in the second quarter of each year.

2.1 SWMU 1 – Paraffin Waste Disposal Landfill

The monitoring plan for SWMU 1 includes:

- One annual downgradient groundwater sample, to be collected from existing Monitoring Well S1MW-2, located on the south side of the landfill. Well S1MW-2 is screened in the Lane Shale.
- One annual soil/sediment sample from directly around the SWMU, to be collected from previously sampled drainage ditch location S1DS-3 located near the southeast corner of the landfill. The sample will be collected at a depth of 0 to 0.5 ft (0 to 6 inches).
- One annual standing surface water sample from directly around the SWMU, if there is any standing surface water, to be collected from previously sampled drainage ditch location S1SW-3 located near the southeast corner of the landfill.
- Annual gauging of fluid levels in six existing monitoring wells (S1MW-1, 2, 4, 5, 6, and 7) to confirm the groundwater flow direction and gradient.

A summary of the sampling and analysis program is presented in Table 2. The monitoring locations are provided on Figure 2.

Groundwater, soil/sediment, and surface water samples will be analyzed for the specific constituents of potential concern (COPCs) outlined in the Permit. However, the list of analytes is not consistent with the list of constituents of concern (COCs) that were developed in the HHRA, carried through the CMS, and approved by USEPA. The analytes include:

- pH
- Volatile organic compounds (VOCs) - benzene
- Semi-volatile organic compounds (SVOCs) - 2 methylnaphthalene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene
- Metals - aluminum, arsenic, chromium, cobalt, iron, lead, manganese, vanadium, nickel, strontium

Note that cadmium was listed in the Permit as a COPC; however, cadmium was not identified as a COPC for any media at SWMU 1 and is therefore not included in the list of analytes for monitoring at SWMU 1.

The groundwater, drainage ditch soil/sediment, and drainage ditch surface water sampling results will be compared to the HBGs developed during the HHRA and outlined in the Corrective Measures Study (CMS) (Arcadis 2012), which are summarized in Table 3. HBGs were not calculated during the HHRA for all compounds listed above for media to be monitored during the CMI. HBGs were calculated only for COCs identified for particular associated media. The groundwater analytical results will also be compared to the federal primary drinking water maximum contaminant levels (MCLs) for determination that groundwater impacts are contained within the Ash Grove property boundaries (Figure 1).
2.2 **SWMU 16 – Industrial Waste Landfill**

The monitoring plan for SWMU 16 includes:

- Annual monitored natural attenuation (MNA) groundwater samples collected from existing Monitoring Wells S16MW-3, 4, 6 (background), 8, and 9, which are screened in the Noxie Sandstone.

- Annual gauging of fluid levels at the existing sandstone monitoring wells (S16MW-1, 2, 3, 4, 5, 6, 7, 8, and 9) to confirm the groundwater flow direction and gradient.

A summary of the sampling and analysis program is presented on Table 2. The monitoring locations are provided in Figure 3.

Groundwater samples will be analyzed for the unit specific COCs outlined in the approved HHRA and CMS, and additional MNA parameters, including:

- pH
- VOCs - benzene
- SVOCs – bis(2-ethylhexyl)phthalate
- Metals - aluminum, arsenic, cobalt, iron, manganese
- MNA parameters (alkalinity, chloride, sulfate, nitrate as N, dissolved gases (ethane, ethene, methane), ferrous iron, dissolved iron, dissolved manganese, total organic carbon)

The groundwater results will be compared to the HBGs developed during the HHRA and presented in the approved CMS, which are summarized in Table 3. The groundwater analytical results will also be compared to the federal primary drinking water MCLs for determination that groundwater impacts are contained within the Ash Grove property boundaries (Figure 1).

2.3 **SWMU 17 – CKD Landfill (North and South)**

The monitoring plan for SWMU 17 includes:

- Annual groundwater samples collected from existing alluvial and sandstone monitoring wells located near the North and South CKD landfills. The following wells will be monitored:
  - Alluvial Aquifer – P-11, S17MWA-1, 4, 5, 6, and 9 (background)
  - Sandstone Aquifer – P-2 (background), P-8, S17MWS-1, 3, 4, and 6

- Annual gauging of fluid levels at the following existing alluvial and sandstone monitoring wells to confirm the groundwater flow direction and gradient:
  - Alluvial Aquifer – P-10, P-11, S17MWA-1, 2, 3, 4, 5, 6, 7, 9, and 9a
  - Sandstone Aquifer – P-2, P-4, P-8, P-12, S17MWS-1, 2, 3, 4, 5, 6, and 7

A summary of the sampling and analysis program is presented in Table 2. The monitoring locations are shown on Figure 4.
Groundwater samples will be analyzed for the unit specific COCs outlined in the approved HHRA and CMS, including:

- pH
- Metals - arsenic, cobalt, manganese

The groundwater results will be compared to the HBGs developed during the HHRA and outlined in the CMS, which are summarized in Table 3. The groundwater analytical results will also be compared to the federal primary drinking water MCLs for determination that groundwater impacts are contained within the Ash Grove property boundaries (Figure 1).

2.4 SWMU 23 – Inactive Kiln Dust Landfill

The monitoring plan for SWMU 23 includes:

- One annual downgradient groundwater sample, collected from existing Monitoring Well S23MW-4, located southeast of the landfill. Well S23MW-4 is screened in alluvium.
- One annual soil/sediment sample from directly around the SWMU, collected from previously sampled drainage ditch location S23DS-3 located near the northeast corner of the landfill. The sample will be collected at a depth of 0 to 0.5 ft (0 to 6 inches).
- One annual standing surface water sample from directly around the SWMU, if there is any standing surface water, collected from previously sampled drainage ditch location S23SW-3 located near the northeast corner of the landfill.
- Annual gauging of fluid levels in six existing monitoring wells (S23MW-1, 1a, 1b, 2, 3, and 4) to confirm the groundwater flow direction and gradient.

A summary of the sampling and analysis program is presented in Table 2. The monitoring locations are provided on Figure 5.

Groundwater, soil/sediment, and surface water samples will be analyzed for the specific COPCs outlined in the Permit. However, the list of analytes provided in the Permit is not consistent with the list of COCs that were developed in the HHRA, carried through the CMS, and approved by USEPA. The analytes include:

- pH
- Metals - aluminum, arsenic, chromium, cobalt, iron, lead, manganese, vanadium

Note that cadmium was listed in the Permit as a COPC; however, cadmium was not identified as a COPC for any media at SWMU 23 and is therefore not included in the list of analytes for monitoring at SWMU 23.

The groundwater, drainage ditch soil/sediment, and drainage ditch surface water sampling results will be compared to the HBGs developed during the HHRA and outlined in the CMS, which are summarized in Table 3. HBGs were not calculated during the HHRA for all compounds listed above for media to be monitored during the CMI. HBGs were calculated only for COCs identified for particular associated media. The groundwater analytical results will also be compared to the federal primary drinking water...
MCLs for determination that groundwater impacts are contained within the Ash Grove property boundaries (Figure 1).

2.5 Analytical Program

2.5.1 Laboratory Analysis

Groundwater, soil/sediment, and surface water samples will be collected for laboratory analysis in the appropriate pre-preserved containers provided by the laboratory and stored immediately on ice at 4 degrees Celsius (°C). In addition to keeping samples chilled, the samples will be promptly transported to the laboratory and analyzed within the appropriate holding times. The number and type of samples are provided for each SWMU in Table 2. The list of analytes is summarized on Table 2 and outlined in the Quality Assurance Project Plan (QAPP, Appendix A). In addition, a summary of analytical methods, sample containers and preservation requirements, holding times, and field and laboratory quality assurance sampling programs are summarized in the QAPP.

2.5.2 Quality Assurance and Quality Control

To monitor sampling, decontamination, and laboratory performance it is necessary to collect field Quality Assurance/Quality Control (QA/QC) samples. These field QA/QC samples include duplicates, trip blanks, equipment rinsate blanks, and matrix spike/matrix spike duplicates (MS/MSD). The QA/QC samples will be collected at a frequency of 5 percent of the primary samples (one per 20 samples) or one per sampling event, if less than 20 samples. One trip blank will be submitted to the laboratory with each cooler that contains samples to be analyzed for VOCs. The QAPP (Appendix A) provides additional detail about QA/QC samples.

2.5.3 Field Analysis

Groundwater and surface water samples will be analyzed in the field during well purging (for groundwater samples) or immediately following sample collection (for groundwater and surface water samples) for the following parameters:

- pH
- Specific conductivity
- Dissolved Oxygen (DO)
- Temperature
- Oxidation-Reduction Potential (ORP)
- Turbidity

2.5.4 Field Measurements and Instrument Calibration

Several instruments will be used to collect field analytical data. The following equipment (including model number and manufacturer) or equivalents will be used:
FIELD SAMPLING PLAN

3.1 Well Condition Evaluation

Before gauging, the wells and piezometers will be inspected to determine their condition. Observations made before groundwater gauging and sample collection will include a description of any well damage, the area surrounding the well, whether or not the lock was secure (if applicable), whether the well could have been impacted by surface water run-off or flooding, ambient weather conditions, and other factors that could affect the final data analysis. This documentation will be recorded on the Groundwater Sampling Form or in the Daily Log.

3.2 Well Repairs, Re-Survey, and Re-Development

Well damage identified during gauging or monitoring events will be repaired as soon as practical, but before the next gauging or sampling event.

Following well repairs that alter the well casing elevation, the top of each well casing and the land surface adjacent to each repaired well will be re-surveyed by a Kansas registered land surveyor to an established benchmark located onsite and tied into the existing well survey.

Wells that have accumulated 10% or more sediment occluding the screen will be redeveloped before the next monitoring event.

3.3 Water Level Measurements

Water level measurements will be referenced to a surveyed elevation point located on the top of the well casing. An electronic water level probe will be used to gauge the water level in the new and existing wells at the Site.

Water level measurements will begin with the upgradient wells (i.e., inferred least potential for impact) and proceed to the downgradient wells (i.e., inferred most potential for impact). All water-level measurements will be collected within a single 24-hour period and will be measured at least two times to check the reproducibility of the measurement data. This measurement validation helps ensure accuracy in regard to the water level data collection. The procedure for obtaining water level measurements is as follows:

- QED Sample Pro bladder pump with QED MP10 Bladder Pump Controller and QED Well Wizard 3020 DC Compressor or similar (no field calibration required)
- YSI 556 MPS-04 flow-through cell or similar (field calibration required)
- LaMotte 2020e turbidity meter or similar (field calibration required)
- Heron H01.L Oil/Water Interface Probe or similar (no field calibration required)

Field instruments will be calibrated at least once a day, and more often if conditions warrant. Calibration procedures will follow manufacturer’s specifications.
1. Put on clean nitrile gloves.
2. Decontaminate the electronic water probe before initiating water level measurements and between all wells.
3. Do not measure the total well depth until after the samples have been collected to prevent suspension of possible sediment at the bottom of the well.
4. Unlock the protective casing and remove the inner cap on the riser.
5. Check the probe to verify that it is operational, then lower it down into the monitoring well.
6. Take fluid level measurements from a fixed reference point (the north side of the top of the well) using an electric tape graduated in 0.01-foot intervals.
7. Repeat the measurements until two measurements are obtained that are within 0.01 ft.
8. Remove and decontaminate the tape, replace the inner cap, and lock the protective casing.

### 3.4 Well Purging and Sample Collection

Groundwater will be sampled using low-flow sampling techniques. However, alternative groundwater purging and sampling techniques, including downhole submersible pump or equivalent and bailer methods, are also provided below, if low-flow techniques cannot be employed due to poor well yield or low groundwater levels.

#### 3.4.1 Low-Flow Method

1. Put on clean nitrile gloves.
2. Put down plastic sheeting or similar around or near the well to prevent field equipment contact with contaminated surfaces.
3. Do not measure the total well depth until after the samples have been collected to prevent suspension of possible sediment at the bottom of the well.
4. Measure fluid levels in the well per the procedures outlined in Section 4.3.
5. Calculate the volume of water in the well casing using the formula outlined below.

\[ V = 7.48 \pi r^2 h \]

where,
- \( V \) = Volume of standing water (gallons)
- 7.48 = gallons per ft\(^3\)
- \( \pi \) (pi) = 3.14
- \( r \) = Radius of well casing (ft)
- \( h \) = Height of standing water (ft), total depth minus depth to water.

- Volume for 2-inch well = 0.162 gallons/ft
- Volume for 3-inch well = 0.367 gallons/ft
6. Insert new, clean tubing or dedicated tubing attached to a pre-cleaned bladder pump into the well to the midpoint of the well screen (see Table 2 for pre-determined pump depths). Record installation time in field notes.

7. Start pump at the lowest possible flow rate and adjust the pumping rate to approximately 100 milliliters per minute (ml/min). Record pump start time in field notes. Verify the flow rate with the graduated cylinder or equivalent by collecting the water from the discharge line for 1 minute. Record results in field notes.

8. Collect fluids for disposal. Record volume of fluids.

9. Monitor water level to verify that little or no drawdown (0 to 0.3 ft) is occurring in the well. If desired, the flow rate may be increased to up to 300 ml/min in more permeable formations as long as minimal drawdown is observed in the well. Record measurements and flow rates in field notes.

10. Using a flow-through cell, obtain field parameter measurements (temperature, specific conductance, pH, DO, ORP, and turbidity) after each liter of water is purged. Continue purging until the criteria listed below have been met (unless low well recovery precludes this):
   - The field parameters stabilize to within +/- 10 percent of three consecutive meter readings taken at least 3 minutes apart.
   - The measured turbidity is less than 10 nephelometric turbidity units (NTUs), unless low recovery precludes this.

11. Prepare and label sample containers.

12. Collect VOC sample at low flow rate (100 ml/min) for laboratory analysis directly into the pre-prepared appropriate sample container. Ensure that no air bubbles are present in the vial. If air bubbles are visible in the sample vial, a new sample should be recollected in a new sample vial. Proceed with collection of additional samples (i.e., collecting in the order of VOCs, SVOCs, total metals, other inorganics) at low flow rate (100 ml/min).

13. Secure sample container lids, label, and place samples on ice immediately.

14. If inadequate water is present in the well to fill the required sample containers, the sample crew will return periodically within 24 hours until adequate sample volume is obtained and field parameters measured. Groundwater will be collected for individual analyses in the appropriate sample order.

15. Using the flow-through cell, obtain a final set of field parameter measurements.

16. Turn off pump. Remove pump and/or tubing from well (if not dedicated to well) and decontaminate or dispose.

17. Determine the total depth of the well. Compare the measurement of the total depth of the well with previous measurements and well construction log to determine available screen length. If more than 10 percent of a well screen is occluded by sediment, the well must be redeveloped before collecting future groundwater quality samples.

18. Replace cap on well, close protective casing, and lock well.

19. Decontaminate down-well equipment using the procedures described in Section 4.6.
3.4.2 Alternate Method for Low-Yield Wells

The following procedures will be implemented when purging and sampling wells with unsustainable yields:

1. Put on clean nitrile gloves.
2. Unlock the metal protective casing, remove the well cap and document the general condition of the well.
3. Determine static fluid-level using electronic probe following procedures in Section 3.3.
4. Do not measure the total well depth until after the samples have been collected to prevent suspension of possible sediment at the bottom of the well.
5. Compute the volume of water in the well (0.162 gallon/foot for a 2-inch diameter well) using the previously recorded well depth measurement.
6. Insert new disposable bailer into well and start purging process until 3 well volumes are removed or until the well is purged dry.
7. Obtain field parameter measurements (temperature, specific conductance, pH, and turbidity) after each well volume of water is purged.
8. If well is purged dry, allow groundwater level to recover up to 24 hours. At end of recovery period, determine fluid level using electronic probe.
9. Collect metals sample, followed by indicator parameters for laboratory analysis directly into the pre-prepared appropriate sample container. Secure sample container lid and store sample containers in chilled cooler.
10. If inadequate water is present in the well to fill the required sample containers, the sample crew will return periodically within 24 hours until adequate sample volume is obtained and field parameters measured. Groundwater will be collected for individual analyses in the appropriate sample order. Metals will be collected and stored first, then indicator parameters will be collected and stored.
11. Determine the total depth of the well. Compare the measurement of the total depth of the well with previous measurements and well construction log to determine available screen length. If more than 10 percent of a well screen is occluded by sediment, the well must be redeveloped prior to collecting future groundwater quality samples.
12. Replace cap on well and protective casing lock well.

3.5 Soil/Sediment Sample Collection

1. Remove vegetation and surface debris at the sample location by scraping away with a clean stainless-steel trowel or equivalent. Remove gravel or other debris before obtaining the sample.
2. Using a clean stainless-steel trowel, spoon, or equivalent, collect the sample from 0-0.5 ft and fill the laboratory prepared sample containers (i.e., collecting in the order of VOCs, SVOCs, total metals, other parameters).
3. Describe the profile of soil/sediment based on visual observations of the material removed from the sample location and record in a Soil Sampling Log. The sample description will include soil or material type, color, odor, moisture content, plasticity, grain-size, and organic content.

4. After the location has been sampled, use the leftover soil/sediment material to backfill the location.

5. Mark the sample location area with a labeled stake or flag.

6. Collect global positioning system (GPS) coordinates.

### 3.6 Surface Water Sample Collection

The following general procedure is applicable to collection of shallow surface water samples. Waders or rubber boots will be required to collect surface water samples.

1. Approach the sample location from the downstream direction taking care not to disturb sediments.

2. Facing the upstream direction, collect a surface water sample into a clean Pyrex glass sampling cup or equivalent near the mid-point (vertically) of the water column. Use the sample cup to transfer to the laboratory-prepared sample bottles such that water gently flows in with minimal disturbance. Collect the sample in the following order: VOCs, SVOCs, total metals, other parameters.

3. Immerse a clean Pyrex glass sampling cup or equivalent to collect enough additional water to perform appropriate field tests. Record: physical characteristics (e.g., color, clarity, presence of sheen, odor), pH, conductivity, DO, turbidity, and temperature.

4. Mark sampling location (along the bank) with wood stake and flagging or equivalent.

5. Collect GPS coordinates for sampling location.

6. Record the sampling location, date and time of collection, sample collection method, sample identification, sample preservative, methods of analysis, and initials of the sampling personnel.

7. Decontaminate the sampling equipment.

### 3.6.1 Alternate Shallow Surface Water Sampling Procedures

If the surface water location has good flow but is so shallow that the sampler cannot be filled without disturbing sediment, the following procedures may be used:

1. Approach the sample location from the downstream direction taking care not to disturb sediments.

2. Facing the upstream direction, use a decontaminated stainless-steel spoon/scoop/shovel and dig out a hole in the bottom of the surface water sampling location of sufficient size to allow the sample container to be dipped into the water without disturbing sediments.

3. Wait to return to equilibrium (i.e. allow sediment to settle) before sampling using the procedure above.

4. If rock substrate prevents digging out a location to sample by dipping, use a clean stainless-steel ladle to collect the sample and transfer it to the appropriate container. The sample order should follow the sampling sequence described above.
5. Collect enough water to perform appropriate field tests. Record: physical characteristics (e.g., color, clarity, presence of sheen, odor), pH, conductivity, DO, turbidity, and temperature.

6. Mark sampling locations with wood stake and flagging or equivalent.

7. Collect GPS coordinates for sampling location.

8. Record the sampling location, date and time of collection, sample collection method, sample identification, sample preservative, methods of analysis, and initials of the sampling personnel.

9. Decontaminate the sampling equipment.

### 3.7 Sample Documentation and Chain-of-Custody

The sampling team will be responsible for the documentation, custody, and care of collected samples until the containers are transferred to the custody of the laboratory. Documentation of sample collection, as well as other pertinent information, such as weather, site conditions, and sampling anomalies, will be recorded in a field log book dedicated to the project or on appropriate field forms.

Standard chain-of-custody procedures will be followed to maintain and document sample possession. A chain-of-custody form will be completed for each shipping container sent to the laboratory, documenting possession from the time of collection to analysis. If the samples will leave the field personnel's immediate control, such as shipment to a laboratory by a common carrier, a chain-of-custody seal will be provided on the shipping container or individual sample bottles to ensure that the samples have not been disturbed during transportation.

### 3.8 Decontamination

#### 3.8.1 Field Sampling and Analytical Equipment and Instrumentation

Any equipment used to collect groundwater, soil/sediment or surface water samples or profile the water column will be either decontaminated using the protocol below or dedicated for one-time use. These protocols minimize the possibility of sampling device cross-contamination.

The exterior of sealed, water-tight equipment should be washed with a phosphate-free, laboratory-grade detergent (such as Alconox) and rinsed with tap water before storage. The interiors of such equipment may be wiped with a damp cloth if necessary. Other field instrumentation should be wiped with a clean, damp cloth. Conductivity probes, pH meter probes, and other similar equipment, should be rinsed with deionized or distilled water and dried before storage.

For non-dedicated equipment, such as groundwater pumping equipment, the following decontamination protocols will be used:

1. Prepare a phosphate-free, laboratory grade detergent (such as Alconox), and distilled water mixture in a clean bucket.
2. Put on new nitrile gloves.
3. Perform any necessary disassembly.
4. Using a laboratory scrub brush, scrub each piece of equipment with the detergent/distilled water mixture.

5. Rinse the cleaned equipment with deionized or distilled water.

6. Allow to air dry on new aluminum foil or plastic sheeting.

If the equipment cannot be cleaned using these procedures, it should be discarded or set aside for further decontamination.

### 3.8.2 Ice Chests and Shipping Containers

If the ice chests and reusable containers that will be used to store or ship samples and sample containers are believed to be contaminated, the shipping containers should be washed with laboratory-grade detergent (interior and exterior), rinsed with portable water, and air dried before storage. If an ice chest or other reusable container becomes severely contaminated, it will be cleaned as thoroughly as possible, rendered unusable, and disposed of properly.

### 3.9 Waste Management

Investigation-derived wastes (IDW) including decontamination fluids, monitoring well purge water, redevelopment water, and personal protective equipment (PPE) will be characterized and disposed according to the procedures described below.

#### 3.9.1 Wastewater

IDW water including decontamination water, well redevelopment water, and purge water will be temporarily containerized onsite as it is generated and will be discharged back on the respective landfill ensuring that fluids do not run off the landfill, transported to Landfill #759 for discharge to the slurry monofill, or discharged to the leachate treatment system located at SWMU 17.

#### 3.9.2 Waste Soil or Sediment

IDW soil or sediment, including any leftover soil/sediment from landfill monitoring samples, will be placed back in the boring or sampling location.

#### 3.9.3 Disposable Personal Protective and Sampling Equipment

Disposable PPE, such as gloves, and sampling equipment, such as disposable bailers or tubing, will be placed in trash bags and disposed in site trash receptacles as refuse. The disposal PPE and supplies will be visually inspected for gross contamination before disposal.

### 4 STATISTICAL ANALYSIS PLAN

The Permit called for the statistical analysis of monitoring data at SWMU 1 and SWMU 23 to determine if a Statistically Significant Increase (SSI) had taken place. The protocol for alleviating an identified SSI that will be followed is outlined in Section 4.7. This section presents the statistical analysis plan for each
SWMU, an overview of the methodology, and comments concerning the existing background data set against which the annual samples will be compared.

4.1 SWMU 1

Annual sampling at SWMU 1 includes groundwater sampling, sediment sampling, and surface water sampling. The samples collected from all of these media will be analyzed for 16 parameters, including pH, benzene, four SVOCs, and 10 metals.

4.1.1 Groundwater

Monitoring well S1MW-2 is to be sampled annually. The annual sample will be compared to an intrawell upper prediction limit (UPL) computed at 95% confidence. The UPL will be computed following methods presented in Chapter 18 of USEPA's Unified Guidance for the Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (USEPA 2009). Well S1MW-2 has been sampled twice, in 1999 and 2002. Some of the constituents have only been analyzed once. Comparison of new sample data to UPLs will begin for a given analyte when eight background values are available for that analyte to allow the computation of a UPL with adequate statistical power. The background data set will be expanded when four to six new data points are available using the Mann-Whitney U test (Mann and Whitney 1947) following procedures presented in Unified Guidance.

If analyte concentrations from a new sample exceed both the UPL and the HBG, the monitoring well will be resampled within 30 days of the completion of the data validation report for the laboratory data with the exceedance. The new sample will be analyzed only for the constituent that had the suspected SSI. If the new sample also exceeds the UPL and the HBG, then the SSI protocol will be followed to alleviate the exceedance.

4.1.2 Sediment

A sediment sample is to be collected annually from drainage ditch location S1DS-3 at a depth of 0 to 6 inches. Because this sample is recurring, the statistical method that best allows comparison is the 95% UPL. The background data set will consist of previous sediment samples from drainage ditch location S1DS-3. This analysis will be analogous to an intrawell UPL. Comparison of new data to UPLs will begin when there are at least eight members of the background data set. The data set will be expanded every four to six sampling events. If there is a suspected SSI that exceeds the HBGs, then the location will be resampled within 30 days of the completion of the data validation report for the laboratory data with the exceedance. The new sample will be analyzed only for the constituent that had the suspected SSI. If the exceedance is confirmed, then the SSI protocol will be followed.

4.1.3 Surface Water

A surface water sample at S1SW-3 will be collected in any sampling event in which standing water is observed. UPLs will also be used for surface water samples following the methods discussed for groundwater and sediment, including the resampling. UPLs can be computed when eight surface water samples exist for SWMU 1. After that, surface water samples will be compared to the UPLs and the HBGs. If a suspected SSI exceeds the HBGs, then the location will be resampled within 30 days of the
completion of the data validation report for the laboratory data with the exceedance. The new sample will be analyzed only for the constituent that had the suspected SSI. If the exceedance is confirmed, then the SSI protocol will be followed. The surface water data set should be expanded when there are four to six sampling events beyond the initial computation of the UPLs, as in the case of the sediment and groundwater data sets.

4.2 SWMU 16

Annual sampling at SWMU 16 includes groundwater sampling of five monitoring wells, S16MW-3, 4, 6, 8, and 9. The samples collected from these wells will be analyzed for eight parameters, including pH, benzene, bis(2-ethylhexyl)phthalate, and five metals. MNA compounds are also included in the analyte list, but will not be part of the statistical analysis program.

MNA is the chosen remedy. Therefore, the statistical test will be trend tests, including the Mann-Kendall test and Sen’s Slope Estimator. These tests will be conducted following methods presented in Unified Guidance (USEPA 2009). At present, the data sets from the five monitoring wells are too small to allow for a robust analysis of trends. When eight data points are obtained, the trend analysis will begin. If an increasing trend is observed and the most recent data point exceeds the HBG, then the monitoring well will be resampled within 30 days of the completion of the data validation report. If the trend is confirmed, the SSI protocol may be invoked. However, one must also consider groundwater flow velocity and whether there has been time for the remedial actions taken thus far to influence the monitoring well in question. An increasing trend in the background monitoring well will not constitute a SSI, but it will serve as a possible explanation for any unexpected results in the other four monitoring wells.

4.3 SWMU 17

Annual sampling at SWMU 17 includes groundwater sampling of six monitoring wells in the alluvial aquifer and six monitoring wells in the sandstone aquifer. The samples collected from these wells will be analyzed for four parameters, including pH and three metals.

The monitoring wells are to be sampled annually. The annual samples will be compared to intrawell UPLs. Intrawell methods are necessary to conform to USEPA guidance. The confidence level of the UPLs for SWMU 17 will be determined using methods in Chapter 19 of Unified Guidance (USEPA, 2009) to control the site-wide false positive rate (SWFPR). The UPL will be computed following methods presented in Chapter 18 of USEPA’s Unified Guidance (USEPA, 2009). Up to the time of this writing, none of the monitoring wells have been sampled more than twice (1999 and 2002). Comparison of new sample data to UPLs will begin for a given analyte when eight background values are available for that analyte to allow the computation of a UPL with adequate statistical power. The background data set will be expanded when four to six new data points are available using the Mann-Whitney U test following procedures presented in Unified Guidance.

If a new sample exceeds both the UPL and the HBG, the monitoring well will be resampled within 30 days of the completion of the data validation report for the laboratory data with the exceedance. The new sample will be analyzed only for the constituent that had the suspected SSI. If the new sample also exceeds the UPL and the BHG, then the SSI protocol will be followed to alleviate the exceedance.
4.4 SWMU 23

The sampling plan for SWMU 23 is analogous to that of SWMU 1, with a single annual groundwater sample, a single sediment sample, and a single surface water sample. Therefore, the statistical methodology used at SWMU 23 will be the same as that used for SWMU 1.

The analyte list is shorter for SWMU 23 than for SWMU 1, containing only pH and eight metals. However, the same statistically methods (intrawell UPLs with periodic data set expansion) will be followed per Unified Guidance.

4.5 Upper Prediction Limits

The UPLs will be computed following principles set forth in Unified Guidance (USEPA, 2009). A few subjects are worth noting including stationarity, censorship, normality and statistical outliers.

4.5.1 Stationarity

Stationarity is a property of a data population having a constant mean and variance over time and space. For interwell testing to be valid, the data for a given constituent in the background monitoring wells must not be spatially variable. If this is not the case, it will be difficult to ascertain whether differences between upgradient and downgradient data are the result of the regulated unit or of natural variations. Because each of the units has no more than one background monitoring well in a given water bearing unit, it is not possible to test for spatial stationarity. Therefore, intrawell methods will be used.

Temporal stationarity will be achieved by testing each data set for trends. An increasing trend is a flag that conditions are changing. Well-constituent pairs with increasing trends will therefore be tested with UPLs and a second method such as control charts for confirmation. When data sets are expanded, the Mann-Whitney U test will be performed to demonstrate that the new data are of the same statistical population as the existing data set.

4.5.2 Censorship

The presence of non-detect data in the background data set is referred to as censorship. Environmental data are often censored. The method used for handling non-detections is referred to in Unified Guidance as the “15% and 50% Non-Detect Rule” (USEPA 2009, p.15-24). According to this rule, if the data set contains non-detections, these values will be replaced by concentrations equal to one half of the detection limit. If the data consist of more than 15% non-detections, then the mean and standard deviation must be adjusted. In data sets with more than 50% non-detections, non-parametric methods must be used.

The Kaplan-Meier method (Kaplan and Meier 1958) is one of the methods recommended by Unified Guidance for adjusting the mean and standard deviation when the rate of non-detection is between 15% and 50%. This method will be used. The nonparametric method will be to use a large order statistic. The maximum detected value can be used as the UPL if four reuses are planned and the data set has 60 members or less. The rationale for this selection is presented in Unified Guidance (USEPA 2009, p.18-16; Davis and McNichols 1999). Statistical tests will not be performed on data sets composed completely of non-detections. Rather, the Double Quantification (DQ) rule will be applied. The DQ rule...
states that “a confirmed exceedance is registered if any well-constituent pair in the ‘100% non-detect’ group exhibits quantified measurements (i.e., at or above the reporting limit) in two consecutive sample and resample events” (USEPA 2009, p.6-11).

In summary, non-detections will be handled based on the proportion of the data set composed of non-detections. If that portion is 15% or less, the non-detections will be substituted with one half for the detection limit. If that portion is 15% to 50%, then the Kaplan-Meier method will be used. If that portion is greater than 50%, then the maximum detection will be used as the UPL. If the portion of the data set that is composed of non-detections is 100%, then the DQ rule will be applied.

4.5.3 Determination of Normality

The Shapiro-Wilk Test for Normality will be used for data sets with sizes up to 50 members (Shapiro and Wilk 1965). The test will be run at the 5% critical level. If larger data sets are encountered, the Shapiro-Francia Test for Normality will be used (Shapiro and Francia 1972). Other tests, such as probability plots (Q-Q Plots), D’Agostino’s Normality Test or the Kolmogorov-Smirnov Test will be used to test normality at the discretion of the statistician.

If a data set does not pass a test of normality, data will be transformed following the ladder of powers (Box and Cox 1964). The ladder of powers is a sequence of transformations: square root, square, cube root, cube, logarithmic transformation, $x^4$, $x^5$, and $x^6$. All points in the untransformed data set will be changed by one of these operations, and the new data set will be tested to determine if the transformed data meet the criterion of normality. If the test fails, the original data will be transformed using the next transformation in the ladder. Transformations will be attempted in the order of the ladder of powers until normality is achieved, or until all of the options are exhausted. In the latter case, non-parametric tests will be necessary.

4.5.4 Statistical Outliers

Extreme outliers in a background data set can bias a statistical test. According to USEPA guidance, outliers should be identified, but they need not be removed from the background data set unless an error is suspected (USEPA 2009, p. 5-5 to 5-6). Unified Guidance does not recommend removing outliers solely on the basis of a statistical test (USEPA 2009, p.12-1). Following this guidance, data sets will be normalized and Dixon’s Test for Outliers (Barnett and Lewis 1994) will be performed on all data sets with 25 or fewer members. Larger data sets will be evaluated using Rosner’s Test for Outliers (Rosner 1975). If outliers are identified, they will be reported in a list. The statistician will recommend whether an outlier should or should not be removed from use in the background data set, and the regulatory agency will evaluate the recommendations. All points deemed unusable will be placed on a list of unused points, and this list will be included in all reports in which the predictions intervals are updated.

4.5.5 Controlling the Sitewide False Positive Rate

Unified Guidance has a method for controlling the Sitewide False Positive Rate (SWFPR) found in Chapter 19 (USEPA 2009). The goal of this method is to find a test-wise value of the statistical significance $\alpha_{test}$ (which is one minus the confidence level) such that the desired SWFPR is attained. Let $\omega$ be the probability that an analysis exceeds the background limit. The method of controlling the SWFPR
is to select a value of $\omega$ that will lead to the desired SWFPR given $r$ the number of analyses that are planned. Unified Guidance recommends setting the annual SWFPR to 0.1 for the intrawell testing. The SWFPR will be computed based upon a “1 for 2” resampling plan. This plan calls for the resampling of any compliance monitoring well for which the UPL is exceeded. An SSI is only recorded if the exceedance is confirmed by the resampling. If $Q$ is the probability that an analytical result will falsely be declared an exceedance, then

$$\alpha = 1 - (1 - Q)^r$$

where $\alpha$ has been chosen as the SWFPR. In a sampling scheme with a “1 for 2” sampling plan,

$$Q = \omega^2$$

Thus

$$\alpha = 1 - (1 - \omega^2)^r$$

Because $\alpha$ has been chosen and it is $\omega$ that we are seeking to compute, this equation is rewritten as:

$$\omega = \sqrt[1/r]{1 - (1 - \alpha)}$$

The number of compliance monitoring wells $w$, the number of constituents $c$, and the number of sampling events $v$ are also parameters in the computation of the SWFPR, because they determine the value of $r$. In this application,

$$r = w \times c \times v$$

For example, monitoring networks at SWMU 17 have five compliance monitoring wells and two constituents that are likely to have parametric UPLs. One sampling event is planned per year. Thus, there will be $5 \times 2 \times 1 = 10$ tests, and $r = 10$. Therefore:

$$\omega = \sqrt[1/10]{1 - (1 - 0.1)^{1/6}}$$

In this illustration, $\omega$ is 0.1024. Per test, the significance is $\omega^2$. That is:

$$\alpha_{\text{test}} = 1 - (1 - \alpha)^{1/r}$$

In the example above, the significance for each test would be 0.010481.

Constituents detected at low frequencies will never have UPLs computed by parametric methods. Therefore, these analytes should not be used in determining $c$ for computing $\omega$. This is why $c$ was 2 and not 3; cobalt is not likely to be detected at sufficient frequency to support parametric methodology. The value of $c$ might change if the newer data alter the detection frequency above or below 50%.

It should be noted that each SWMU will be treated as a separate “site.” With that in view, this SWFPR methodology can only be applied to UPLs computed where there are multiple monitoring wells. Separate values of the SWFPR are needed for each water-bearing unit, the alluvium, and the sandstone. Computing $\alpha$ for the non-parametric tests will involve an alternative strategy. By definition, $\alpha$ cannot be selected precisely for a non-parametric test.
4.5.6 Updating the Background Data Set

The UPLs are being computed for a pre-determined number of future uses. Every four to six sampling events, the background data set will be updated and new UPLs will be computed for the updated data set. There are several methods for updating a data set. One method is continual addition. By this method, the number of data points will increase continually. A second method is the moving window approach. Using this approach, the oldest data points are removed from use in computing UPLs whenever newer ones are added. Both methods have their strengths and weaknesses. The advantage of continually adding data points is obvious. This method can make for a large data set. If the mean and standard deviation are constant, then the sample mean and standard deviation will approach their true values the larger the sample size becomes. The disadvantage of this method is that more recent trends in the data will be lost by the effect of the earlier data points. For this unit, the advantage seems to outweigh the disadvantage. Therefore, the data set will expand continuously.

Before admitting the new data points to the background data set, the new points will be tested to determine if they are from the same statistical population as the existing data. This will be accomplished by comparing the existing background data to the new data points using a Mann-Whitney U test at a 0.01 level of statistical significance. If no significant differences are noted between the means, then the four points will be added. If differences are identified, then the most extreme of the new data points will be removed, and the other data points will be retested. If this test also indicates a difference, then the data set will not be updated, and the old UPL will be used for 4 to 6 more years. In the case of a failure, Mann-Whitney U tests in future years will explore the use of data points previously set aside when making decisions about admitting the new data.

4.5.7 Computing Prediction Limits

Every time the background data set is updated, a new set of UPLs will be computed. In groundwater monitoring, these intervals are usually set up with one tail, to cover the range from zero to an upper limit. The reason for this arrangement is obvious; in environmental investigations, it is rarely an issue if the concentration of an analyte is too low. If it were to become necessary to include pH in the statistical analysis, this parameter would have to be tested in two-tailed mode, because low pH is just as much of an environmental concern as high pH. Thus, a UPL will be computed for every analyte for every monitoring well and a lower prediction limit (LPL) may also be computed for pH.

Prediction intervals are ranges of potential values based on past results in which future measurements can be expected to occur with a chosen rate of confidence. Prediction intervals can be determined parametrically based on the mean ($\bar{x}$), the standard deviation ($S$), the number of samples ($n$), and a quantile value, in this case the t-statistic ($t$). The parametric equations for the UPL and the LPL, respectively are:

$$UPL = \bar{x} + S \cdot t \sqrt{1 + \frac{1}{n}}$$

and
\[ \text{LPL} = \bar{x} - S t \sqrt{\frac{1}{1 + \frac{1}{n}}} \]

The mean and standard deviation can be obtained directly from the data. The value of the t-statistic can be obtained from Table 16-1 in Unified Guidance (USEPA 2009). The value of \( t \) depends on the number of degrees of freedom and \( \alpha_{\text{test}} \). The former is the \( n - 1 \). The latter will be obtained from the SWFPR calculations discussed in a previous section. In a two-tailed calculation, the statistical significance will be set equal to one half \( \alpha_{\text{test}} \), with half of the significance on each tail.

The use of these parametric equations is conditional. The data must be normally distributed, the principle of statistical independence must be maintained, and there must be stationarity. Outliers and non-detections must be properly handled. If a transformation is needed using the ladder of powers, the UPL will be back-transformed to the original measurement scale for the convenience of the user (USEPA 2009, p.17-16). If the Kaplan-Meier method is needed to handle non-detections, the values of \( x \) and \( S \) used in the above equations will be the adjusted values.

If the rate of detection is less than 50% or if no transformation can be found to satisfy the normality test, then the parametric equations cannot be used. Instead, the maximum detected value will function as the UPL.

A table will be prepared every time UPLs are computed indicating the method used for obtaining the UPL, whether parametric or non-parametric. If transformations were necessary, this will also be recorded.

### 4.5.8 Comparing Monitoring Data Upper Prediction Limits

Every time the monitoring wells or other locations are sampled, the analytical results will be compared to their respective UPLs. A table will be prepared showing the analytical results and the UPLs side by side. Any analytical result outside its respective prediction interval will be indicated by bolding or shading.

### 4.6 Trend Testing

The trend tests, Mann-Kendall and Sen’s Slope Estimator, will be conducted following Unified Guidance (USEPA 2009). The Mann-Kendall trend test (Gilbert 1987) is a non-parametric test for linear trends based upon the concept that a series of data points without a trend should fluctuate randomly around a constant mean. If an increasing trend were to exist, one would expect an earlier point to have a lower value than a later point. The converse would be true if a decreasing trend were present. A Mann-Kendall statistic \( S \) is computed by comparing each pair of data points in a data set and assigning a value of +1 or -1 if the earlier data point is less than the later data point or greater than the later one, respectively. If the two data points are equal, the pair is assigned a zero. The values assigned to the pairs are summed. If the total is positive, it implies that most of the differences between the points are positive, indicating a positive trend. Likewise, a negative sum indicates a decreasing trend. A value at or near zero indicates that the differences are roughly equal, implying that there is no trend. A critical value of \( S \) is determined based on the number of points in the data set and the level of significance of the test. If the Mann-Kendall statistic \( S \) exceeds the critical \( S \), then an upward trend is statistically significant. Conversely, if the Mann-Kendall \( S \) is negative and its absolute value is greater than the critical \( S \), then there is a
statistically significant downward trend. This test is described in detail in Unified Guidance (USEPA 2009, p. 17:30-34).

Unified Guidance is remarkably silent on the question of what confidence level Mann-Kendall should be run. Based on experience and on a communication with the primary author of that guidance, the test will be run at 90% confidence (with 5% statistical significance on each tail) for data sets with fewer than ten members. It will be run at 95% confidence (with 2.5% significance on each tail) for data sets with 10 to 19 members. Data sets with 20 or more data points will be run at 98% confidence (with 1% significance on each tail).

In the data sets in which statistically significant trends were not identified, a distinction will be made between data sets with a coefficient of variation that was less than or equal to 1.0 and those greater than 1.0. Data sets with a coefficient of variation of less than 1.0 are considered “stable”. Data sets will be categorized as having “no trends” if the coefficient of variation was greater than 1.0. The coefficient of variation is defined as the sample standard deviation divided by the sample mean. As such, this coefficient provides a measure as to how “spread out” the data are. For example, suppose two monitoring wells had eight measurements of the concentration of a certain constituent. The first well had the following measurements in this order: [20, 12, 16, 14, 18, 15, 18, 10] and the other one had measurements in this order: [32, 4, 7, 1, 2, 16, 55, 6]. The values in the second data set are more “spread out” than in the first one. If the Mann-Kendall test is run, neither data set has a statistically significant trend. Both data sets have an arithmetic mean of 15.38. The difference is that the standard deviation of the first data set is 3.34 and the standard deviation of the second data set is 18.97. Thus, the respective coefficients of variation are 0.22 and 1.23. We would call the first data set “stable”. The second data set would be designated “no trend”.

Sen’s slope estimator (Helsel 2005) is a good compliment to the Mann-Kendall test, because the values of the concentrations are considered. Like the Mann-Kendall test, it is non-parametric. This test computes the slope of every pair of distinct measurements. Unlike the Mann-Kendall test, where the issue is simply whether the succeeding value is higher or lower than the previous data point in a pair, the amount by which they differ matters, and the actual slope is estimated from the median of the pairwise slopes. The test is nonetheless non-parametric, because it determines the median, not the arithmetic mean of the pairwise slopes. This test is described in detail in Unified Guidance (USEPA 2009, p. 17:34-38).

### 4.7 SSI Protocol

In the event that a SSI is confirmed and the SSI exceeds the respective HBG, the following protocol will be followed. The SSI protocol for monitoring during the CMI includes developing a SWMU-specific plan designed to alleviate the particular exceedance. The plan will be submitted to USEPA and KDHE for review and approval before implementation.

### 5 REPORTING

Following the collection of field data and receipt of laboratory data, the data will be reviewed and validated (see QAPP in Appendix D). The monitoring activities and results will be documented in the annual summary report submitted to USEPA and KDHE (see Reporting section of the CMI Work Plan).
The annual summary report will include a brief description of the field activities completed and appropriate conclusions about the data. The report will also include summary tables (including fluid-level gauging, total depth comparison, and analytical data), site figures (including groundwater flow maps and maps showing the lateral extent of constituents, as applicable), sample collection forms, chain-of-custody forms, laboratory data, and data validation reports. The report will also include documentation of any well repairs, maintenance, or survey completed since the previous report.

6 REFERENCES


Mann, H.B. and D.R. Whitney. 1947. On a test of whether one of two random variables is stochastically larger than the other. Annals of Mathematical Statistics, 18(1), 50-60.


GROUNDWATER MONITORING PLAN
Ash Grove Cement Company, Chanute, Kansas


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Notes:
ft msl Feet above mean sea level.
ft bgs Feet below ground surface.
\(^1\) Measuring point elevations resurveyed 2002.
### Table 2: Sampling and Analysis Program
Ash Grove Cement Company
Chesnok, Kansas

#### SWMU 1 - Paraffin Waste Storage Area

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#### Notes:
- **VOC**: volatile organic compound
- **SVOC**: semi-volatile organic compound
- **VOCs by 8260B**
- **SVOCs by 8270C**
- **Total Metals by 6010/6020**
- **MNA**: monitored natural attenuation
- **VOCs by 8260B**: monitored natural attenuation
- **SVOCs by 8270C**: volatile organic compound
- **Total Metals by 6010/6020**: volatile organic compound
- **MNA**: monitored natural attenuation
- **Notes**: monitored natural attenuation

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#### Water Field Parameters:
- **Turbidity**
- **Dissolved Oxygen**
- **Specific Conductance**
- **Temperature**
- **Chloride**
- **Alkalinity**
- **Dissolved Iron**
- **Ethane, Ethene, Methane (dissolved gases)**
- **vanadium**
- **iron**
- **cobalt**
- **chromium**
- **arsenic**
- **aluminum**
- **Total Metals by 6010/6020**

#### Groundwater Field Parameters:
- **Temperature**
- **Specific Conductance**
- **Dissolved Oxygen**
- **Chloride**
- **Alkalinity**
- **Dissolved Iron**
- **Ethane, Ethene, Methane (dissolved gases)**
- **vanadium**
- **iron**
- **cobalt**
- **chromium**
- **arsenic**
- **aluminum**
- **Total Metals by 6010/6020**

#### Analytical Laboratory Parameters:
- **Total Metals by 6010/6020**
- **MNA Parameters**
- **notes**

#### SWMU 16 - Industrial Waste Landfill

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#### SWMU 17 - CKD Landfill (North and South)

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#### Analytical Laboratory Parameters:
- **Total Metals by 6010/6020**
- **MNA Parameters**
- **Notes**
### Table 3
Screening Criteria Summary
Ash Grove Cement Company
Chanute, Kansas

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**Notes:**
- mg/L: milligrams per liter
- mg/kg: milligrams per kilogram
- HBG: Health Based Goal
- MCL: Maximum Contaminant Level
- SVOC: semi-volatile organic compound
- VOC: volatile organic compound
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 1 - Paraffin Waste Disposal
Landfill

Legend
- Bedrock Monitoring Well (Lane Shale)
- Sediment Sample
- Surface Water/Sediment Sample
- Drainage Ditch
- Topographic Contour (5-Foot Interval)
- Surface Water Feature
- Solid Waste Management (SWMU) Area

Notes:
1) All locations are approximate
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 16 - Industrial Waste Landfill

Legend
- Monitoring Well
- Sandstone Monitoring Well
- Drainage Ditch
- Topographic Contour (5-Foot Interval)
- Surface Water Feature
- Solid Waste Management (SWMU) Area
- CMI Annual Sample Locations
- Wells Gauged Only During Annual CMI Sampling Events

Notes:
1) All locations are approximate
ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 17 - CKD Landfill

Notes:
1) All locations are approximate

Legend
- Alluvial Aquifer Monitoring Well
- Limestone Aquifer Monitoring Well
- Sandstone Monitoring Well
- Deep Piezometer
- Drainage Ditch
- Topographic Contour (5-Foot Interval)
- Surface Water Feature
- Solid Waste Management (SWMU) Area
- CMI Annual Sample Locations
- Wells Gauged Only During Annual CMI Sampling Events

GRAPHIC SCALE

0 700 1,400 Feet

FIGURE 4
Notes:
1) All locations are approximate

ASH GROVE CEMENT COMPANY
CHANUTE, KANSAS

SWMU 23 - Inactive Kiln Dust Landfill

Legend
- Monitoring Well
- Sediment Sample
- Surface Water/Sediment Sample
- Drainage Ditch
- Surface Water Feature
- Solid Waste Management (SWMU) Area

S23SW-3 CMI Annual Sample Locations
S23MW-4 Wells Gauged Only During Annual CMI Sampling Events
Appendix D

QUALITY ASSURANCE PROJECT PLAN/DATA MANAGEMENT PLAN

Ash Grove Cement Company
Chanute, Kansas

December 21, 2017
QUALITY ASSURANCE PROJECT PLAN / DATA MANAGEMENT PLAN
Ash Grove Cement Company, Chanute, Kansas

Tina Lloyd, P.G.
Principal Geologist

John Shonfelt, P.G.
Senior Project Manager/Principal

QUALITY ASSURANCE PROJECT PLAN / DATA MANAGEMENT PLAN
Ash Grove Cement Company
Chanute, Kansas

Prepared by:
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Kansas 66215
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Fax 913 492 0902

Our Ref.:
KC001721.0001

Date:
December 21, 2017
QUALITY ASSURANCE PROJECT PLAN / DATA MANAGEMENT PLAN
Ash Grove Cement Company, Chanute, Kansas

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      3.3.1.2 Shipping Containers
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      3.3.2.1 Field Custody Procedures
      3.3.2.2 Sample Labels
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      3.5.1.1 Duplicates
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QUALITY ASSURANCE PROJECT PLAN / DATA MANAGEMENT PLAN
Ash Grove Cement Company, Chanute, Kansas

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ATTACHMENTS

1  Quality Manual for Analytical Laboratory (on CD)
2  Summary of Analytes, Analytical Methods, Reporting Limits, and Method Detection Limits for Analytical Laboratory
ACRONYMS AND ABBREVIATIONS

ASTM  American Society for Testing and Materials
°C  degrees Celsius
CAS  Chemical Abstract Registry
CFR  Code of Federal Regulations
CLP  Contract Laboratory Program
CMI  Corrective Measures Implementation
COC  Chain-of-Custody
DM  Data Management
DMP  Data Management Plan
DOT  U.S. Department of Transportation
DQO  Data Quality Objective
EDD  electronic data deliverable
GC/MS  gas chromatography/mass spectrometry
GPS  global positioning system
GWMP  Groundwater Monitoring Work Plan
ICP  inductively coupled plasma
IDW  investigation-derived waste
KDHE  Kansas Department of Health and Environment
LCS  laboratory control sample
MDL  method detection limit
MS/MSD  matrix spike/matrix spike duplicate
NELAC  National Environmental Laboratory Accreditation Program
NFG  National Functional Guidelines
NIST  National Institute of Standards and Technology
OSHA  Occupational Safety and Health Administration
PARCC  precision, accuracy, representativeness, completeness, and comparability
Permit  Hazardous and Solid Waste Management Facility Permit
Permittee  Ash Grove Cement Company
Plan  Groundwater Monitoring Plan
PPE  personal protective equipment
QA  Quality Assurance
QA/QC  Quality Assurance/Quality Control
QAM  Quality Assurance Manual
QAPP  Quality Assurance Project Plan
QC  Quality Control
RL  reporting limit
QUALITY ASSURANCE PROJECT PLAN / DATA MANAGEMENT PLAN
Ash Grove Cement Company, Chanute, Kansas

RPD  relative percent difference
SAP  Sampling and Analysis Plan
SOP  Standard Operating Procedure
SOW  Scope of Work
SVOC  semi-volatile organic compound
SWMU  Solid Waste Management Units
USEPA  United States Environmental Protection Agency
VOC  volatile organic compound
1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) and Data Management Plan (DMP) was developed for and will be implemented in conjunction with the Corrective Measures Implementation (CMI) Work Plan and the Groundwater Monitoring Plan (GWMP) to be completed by the Ash Grove Cement Company (Permittee) at the Ash Grove Cement Company property (herein referred to as the Site) located at 1801 North Santa Fe Street in Chanute, Kansas.

1.1 Quality Assurance

This QAPP has been prepared in accordance with U.S. Environmental Protection Agency (USEPA) Requirements for Quality Assurance Project Plans for Environmental Data Operations, EPA QA/R-5 (USEPA 2001, reissued 2006) and USEPA Guidance for Quality Assurance Project Plans, EPA QA/G-5 (USEPA 2002b). This QAPP presents the policies, organization, objectives, functional activities, and specific quality assurance (QA)/quality control (QC) procedures that will be employed to ensure that technical data generated are accurate, representative, and of known and documented quality. This QAPP will be implemented to ensure that environmental monitoring data meet the data quality objectives (DQOs) applicable to the project.

The QAPP is formatted to address the following four major sections listed in the USEPA QAPP guidance documents:

- Project Management
- Measurement/Data Acquisition
- Assessment/Oversight
- Data Validation and Usability.

This QAPP addresses the 24 standard elements within the above listed groups. The information provided in the QAPP also covers general procedures for implementing the applicable USEPA guidance and standard operating procedures (SOPs) for field, laboratory, and data handling activities as well as the analytical laboratory SOPs.

1.2 Data Management

This document also incorporates the elements of a DMP to define the data management (DM) and retention methodologies to be used in completion of the CMI. Consistent and valid data values are only obtainable as a result of proper DM planning followed by consistent execution of the DM methods. This document will direct the DM procedures with respect to the planning and collection of analytical samples and other data in the field. Additional planning documents (also attached to the CMI Work Plan) have been created that document SOPs for data collection methodologies. The specific methods or data collection are not here described except by reference to the other project plans.
QUALITY ASSURANCE PROJECT PLAN / DATA MANAGEMENT PLAN
Ash Grove Cement Company, Chanute, Kansas

The elements of a DMP included in this document include:

- Data Acquisition
- Data Verification and Validation
- Data Management
- Data and Document Storage and Retention.

Arcadis will maintain the paper and electronic project files according to the procedures outlined in this document. Data generated by land surveyors, analytical laboratories, and other subcontractors will be submitted directly to Arcadis to be kept in the Arcadis project file.
2 PROJECT AND DATA MANAGEMENT ROLES

This section addresses project management elements that help ensure the project has a clearly defined goal, the project team understands the goals and the approach, and that project planning is documented.

2.1 Project Organization

The project organization chart is included on Figure 1, and the project technical team is presented in Table 1. The specific QA responsibilities of the key project personnel are described below.

2.1.1 Project Manager

The Project Manager, designated by Ash Grove, will administer actions undertaken by Ash Grove as listed in the Hazardous Waste Management Facility Permit (Permit), and the Project Manager or designee will be present on site or readily available during the field activities.

The Project Manager will oversee the implementation of project schedules and budgets, establish and interpret contract policies and procedures, and access appropriate resources to maintain technical quality. The Project Manager will work with Ash Grove and the USEPA to resolve any issues during the implementation of the project activities.

The Project Manager is responsible for the QC functions for investigative field activities, and will coordinate with technical resources on issues that impact the overall quality of performance on the project. The Project Manager will also review any new work assigned to determine whether the QAPP will require amendments or modifications. Specific Project Manager responsibilities include:

- Day-to-day oversight of task performance including technical and administrative operations
- Tracking of schedules and budgets and management of mobilization and contract activities
- Performance of assessment and oversight duties as described in the Permit
- Selecting and monitoring technical staff and subcontractors
- Managing the development of site-specific work plans
- Reviewing and approving final reports and other work products
- Distributing the QAPP and other appropriate documents.

2.1.2 Site Manager

The Site Manager will coordinate and be present (or a designee will be present) during sampling activities and will ensure the availability and maintenance of sampling materials and equipment. The Site Manager (or designee) will complete sampling and chain-of-custody documentation. The Site Manager will be responsible for the overall quality of work performed during project activities as it relates to the following specific roles:

- Implementation of the field activities
• Managing field staff including health and safety procedures
• Coordination of work including subcontractors.

2.1.3 Project QA Manager
The Project QA Manager is responsible for oversight of QA/QC activities for the project. The QA Manager will ensure that project and task-specific QA/QC requirements are met, and will have direct access to technical staff and other resources, as necessary, to resolve any QA/QC problems, disputes, or deficiencies. The QA Manager’s specific duties include:
• Maintaining, reviewing, and approving the QAPP
• Reviewing and approving substantive changes to the QAPP
• Reviewing any new work with the Project Coordinator to determine if the QAPP requires modification
• Providing external review of field and analytical activities by performance of assessment and oversight duties
• Conducting field audits, as needed, and keeping written records of those audits.

2.1.4 Project Chemist
The Project Chemist is responsible for data validation and verification, generation of QC reports, oversight of the hard copy and electronic analytical data, and oversight of laboratories used for sample analysis. The Project Chemist specific duties include:
• Coordinating and overseeing analytical laboratory activities by assessment and data verification
• Conducting laboratory audits, as needed, in conjunction with the Project QA Manager and keeping written records of those audits
• Coordinating with the Project Coordinators, Site Manager, and laboratory management to ensure that QA objectives appropriate to the project are set and that laboratory and field personnel are aware of these objectives
• Recommending, implementing, and/or reviewing actions taken in the event of QA/QC failures in the laboratory or field
• Reporting nonconformance with either QC criteria or QA objectives (including an assessment of the impact on data quality or work assignment objectives) to the appropriate managers.

2.1.5 Technical Resources
Other technical resources, including but not limited to the Statistical Analyst, Engineering Designers, and GIS Support, will implement project tasks, analyze data, and prepare reports/support materials. Assigned support personnel will be experienced professionals who possess the degree of specialization and technical competence required to perform the required work effectively and efficiently.
2.1.6 Laboratories

Laboratories providing analytical services will be chosen as appropriate for the project requirements. Fixed-base laboratories will be accredited by the Kansas Department of Health and Environment (KDHE) and National Environmental Laboratory Accreditation Conference (NELAC) for the analytical parameters required for the project and covered under the scope of the certification programs.

The Project Chemist will review the laboratory QA programs. The laboratory must provide an experienced Laboratory Project Manager to coordinate between the Project Chemist and the laboratory. The laboratory staff will include a QA Officer/Coordinator who is independent of the day-to-day operations of the laboratory. The specific duties of the Laboratory Project Manager and QA Manager on the project include:

- Reviewing the QAPP to verify that analytical operations will meet project requirements
- Documenting and implementing site-specific QA/QC requirements in the laboratory and reviewing analytical data (10 percent for the QA Officer) to verify attainment of requirements
- Reviewing receipt of sample shipments and notifying the Project Coordinators and Project Chemist of any discrepancies within one day of receipt
- Conducting internal laboratory audits to assess implementation of the QAPP and providing written records of those audits
- Rapid notification to the Project Coordinators, Site Manager, and Project Chemist regarding laboratory nonconformance with the QAPP or analytical QA/QC problems affecting samples
- Coordinating with the project and laboratory management to implement corrective actions as required by the QAPP or laboratory Quality Assurance Manual (QAM).

The analytical laboratories selected for this project are specified in Table 1. The QAM provided by the laboratory is included on CD in Attachment 1.

2.1.7 Other Subcontractors

Subcontractors, such as direct-push, drilling, surveying, and/or other contractors, are responsible for implementing the applicable portions of this QAPP. Subcontractors are responsible for notifying the Site Manager regarding nonconformance with the QAPP or QA/QC problems affecting the project. Subcontractors must coordinate with the Site Manager to implement corrective actions designated in this QAPP.

2.1.8 Regulatory Liaison and Coordination

The regulatory agency with oversight responsibility for this project is USEPA Region 7. The USEPA and personnel involved with this project are provided in Table 1. While USEPA will make decisions for the work at the Site, additional copies of plans, reports, notifications, and other submissions will be shared with the KDHE.

USEPA Region 7 is responsible for reviewing and approving plans and reports pertaining to project activities.
Working in conjunction with the USEPA Project Coordinator, the Project Manager will be involved in major discussions related to project goals, scope, methodologies, performance, schedule, reporting, and dispute resolution.

2.2 Problem Definition/Background

The project background, problem definition, and specific scope of work (SOW) for the current activities are defined in the Work Plan. This QAPP presents the foundation for controlling the quality of services and deliverables.

The SOW and project background are provided in detail in the Work Plan.

2.3 Data Quality Objectives for Measurement Data

The DQOs are qualitative or quantitative statements derived from the planning process used to clarify the study objectives and define the appropriate type of data required to support project decisions. Additional guidance on the development of DQOs is provided in USEPA Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 (USEPA 2006). The DQOs are summarized in Table 2. Acceptance and performance criteria establish the quality and quantity of data needed to meet the project DQOs. General acceptance or performance criteria for the collection, evaluation, or use of data for the project are outlined in Section 5.

Acceptance and performance criteria are often specified in terms of the precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Numerical acceptance criteria cannot be assigned to all PARCC parameters, but general performance goals are established for most data collection activities. Numerical goals for analytical methods are presented in Section 3.5. Data assessment procedures documented throughout the QAPP clearly outline the steps to be taken, the responsible individuals, and the implications if QA objectives are not met. PARCC parameters are briefly defined below.

2.3.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value, usually stated in terms of standard deviation or coefficient of variation. It also may be measured as the relative percent difference (RPD) between two values. Precision includes the interrelated concepts of instrument or method detection limits and multiple field sample variance. Sources of this variance are sample heterogeneity, sampling error, and analytical error.

Project precision goals for matrix spikes and laboratory replicates will use the precision criteria developed for laboratory method performance as listed in Attachment 1. Control limits for RPDs associated with field duplicate samples will be 35% for aqueous samples and 50% for soil samples.

2.3.2 Accuracy

Accuracy measures the bias of the measurement system. Sources of this error are the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis. Data
interpretation and reporting may also be significant sources of error. Typically, analytical accuracy is assessed through the analysis of spiked samples and may be stated in terms of percent recovery or the average (arithmetic mean) of the percent recovery. Blank samples are also analyzed to assess sampling and analytical bias (i.e., sample contamination). Background measurements similarly assess measurement bias. Laboratory control limits provided in Attachment 1 will be used as the project accuracy goals.

2.3.3 Representativeness

Representativeness expresses the degree to which data represent a characteristic of a population, a parameter variation at a sampling point, or an environmental condition. Representativeness is a qualitative parameter most concerned with proper design of the measurement program. Sample/measurement locations may be biased (judgmental) or unbiased (random or systematic). For unbiased schemes, the sampling must be designed not only to collect samples that represent conditions at a sample location, but also to select sample locations, which represent the total area to be sampled.

2.3.4 Completeness

Completeness is defined as the percentage of measurements performed that is judged to be valid. Although a quantitative goal must be specified, the completeness goal is the same for all data uses, that a sufficient amount of valid data be generated. It is important that critical samples are identified and plans made to ensure that valid data are collected for them. The project completeness goal will be 90% for total samples collected and analytical data produced. The following formula is used to calculate completeness:

Completeness = (Number of planned samples / Number of valid samples) X 100

2.3.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set may be compared to another. Sample data should be comparable with other measurement data for similar samples and sample conditions. This goal is achieved by means of standard techniques to collect and analyze samples. USEPA-approved methods will be used for analyses to ensure comparability of data.

2.4 Special Training Requirements/Certification

The field team and subcontractors that participate in field activities must have completed the Occupational Safety and Health Administration (OSHA) 40-hour HAZWOPER training program. Each employee must successfully complete a minimum of 8 hours of annual refresher training. Contractors that are onsite for five or more days per year must complete the 24-hour initial and 8-hour refresher Mine Safety and Health Administration (MSHA) training, and the contractor must have an MSHA contractor identification number. Other special health and safety training requirements are outlined in the Health and Safety Plan. The field team will be subject to periodic oversight by the Project Manager and full-time oversight by the Site Manager or designee.
2.5 Documentation and Records

The primary documentation for the project includes field records and analytical data packages. Documentation generated in support of the project will be retained for at least 3 years. If at any time the QAPP is modified, the revised portions of the QAPP will be distributed to the project personnel listed on the signature page of the QAPP.

Requirements for maintaining field records are documented in the Sampling and Analysis Plan (SAP) and are described briefly below. Requirements for analytical data packages for the project activities are also described below. The remainder of the QAPP describes additional project documentation and record requirements for QA/QC assessments, data validation, data management, and other areas. The reports that encompass the documentation and records are described in Section 4.2.

2.5.1 Field Documentation and Sample Identification

Information on the sample identifications (IDs), field documentation, chain-of-custody (COC), and sample shipment activities are discussed in the following three subsections.

2.5.1.1 Sample Designation

An alphanumeric system has been developed for naming each type of environmental sample collected during the field activities for the unique identification of each individual sample. This system will provide a tracking procedure to allow ease of data retrieval, reduction, and evaluation, and to prevent sample identifiers from duplication. The most important aspect of any sample numbering system is ensuring the uniqueness of an individual sample number. The Project Coordinator will maintain a listing of the sample identification numbers, and the Site Manager will ensure that it is universally applied to samples collected during the project.

The numbering system for this investigation consists of the components described below:

- An alpha code will be used to determine sample type or sample origin and will be designated as:
  - DS – Soil/sediment Sample collected from Drainage Ditch
  - MW – Groundwater Sample collected from Monitoring Well
  - SW – Surface Water
  - DUP – Duplicate Sample
  - EB - Equipment Rinsate Blank
  - TB – Trip Blank
  - MS/MSD – Matrix Spike/Matrix Spike Duplicate (extra sample volume for MS/MSD will be identified on the COC form)
  - IDW – Investigation-Derived Waste Characterization Sample
- Sample identifiers will include a prefix designating from which Solid Waste Management Unit (SWMU) the sample was collected, including S1-, S16-, S17-, and S23-.
• Sample location alphanumeric identifiers will be composed of four or five digits. For example, soil boring one will be identified as DS01 and not DS-1.

• For a discrete soil/sediment sample, the depth in feet will be designated in parentheses after the alpha code.

• An eight-digit date code (YYYYMMDD) will follow the alphanumeric code and depth for samples.

Examples of the sample nomenclature system:

• S1DS01 (0-2) 20180923 represents a soil sample collected at 0 to 2 feet below ground surface from drainage ditch location DS01 at SWMU 1 on September 23, 2018.

• S23MW04 (20180105) represents a groundwater sample collected from Monitoring Well MW-4 at SWMU 23 on January 5, 2018.

• TB02 (20180603) represents the second trip blank submitted to the laboratory in a cooler of volatile organic compound (VOC) samples on June 3, 2018.

• DUP01 (20180603) represents the first duplicate sample collected on June 3, 2018.

2.5.1.2 Field Logs

Field logs, bound field books, and other data collection forms (collectively, Field Logs) are necessary to provide sufficient data to document field activities and to enable participants to reconstruct events that occurred during the project. Field logs will document work, any deviations from the Work Plan or other applicable planning document, and will describe the rationale for the changes. Procedures for recording information are specified below. Entries will be made in waterproof ink, and the time and date of the entry will be recorded. The top of each page will contain the project number, the project name, and the date on which the entries on that page were recorded.

The Field Logs will include:

• Name of the person making the entry (signature)

• Names of team members, subcontractors, and visitors

• Levels of personal protective equipment (PPE): level of protection originally used, changes in protection (if required), and reasons for changes

• Time spent collecting samples

• Probing and drilling information, including: method employed, diameter of borehole, materials used, depth of borehole, and abandonment procedures (if appropriate)

• Documentation on samples collected such as: sampling location, sampling depth for subsurface soil and surface water samples; sample identification number; sampling date, time, and personnel; sample sequence (order in which samples were collected); equipment used (including the use of fuel-powered units/motors during surface water sampling); type of sample (e.g., grab, composite, QC); quantity of each subsample or aliquot (if sample is a composite); sample matrix; and sample preservation
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- Types of field QC samples, including when and where they were collected. The description of equipment rinsate sample collection should include the equipment rinsed and the actual field samples collected with that equipment before collection of the equipment rinsate blank
- Information regarding purging of wells or borings, including: depth to water and total well depth, calculations used for volume purged, volume purged, flow rates, equipment used, field measurements, length of purge time, and date and time well was purged
- Field equipment used, equipment identification numbers, and instrument calibration information, as well as any maintenance performed
- Measurement data
- Field observations and remarks
- Weather conditions and wind direction
- Decontamination procedures
- Unusual circumstances or difficulties
- Initials or signature of person recording the information.

2.5.1.3 Corrections to Field Logs

No pages will be removed from a bound notebook for any reason. If corrections are necessary, a single line will be drawn through the original entry (so that the original entry can still be read) and the corrected entry will be written alongside it. The correction must be initialed and dated. A footnote explaining the correction may be necessary to explain the required change.

2.5.1.4 Photographs

Field conditions and activities may be photographed. The following information concerning photographs will be noted in the Field Logs:
- Date, time, location, and compass direction at which photograph was taken
- Description of the photograph taken.

Digital photographs will be stored on a secure network.

2.5.2 Laboratory Data Reporting

At a minimum, a Level 2 data package will be requested from the analytical laboratory. The data package for routine analytical services will consist of a case narrative, fully executed COC, sample identification reference table, analytical results, and summary of laboratory batch QC sample results (method blank, laboratory control sample [LCS], matrix spike/matrix spike duplicate [MS/MSD]). A summary of initial and daily calibrations may be requested. The laboratory must provide an electronic data deliverable (EDD) that matches analytical data in the hard copy report. Electronic data report requirements are described in Section 3.10.
The analytical report must include the sample aliquot, final extract volume, and dilution factor. Additionally, the analytical summary data report must include the laboratory reporting limits (RLs) and method detection limits (MDLs) for target compounds. These limits must be corrected for percent moisture and dilution factors. Any compounds detected at concentrations less than the reporting limit but greater than the MDL will be reported as estimated values denoted with a "J" qualifier. This protocol applies to organic and inorganic parameters.

The QC information must include a summary report or batch identifier clearly linking QC results to actual field sample results. Laboratory control limits must be included as well as any qualification flags associated with results reported outside control limits. The case narrative must include an explanation of QC results reported outside control limits and discussion of corrective action implementation or confirmation of interference as well as a justification for reporting associated sample data. The laboratory must provide copies of any nonconformance or corrective action forms associated with the data in the laboratory report.

Records will be retained in a secure area for a period of at least 3 years. Types of records to be maintained in addition to the analytical report for the project activities include the following:

- Complete COC records from sample receipt to destruction. Sample destruction records must contain information on the manner of final disposal
- Supporting documentation for any nonconformance or corrective action forms supplied in the analytical report or related to the analysis of project samples
- Electronic records with backup of cost information, scheduling, laboratory COC transfers, and laboratory management records
- Laboratory notebooks including raw data such as readings, calibration details, and QC results
- Hard copies or electronic copies of data system files (e.g., chromatograms and mass spectra data files) and reports.
3 MEASUREMENT/DATA ACQUISITION

This section of the QAPP describes aspects of the implementation of field, laboratory, and data handling procedures to meet the requirements of the project. The QAPP provides the basis for ensuring that the appropriate methods are used and thoroughly documented.

3.1 Sampling Process Design

Elements of the sampling process proposed for this project are presented in Tables 2, 3, 4, 5, and 6. Table 2 summarizes the project DQOs. Table 3 summarizes container preservation and holding times for the samples as well as the required analytical methods. Table 4 presents the field QC sample collection frequency. Table 5 presents the laboratory QC criteria for sample analysis. Table 6 includes general field equipment and calibration procedures for field equipment that may be used for sampling during implementation of the Work Plan. A summary of analytes, analytical methods, reporting limits, and method detection limits to be reported by the laboratory is provided in Attachment 2.

3.2 Sampling Method Requirements

For each task, the project requirements will be reviewed to determine the best technology to obtain the samples required for achieving the stated goals. Specific investigation methodologies and procedures; sample types, numbers, and locations; and sampling equipment are included in the Work Plan for the project. In general, sampling will progress from clean areas to impacted areas to the extent practical. This practice lowers the potential for cross-contamination of samples and, subsequently, eliminates data anomalies or misinterpretation of the extent of contamination.

Samples will be collected at a specific location according to the following sequence:

1. Volatile Organic Compounds (VOCs)
2. Semi-Volatile Organic Compounds (SVOCs)
3. Metals
4. Other inorganic parameters

This sequence helps maintain the representativeness of the samples and the analytical results. Note that not all parameters presented in Table 3 will be collected at all sampling locations.

The remainder of this section describes typical procedures for equipment decontamination; the handling of investigation-derived waste (IDW); and sample containers, preservatives, holding times, packing, and shipping. Procedures for verifying the effectiveness of the sampling methods are described in Section 4. Overall, the Site Manager will ensure that correct methods are employed, document any problem, and verify required corrective actions. The Project Manager will approve and oversee the corrective actions, if appropriate, as well as any changes to the sampling program including sample locations.
3.2.1 Equipment Decontamination

Sampling methods and equipment are chosen to minimize decontamination requirements and the possibility of cross-contamination. Equipment or supplies that cannot be effectively decontaminated (e.g., sample tubing or rope) will be disposed of after sampling. Investigation/sampling equipment will be cleaned before use, between sampling locations, and before transport back to the storage facility. Decontamination, and necessary changes to decontamination procedures made in the field, of field equipment will be noted in the Field Log. Otherwise, a notation will be made each day that decontamination was conducted as specified in the project documents. Procedures for decontaminating investigation/sampling equipment that may be used are provided in the Work Plan. Other procedures will be developed as needed and incorporated into the Work Plan. Equipment rinse blanks will be collected to verify the effectiveness of the decontamination procedures. If equipment rinse blanks indicate poor techniques, the Site Manager will ensure techniques are modified and samplers trained appropriately.

3.2.2 Investigation-Derived Waste

Any IDW generated during field activities will be handled as described in the Work Plan and in a manner consistent with applicable federal, state, and local regulations. IDW may include disposable equipment, PPE, purge water, bailers, waste soils, and decontamination fluids.

3.2.3 Sample Containers

The volumes and containers required for the sampling activities are indicated in Table 3. The laboratories will provide certified clean sample containers. The laboratories must use an approved specialty container supplier, which prepares the containers in accordance with USEPA bottle-washing procedures. Trip blanks will be transported to the project areas inside the same container as the vials to be used for samples.

3.2.4 Sample Preservation and Holding Times

Pre-preserved containers obtained from the laboratories will be used for samples requiring preservation. Alternatively, samples may be preserved in the field immediately after collection and transportation to the project area using the following procedure. A clean, disposable pipette or a pre-measured, single-use, glass ampoule will be used to transfer liquid preservatives to the sample container. Care will be taken to avoid contact between the pipette or ampoule and the sample or sample container. Solid preservatives will be transferred to the sample container using a clean, stainless steel spoon. Use of additional preservatives will be recorded in the Field Logs. Field blanks, which require preservation, will be preserved with a volume of reagent equal to that used in the samples that the blanks represent. A list of preservatives and holding times for each type of analysis is included in Table 3. Additional preservation requirements and holding times for non-target analytes are listed in 40 Code of Federal Regulations (CFR), Part 136, July 1, 1987.

Reagents used for preservation will be reagent-grade and supplied by the laboratories. The laboratories must maintain traceability records on the preservatives in the event of potential field contamination of samples. Sample containers must include identification of any chemical preservative present. Aqueous VOC samples will be preserved with hydrochloric acid unless effervescing is observed in the field.
Samples that effervesce in the presence of acid will be collected in unpreserved vials, and the holding time from collection to analysis will be reduced to 7 days. Samples that require filtration will be shipped to the laboratory for filtration and preservation upon receipt.

For preservatives to be added in the field, each container received from the laboratory must be clearly labeled with laboratory name, type of chemical, lot number, and expiration date. The field personnel should record the date on which it was used in the field, project name, and project number on the label or in the Field Logs. Fresh sample preservatives will be obtained from laboratory stocks before mobilization for each sampling event. Preservatives stored will be disposed of after use as noted above. No preservatives will be used past the expiration date. Sample preservation will be verified at the laboratory on receipt or before analysis. The preservation or pH will be recorded in the Field Logs.

Preservation will be verified by the laboratory upon receipt except for VOC samples. Appropriate chemical preservation of VOCs will be verified at the time of analysis. If the samples are improperly preserved, a corrective action form will be submitted to the Laboratory Project Manager for follow-up action. The laboratory will notify the Project Coordinator or Project Chemist to implement corrective actions in the field.

### 3.3 Sample Handling and Custody Requirements

Field and laboratory personnel will maintain samples, whether in the field or in the laboratory, under strict chain of custody. The following sections details sample handling and sample custody requirements.

#### 3.3.1 Sample Handling

Samples will be transported and handled in a manner that protects the integrity of the sample. Regulations for the packaging, marking, labeling, and shipping of hazardous materials are promulgated by the U.S. Department of Transportation (DOT) in 49 CFR 171 through 177. The procedures for sample packing and shipping are summarized below.

##### 3.3.1.1 Sample Packaging

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures (i.e., less than 4 degrees Celsius [°C]). The following sample packaging requirements will be followed:

- Sample bottle lids should not be mixed. Sample lids must stay with the original containers.
- The sample label should not cover any bottle lot numbers or weight information. Additional sample labels should not be affixed directly to pre-weighed containers, such as EnCores or TerraCores for soil sample collection.
- Shipping coolers will be filled with packing materials and ice (when required) to prevent bottle breakage during shipping.
- The sample bottles will be placed in the cooler in such a way as to ensure that they do not touch one another.
3.3.1.2 Shipping Containers

Environmental samples will be properly packaged and labeled for transport to the laboratory facility. A separate COC record must be prepared for each shipping container. The following requirements for shipping containers will be followed. Sample shipping containers will generally be commercially purchased coolers (e.g., Igloo or Coleman coolers). Any water spouts must be sealed with tape to prevent leaking of melted ice or samples from broken bottles. Each shipping container will be custody-sealed for shipment as appropriate. The container custody seal will consist of packing tape wrapped around the package at least twice and custody seals affixed in such a way that access to the container can be gained only by cutting the tape and breaking a seal. Field personnel will arrange transportation of samples to the laboratory. In most cases, samples will be shipped using an overnight express carrier (e.g., FedEx or UPS) or by laboratory courier. Field personnel will provide the laboratory with a shipment schedule and notify them of deviations from planned activities.

3.3.2 Sample Custody

Formal sample custody procedures begin when the pre-cleaned sample containers leave the laboratory or upon receipt from the container vendor. The laboratory must follow their written and approved procedures for shipping, receiving, logging, and internally transferring samples. Sample identification documents must be carefully prepared so that sample identification and custody can be maintained and sample disposition controlled. Sample identification documents include:

- Field Logs
- Sample labels
- Shipping records
- Custody seals
- COC records.
The primary objective of the COC procedures is to provide an accurate record that can be used to trace the possession and handling of a sample from sampling through completion of required analyses and ultimate disposal. A sample is in custody if it is:

- In a team member's physical possession
- In a team member's view
- Locked in a vehicle, storage area, hotel room, or other secure area
- Kept in a secured area that is restricted to authorized personnel.

3.3.2.1 Field Custody Procedures

The laboratory will ship pre-cleaned sample containers to the Site Manager at a specified location. The following field custody procedure will be used for collection of samples:

- As few people as possible should handle samples.
- Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage before use.
- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under COC rules.
- The sample collector will record sample data in the Field Logs.
- The Project Coordinators will evaluate whether proper custody procedures were followed during the field work and decide if replacement samples are required.

3.3.2.2 Sample Labels

Sample labels or tags attached to or affixed around the sample container must be used to properly identify samples collected in the field. Each sample container will be marked in permanent ink with the following information:

- Name or identifier of facility
- Unique identification number for each sample
- Date and time of sample collection
- Preservative used
- Required analysis
- Sampler’s initials.

Sample labels will be completed and affixed to the sample containers before collection or immediately following collection.

Note that, for pre-weighed sample containers, an additional label should not be placed on the container, but either the previously affixed label should be completed or the label should be placed on the outside of the individual protective packaging, such as a bubble wrap envelope.
3.3.2.3 Chain-of-Custody Record

The COC form will be completed by the technical staff designated by the Site Manager as responsible for sample shipment to the appropriate laboratory for analysis. At least one copy of the COC form will be transported with the samples to the laboratory and the Site Manager will retain a copy. If samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations), the person completing the COC record should note these constraints in the "Remarks" or "Comments" section of the custody record. The custody record also should indicate any special preservation techniques necessary or whether the samples need to be filtered and clearly indicate field QC samples for MS/MSD, trip blanks, field blanks, and equipment rinseate blanks. Copies of the COC records will be maintained with the project file. The fully executed COC will be included in the final analytical data package. An example of the COC form is included in the laboratory quality assurance manual provided in Attachment 1.

3.3.2.4 Custody Seals

Custody seals are preprinted, adhesive-backed seals with security slots designed to break if the seals are disturbed. Sample shipping containers are sealed in as many places as necessary to ensure security. Seals must be signed and dated upon use. Upon receipt at the laboratory, the custodian must check and document on a cooler receipt form that seals are intact.

3.3.3 Laboratory Custody Procedures

Laboratory custody procedures must maintain a system that provides for sample log-in; internal tracking procedures for samples, extracts, and digestates; data storage and reporting; and sample disposal. These procedures must ensure continuous documentation of sample custody from receipt to disposal. Laboratories must complete cooler receipt forms documenting the temperature and condition of the samples on receipt. The forms will be provided in the laboratory data package.

3.4 Analytical Method Requirements

Analytical method requirements are presented in Table 3. The specific implementation of the analytical methods will be documented in laboratory SOPs. The laboratory SOPs and QA program will be reviewed and approved as part of the procurement process.

3.4.1 Standard Laboratory Analytical Procedures

Analytical methods in support of the project activities are referenced in:

- 40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act
- Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983
The Project Chemist or their designee will review laboratory SOPs for compliance with project-specific requirements, as appropriate. The laboratory is required to provide updated copies of SOPs when requested if any significant changes are introduced during the project. Laboratory SOPs will be available for review during any laboratory audit.

Immediately before analysis, the laboratory must notify the Project Coordinator and Project Chemist of any updated limits. The changes in limits will be evaluated to verify that the changes have no impact on DQOs. Any methods required for future projects will be specified in the QAPP. The standard laboratory turnaround time is 21 days unless otherwise stated.

3.4.2 Nonstandard Laboratory Analytical Procedures

Although not anticipated in this project, the laboratory may be required to develop, validate, and use nonstandard analytical techniques for specific purposes. Generally, these methods are proposed where it can be shown that substantial cost or timesaving can be achieved in comparison to standard procedures or to meet specific data needs for the project. In these instances, the laboratory will be required to provide a method performance package including initial precision and accuracy data, MDL studies, and an SOP. The method performance packages will be incorporated into QAPP revisions as appropriate.

3.5 Quality Control Requirements

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of glassware and reagents. Field QC will include field duplicates, trip blanks, field equipment blanks, field blanks, and miscellaneous field QC samples. Field QC samples will be preserved, documented, and transported in the same manner as the samples they represent. Laboratory-based QC will consist of standards, replicates, spikes, and blanks. Any changes to this protocol will require Project Chemist approval and will be detailed in the QAPP revisions.

3.5.1 Field Quality Control Samples

The collection of field QC samples and the conditions under which the samples were collected will be documented in the Field Logs. The field QC samples listed below will be collected and analyzed at the frequency listed in Table 4.

3.5.1.1 Duplicates

Duplicate samples provide insight as to the homogeneity of the sample matrix and enable consideration of variations in contaminant concentrations present in the matrix. Duplicate sample data establish a degree of confidence that the sample represents site conditions. Duplicate samples will be collected at the rate of 5 percent or one duplicate per 20 project samples of the same matrix.

- Duplicate soil samples will be prepared by collecting equal aliquots from the same sample source and placing them in separate sample bottles.
- Duplicate water samples will be prepared by collecting successive volumes of water and placing them in separate bottles.
• Duplicate soil vapor samples will be prepared by collecting successive volumes of soil vapor in separate containers.

Duplicate samples will be shipped with the samples they represent and will be analyzed in the same manner. Duplicate samples must be labeled so as to be blind to the laboratory. The duplicate samples must not be identified as such on the COC. The RPD between the concentration in the original and duplicate sample measures the overall precision of the field sampling and analytical method. The RPD will be calculated as follows:

\[
\text{RPD} = \left( \frac{\text{PR} - \text{DR}}{\frac{1}{2}(\text{PR} + \text{DR})} \right) \times 100
\]

where:

- PR = primary sample result
- DR = duplicate sample result

Field duplicates are evaluated using approximately two times the laboratory QC criteria for duplicates (i.e., RPDs of 35 percent for waters and 50 percent for soils and soil vapor). If other laboratory QC criteria are met, RPD results outside control limits indicate potential matrix effects. Significant deviations in the RPD results of field duplicates are assessed to evaluate whether data met DQOs for the project.

3.5.1.2 Trip Blanks

Trip blanks are collected to establish that the transport of sample bottles to and from the field does not result in the contamination of the sample from external sources. Trip blanks will be submitted in conjunction with aqueous and soil VOC samples. Trip blanks for aqueous samples will be prepared by the laboratory by filling two 40-mL vials with analyte-free water, preserved, sealed, and labeled in a clean area. Trip blanks for soil samples (to accompany EnCores or TerraCores) will be prepared by the laboratory. The trip blanks will be included in every shipping container containing samples for VOC analysis from the laboratory to the field and return. Trip blanks will be treated in the same manner as the VOC samples they represent.

3.5.1.3 Equipment Rinsate Blanks

Equipment rinsate blanks (also called rinsate blanks or field equipment blanks) are designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use and that cleaning procedures between sample locations are sufficient to minimize cross-contamination. Field equipment blanks will be prepared in the field using an approved water source, such distilled or deionized water. The field equipment blank will be preserved, documented, shipped, and analyzed in the same manner as the samples they represent. Field equipment blanks will be collected for 5 percent (one per 20 samples) of samples collected on a field-cleaned equipment set. An equipment set is non-dedicated sampling equipment required to collect one sample. For example, one soil sample equipment set may include a stainless steel bowl, a stainless steel trowel, and a bucket auger. Samples collected with dedicated or disposable equipment (e.g., EnCore or TerraCore samplers, disposable tubing, soil sampler
liners) do not require field equipment rinsate blank samples. The field equipment blanks demonstrate contamination-free procedures in the field and during sample collection.

3.5.1.4 Field Blanks

Field blanks are exposed to the same field conditions as the primary sample to assess the potential for field contamination. Field blanks will be prepared in the field using an approved water source, such as distilled or deionized water. The field blank will be preserved, documented, shipped, and analyzed in the same manner as the samples it represents. Field blanks will be collected for 5 percent (one per 20 samples) of samples collected. Field blanks are prepared by filling a laboratory-prepared and preserved sample bottle with distilled or deionized water. The field blank should be collected as close to the sample location(s) and sample collection time(s) as possible. The field blank should be collected in manner similar to that of the sample, but without using the sample collection equipment.

The goal for field QC samples (i.e., equipment rinsate blanks, field blanks, and trip blanks) is to be free of contamination. If low-level contamination is present in a field QC sample, the sample results reported are unaffected if the sample results are greater than five times the level found in the blank. If contaminant levels in the sample are less than five times the levels in the blank, the sample results are qualified as non-detect at an elevated reporting limit. If blank contaminants also are present in the method blank, are classified as typical laboratory contaminants, or are not present in the project samples, qualification is based on the highest associated blank concentration observed in the analytical system. Other sources of contamination must be investigated as part of the corrective action process. Sample results that do not meet DQOs after qualification may require re-sampling. The QA Manager, Project Chemist, and/or Project Coordinators must determine potential changes in the field procedures to eliminate contamination sources before re-sampling.

3.5.1.5 Miscellaneous Field QC Samples

Miscellaneous QC samples may include various source water, monitoring well drilling fluids (if used), and filters. Because the water supply source is used in decontamination and well drilling activities, it may be necessary to investigate the possibility of introduction of outside contaminants. Drilling fluids (muds) used during well installation may also be analyzed in order to assess the possibility of mud constituents affecting groundwater samples. In-line filters used to collect dissolved constituents may also contribute contamination. If needed, miscellaneous field QC samples will be collected and analyzed using the same methods as normal field samples. The need for miscellaneous field QC samples will be determined based on field activities and in consultation with the Site Manager, Project Coordinators, and/or Project Chemist.

3.5.2 Fixed Laboratory Quality Control Analyses

Analytical performance is monitored through QC samples and spikes, such as laboratory method blanks, laboratory control samples, surrogate spikes, calibration verification standards, MS/MSDs, and laboratory replicates. QC samples are performed on the basis of a laboratory batch. Two basic types of batches are used: the preparation batch and the run (i.e., analytical) batch. The preparation batch includes samples processed as a unit during organic sample preparation, metals digestion, or wet chemistry preparation.
Preparation batches do not exceed 20 samples, excluding associated QC samples. The QC samples associated with sample preparation include method blanks, LCS, MS, and duplicates. The run batch comprises samples analyzed together in the run sequence. The run sequence is typically limited to 24 hours unless defined differently for the analytical method. For some analyses, such as those for VOCs, the run batch is equivalent to the preparation batch. The QC samples associated with the run sequence include calibration standards, instrument blanks, and reference standards.

Instances may arise where high sample concentrations, non-homogeneity of samples, or matrix interferences preclude achieving the detection limits or associated QC target criteria. In such instances, data will not be rejected a priori, but will be examined on a case-by-case basis. The laboratory will report the reason for deviations from these detection limits or noncompliance with QC criteria in the case narrative. The laboratory QC samples listed below will be collected and analyzed at the frequency listed in Table 5. The laboratory will make reasonable efforts to report the lowest technically achievable reporting limit including but not limited to reporting from multiple dilutions as applicable.

3.5.2.1 Laboratory Method Blank

A laboratory method blank is an analyte-free material processed in the same manner and at the same time as a project sample. The blank is prepared using ASTM International (ASTM) Type II water when analyzing water samples, and where practical, pre-cleaned sand or other solid material (such as sodium sulfate) when analyzing solid samples. The laboratory method blank sample is prepared along with the project samples at a frequency of one laboratory method blank per batch of 20 (or fewer) project samples for the given matrix type. The laboratory method blanks demonstrate a contamination-free environment in the laboratory. The goal is for method blanks to be free of contamination. Low-level contamination may be present, but must be less than the level in the samples defined by the method SOP. If contamination is greater, the samples are to be reanalyzed. If contaminants are present in the method blank but not in project samples, no further action is required. Sources of contamination that are not common laboratory contaminants as defined in the method SOPs must be investigated as part of the corrective action process.

3.5.2.2 Surrogate Standards

For certain organic methods, samples (including the laboratory method blank and standards) are spiked with a set of specific surrogate standards to monitor the accuracy of the analytical determination. Surrogate spikes are added at the start of laboratory preparation. Surrogate compounds are not typically found in environmental samples. QC criteria for surrogate recoveries are method- and matrix-specific. Surrogate recoveries must be within QC criteria for method blanks and LCS samples to demonstrate acceptable method performance. If surrogate recoveries are outside QC criteria for method blanks or LCS samples, corrective action is required, and the Project Chemist should be notified. Surrogate recoveries in the samples indicate the method performance on the particular sample matrix. Surrogate recoveries that are outside QC criteria for a sample indicate a potential matrix effect. Matrix effects must be verified based on review of recoveries in the method blank or LCS, sample reanalysis, or evaluation of interfering compounds. Sample clean-up procedures required by the laboratory SOPs must be implemented to alleviate potential matrix problems.
\[
\% \text{ Recovery} = \frac{\text{SR}}{\text{SA}} \times 100
\]

where:
\[
\text{SR} = \text{Sample Result}; \quad \text{and} \quad \text{SA} = \text{Standard Added}.
\]

Surrogate recovery control criteria are presented in Attachment 1.

3.5.2.3 Laboratory Control Samples

An LCS consists of ASTM Type II water, and where practical, pre-cleaned sand or sodium sulfate for solid matrices or a purchased performance evaluation sample. The LCS is spiked with the analytes of interest near the mid-point of the calibration range as defined by the method. The LCS is processed by the same sample preparation, standard addition, and analysis as the project samples. LCSs are analyzed at the frequency of one per batch of every 20 samples or fewer. The recovery of target analytes in the LCS is an estimation of method accuracy. LCS recoveries must be monitored on control charts. QC criteria should be updated annually. The LCS recovery must be within the control limits to demonstrate acceptable method performance. If the LCS recoveries are outside QC criteria for more than a few target analytes, recoveries are significantly low, or the compounds were detected in the samples, then corrective action is required. After corrective action is complete, sample reanalysis is required for the failed parameters. If LCS recoveries exceed the QC criteria, and that parameter is not found in any of the samples, re-analysis is not necessary. For any other deviations from the LCS control limits that cannot be resolved by sample re-analysis within holding times, the Project Chemist must be notified immediately. If critical samples are affected, the Project Coordinators may determine that re-sampling is required.

3.5.2.4 Matrix Spike Samples

An MS sample consists of a project sample split into two parts and processed as two separate samples in a manner identical to that of the rest of the samples. Additional sample volume will be collected and provided to the laboratory for use as the MS sample. In addition to the regular addition of monitoring standards (internal standards, surrogate), spiking analytes are added to the sample aliquot. Generally, method target analytes, if compatible, are added. A subset of target analytes may be used if indicated in the method SOP and approved during review of the SOP. An MS must be prepared for every batch of 20 samples (or fewer) for a given matrix if sufficient sample allows. Field and trip blanks must not be chosen for spiking. MS recoveries are a measure of the performance of the method on the sample being analyzed. MS recoveries outside the control limits applied to the LCS indicate matrix effects. Sample clean-up procedures may be warranted for samples with severe matrix effects. The laboratory should notify the Project Chemist of these instances to determine an appropriate corrective action.

\[
\% \text{ Recovery} = \frac{\text{SSR} - \text{SR}}{\text{SA}} \times 100
\]

where:
3.5.2.5 Matrix Spike Duplicate Samples

The MSD sample is commonly prepared in conjunction with the MS sample. The MSD is prepared from a separate portion of the client sample and processed with the same additions as the MS. The MSD is prepared for methods that do not typically show concentrations of target analytes at concentrations above MDLs, such as organic methods. The RPD between the recoveries in the MS and MSD measures the precision of the analytical method on the actual project samples. For this project, QC criteria for RPDs are 20 percent for waters and 35 percent for soils unless the laboratory provides additional statistical criteria.

$$\text{RPD} = \left( \frac{\text{PR} - \text{DR}}{\frac{1}{2} (\text{PR} + \text{DR})} \right) \times 100$$

where:

- $\text{PR}$ = primary sample result
- $\text{DR}$ = duplicate sample result

MS control criteria are presented in Attachment 1.

3.5.2.6 Laboratory Duplicate Samples

A duplicate sample consists of a set of two samples obtained in an identical manner from the same project sample. The collection of duplicate samples from a heterogeneous matrix requires homogenization to ensure that representative portions are analyzed. Note that samples to be analyzed for VOCs will not be homogenized. One sample per batch of 20 samples or fewer per matrix may be analyzed in lieu of an MSD for wet chemistry parameters. The duplicate is prepared for methods that typically show concentrations of target analytes above MDLs, such as metals and wet chemistry methods. The RPDs between the results in the original and duplicate measure the precision of the analytical method on the actual project samples. Laboratory-established control limits will be used as the project control criteria when laboratory replicates are used. If other QC criteria are met, RPD results outside control limits indicate potential matrix effects. The laboratory should investigate significant deviations in the RPD results by observing the sample to determine any visual heterogeneity or reviewing sample chromatograms for matrix interference. If visual observation does not indicate a potential problem, the sample may be reanalyzed. Potential matrix effects are reported in the case narrative.

3.5.2.7 Instrument Blanks

Instrument or reagent blanks are analyzed in the laboratory to assess laboratory instrument procedures as possible sources of sample contamination. If method blanks show contamination, or if the analyst
suspects carryover from a high-concentration sample, an instrument blank will be used to determine the appropriate corrective action. Instrument blank results are reported on a laboratory corrective action form.

3.5.2.8 Calibration Verification Standards

A check standard is obtained from a different source or, at a minimum, a different lot from that of the calibration standard. A check standard result is used to validate an existing concentration calibration standard file or calibration curve. The check standard provides information on the accuracy of the instrumental analytical method independent of various sample matrices. Check standards are analyzed with each analytical batch unless specified by the method SOP.

3.5.2.9 Other Laboratory QC Samples

The laboratory analyzes other QC samples or standards depending on the analytical method. Standard QC samples or standards are documented in the specific method SOP. Method-specific QC samples or standards include internal standard spikes for gas chromatography/mass spectroscopy (GC/MS) methods; post-digestion spikes and serial dilutions for metals analysis; and interference check samples for inductively couple plasma (ICP) analysis. Laboratory control criteria will be used for evaluation of these sample results.

3.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Laboratory and field instruments and equipment used for sample analysis must be serviced and maintained by qualified personnel. Procedures will be implemented to ensure that instruments are operating properly and calibrations are correct before analysis and reporting of data.

3.6.1 Field Equipment Maintenance

Routine preventive maintenance is performed on each piece of field equipment. A technician maintains the field instruments or the instruments are returned to the manufacturer or equipment rental company. Repairs, adjustments, and calibrations will be documented in an appropriate maintenance Field Log or data sheet that will be kept on file. The field equipment maintenance Field Logs will clearly document the date, description of the problems, corrective action taken, result, and person who performed the work. Calibration procedures described in Section 3.7 will be used to test or inspect the instrument's performance. In the event of major equipment failure in the field, in most instances, a replacement unit can be obtained within 24 hours or less.

3.6.2 Laboratory Equipment Maintenance

The laboratory must maintain a stock of spare parts and consumables for analytical equipment. Routine preventive maintenance procedures should be documented in the laboratory SOPs. Maintenance performed on each piece of equipment must be documented in a maintenance Field Log. Daily checks of the laboratory deionized water and other support systems are required. The laboratory must operate backup instrumentation for most of its analytical equipment in the event of major instrument failure or
have an alternative approached to ensure that analytical work proceeds within holding times with no adverse impacts on data quality. The laboratory will also maintain service agreements for major instruments such as gas chromatographs, mass spectrometers, and ICPs.

### 3.7 Instrument Calibration and Frequency

Instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer’s guidelines and recommendations, as well as criteria set forth in the applicable analytical methodology references. Personnel properly trained in these procedures will perform operation, calibration, and maintenance of instruments. Documentation of routine and special maintenance and calibration information will be maintained in an appropriate Field Log or reference file and will be available for inspection. Table 6 lists typical monitoring equipment used during field work and is representative of instruments required for this project. Field personnel receive annual refresher training on the field operation of health and safety-related equipment, which includes calibration procedures. Brief descriptions of calibration procedures for major field instruments are included in Table 6. Equipment calibration in the field must be recorded on the Field Logs. Laboratory instrument calibration will be documented in analytical method SOPs.

### 3.8 Inspection/Acceptance Requirements for Supplies

#### 3.8.1 Standard Reagent Receipt and Traceability

Standards are obtained directly from a reliable supplier with a proven record for quality standards. Commercially supplied standards are traceable to USEPA or National Institute of Standards and Technology (NIST) reference standards, and appropriate documentation is obtained from the supplier. The certificates are kept on file in a central location. When standards are received, they are documented with: date received, chemical, lot number, concentration, and date opened or expiration date. When standards are prepared from these source materials, information is included in a Field Log with date of preparation, lot source, amount used, final volumes, resulting concentration, and preparer’s initials. Laboratory SOPs and standard/reagents records may be reviewed during laboratory audits or if analytical problems are suspected during data verification.

For the field efforts, these requirements are primarily applicable to chemical preservatives as described in Section 3.2.4. These chemicals are typically obtained from the laboratory that is responsible for maintaining the traceability records. Laboratory SOPs are reviewed during laboratory audits or if QC problems arise to assure that traceability requirements are met.

#### 3.8.2 Field Equipment and Supplies

The Site Manager will inspect supplies and equipment to verify that the correct materials and equipment are available in the field and in good working order.

### 3.9 Data Acquisition Requirements

Data acquired from non-direct measurement sources may include the following:
• Physical information such as descriptions of the sampling activities and geologic logs
• State and local environmental agency files
• Reference computer databases and literature files
• Historical reports and subjective information gathered through interviews.

Acquisition requirements for this type of data are described in the SAP. No specific limitations are placed on the non-direct measurements, which for the investigation is primarily review and evaluation of previous technical documents and collection of data from governmental agencies. Any future limitations placed on these data will be identified in the report.

3.10 Data Management

Data management procedures track samples and results from work plan generation to the final report. The data management procedures are summarized below. The field data include approved work planning tables, labels, Field Logs, COCs, and geographic coordinates for sample locations. The Site Manager will review field data for accuracy. Field data will be entered into a database or spreadsheet. The laboratory will provide an EDD for analytical reports. The EDD will include the following:

• Laboratory header information – laboratory name, client name, laboratory work order, client project number, and date received
• Sample information – client sample identification, laboratory sample identification, date sampled, time sampled, matrix, beginning depth and ending depth (if applicable), pH, and percent moisture, as appropriate
• Analytical data – test method, test name, analyte, analyte type, sample type, Chemical Abstract Service (CAS) number, date prepared, date analyzed, preparation batch identification, analytical batch identification, result, laboratory qualifier, MDL, units, reporting limit, and dilution factor
• QC data – analytical results for method blanks, surrogate recoveries, LCS recoveries, MS/MSD recoveries and RPDs, and laboratory replicate RPDs; QC sample type, control limits for precision and accuracy, and any associated qualifiers. Calibration data are not required.

Excel or the Environmental Quality Information Systems (EQuIS) data management system may be used to manage the environmental data generated for this project. EQuIS is a comprehensive geo-environmental data management database designed to store analytical test data and related data obtained during investigations, routine monitoring, and hazardous waste remediation projects. EQuIS can be used for report and chart generation and is integrated with multiple statistical, numerical modeling, and data visualization tools. Electronic data management augments data review and reporting by streamlining data entry and availability for evaluation while reducing the potential for entry errors.

The Project Chemist will review a subset (5 to 10 percent) of laboratory and field data to verify the results against the hard copy and check for transcription errors. The results will be transferred to a centralized database. If significant deviations are observed, additional data will be reviewed to verify that results match. The Project Chemist will add any data qualifiers, and the Database Manager will create data tables for the data report. The Project Chemist and Site Manager will resolve discrepancies between the
planned activities and actual data collected and document the findings in the data report. The central
database will be stored in a secure area with access limited to data management specialists designated
by the Project Coordinators. Data users may enter additional electronic data, such as risk-based criteria,
for comparison of the results. These data will be stored in separate tables in the database and linked to
the actual results. Any data from outside sources will include a description of the data, a reference to the
source, and the date updated. The outside data will be checked before use in order to verify that the most
current values are used.
4 ASSESSMENT/OVERSIGHT

Assessment and oversight for the project activities will be implemented in accordance with this QAPP. This QAPP outlines general roles and responsibilities for the project team and specific assessment procedures applicable to the project activities. These assessment procedures are summarized in this section.

4.1 Assessments and Response Actions

Assessment activities include management assessments, development of SOPs, and performance evaluations. Management assessments include weekly meetings and conference calls to evaluate staff use. Assignment of qualified personnel to the project, maintenance of schedules and budgets, and quality of project deliverables are verified as part of these assessments. SOPs and performance evaluations provide trained and qualified staff for the project. Technical assessments applicable to the project include peer review, data quality reviews, and technical system audits (i.e., laboratory and field). Procedures for assessment and audit of data quality are described in this section of the QAPP. Procedures for peer review and technical assessments are summarized briefly below. Both the overall and direct technical assessments may result in the need for corrective action. The procedure for implementing a corrective action response program for both field and laboratory situations are summarized briefly below.

4.1.1 Peer Review

Project deliverables, including the Work Plan, QAPP, draft and final reports, and technical memoranda will be peer reviewed. The peer review provides for a critical evaluation of the deliverable by an individual or team to determine whether the deliverable will meet the established criteria, DQOs, technical standards, and contractual obligations. The Project Coordinators will assign peer reviewers, depending on the nature and complexity of the project, when the publications schedule is established. The Project Coordinators will be responsible for ensuring that peer reviewers participate in the review and approval of final deliverables. For technical memoranda and other project documents, the Project Coordinators will be responsible for obtaining review and approval. The QA Manager is responsible for verifying that project documents are generated in accordance with the QAPP.

4.1.2 Technical Systems Assessments

The entire project team is responsible for ongoing assessment of the technical work performed by the team; identification of nonconformance with the project objectives; and initiation, implementation, and documentation of corrective action. Independent performance and systems audits are technical assessments that also are an integral part of the overall QA/QC program for the project activities. The following subsections describe the types of audits conducted, the frequency of these audits, and the personnel responsible for conducting the audits.

4.1.2.1 Field Audits and Inspections

Field audits may be performed under the direction of the QA Manager. The Site Manager will be responsible for general oversight of field activities to verify compliance with the project plans.
4.1.2.2 Laboratory Audits

The primary and any subcontract laboratories will implement a comprehensive program of internal audits to verify the compliance of their systems with the SOPs and QAMs. The laboratory may be requested to perform a project-specific audit to verify compliance with the project requirements. The Project Chemist also may audit laboratories. These audits typically verify the laboratory capabilities and implementation of any complex project requirements or are in response to a QC nonconformance identified as part of the data review process. Laboratories performing analyses for this project will maintain current accreditation under NELAC for methods performed.

4.1.3 Corrective Action

In conjunction with the QA Manager and Project Chemist, the Site Manager is responsible for initiating corrective action and implementation in the field. The Laboratory Project Manager, in conjunction with the Laboratory QA Coordinator, will be responsible for implementation in the laboratory. It is a combined responsibility to see that sampling and analytical procedures are followed as specified and that the data generated meet the prescribed acceptance criteria. Specific corrective actions, if necessary, will be clearly documented in the Field Logs or analytical reports.

4.1.3.1 Field Situations

The need for corrective action in the field may be determined by technical assessments or by more direct means such as equipment malfunction. Once a problem has been identified, it may be addressed immediately, or an audit report may notify project management staff that corrective action is necessary. Immediate corrective actions taken in the field will be documented in the project Field Logs. Corrective actions may include, but are not limited to:

- Correcting equipment decontamination or sample handling procedures if field blanks indicated sample contamination
- Recalibrating field instruments and checking battery charge
- Training field personnel in correct sample handling or collection procedures
- Accepting data with an acknowledged level of uncertainty.

After a corrective action has been implemented, its effectiveness will be verified. If the action does not resolve the problem, appropriate personnel will be assigned to investigate and effectively remedy the problem.

4.1.3.2 Laboratory Situations

Out-of-control QC data, laboratory audits, or outside data review may determine the need for corrective action in the laboratory. Corrective actions may include, but are not limited to:

- Reanalyzing samples, if holding times permit
- Correcting laboratory procedures
• Recalibrating instruments using freshly prepared standards
• Replacing solvents or other reagents that give unacceptable blank values
• Training additional laboratory personnel in correct sample preparation and analysis procedures
• Accepting data with an acknowledged level of uncertainty.

Specific laboratory corrective actions for analytical deficiencies must be consistent with the analytical method. The laboratory corrective actions must be defined in analytical SOPs. Any deviations from the analytical SOP require corrective actions and must be documented and approved by the Project Chemist. Whenever the Project Chemist deems corrective action necessary, the Laboratory Project Manager will ensure that the following steps are taken:

• The cause of the problem is investigated and determined
• Appropriate corrective action is determined
• Corrective action is implemented and its effectiveness verified by the laboratory QA officer
• Documentation of the corrective action verification is provided to the Project Chemist in a timely manner.

4.2 Reports to Management

The following reports will be prepared as part of the project activities:

• Field Reports – The Site Manager prepares field summary reports as requested. The reports document field progress and any concerns in the field. Adjustments to the field scope of work and other problems will be reported immediately. The report will be provided to the Project Coordinators in electronic (email), written, or verbal format.

• Audit Reports - Audit reports are prepared by the QA Manager or audit team leader immediately after completion of the audit, when/if audits are completed. The report will list findings and recommendations and will be provided to the Site Manager and Project Coordinators.

• Data Validation Reports - Data validation reports will be completed by the Project Chemist as soon as possible after receipt of the data from the laboratory. Impacts on the usability of the data will be tracked by adding qualifiers to individual data points as described in Section 5. The report will list findings and recommendations and will be provided to the Site Manager and Project Coordinators.

Annually, analytical and QC data will be incorporated into a data report that summarizes the field QC activities and provides a data evaluation. A discussion of the validity of the results in the context of QA/QC procedures will be included, as well as a summation of QA/QC activities. Serious analytical problems will be reported immediately to the Project Coordinator and Project Chemist. Time and type of corrective action (if needed) will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting an audit, or modifying laboratory protocol.
5 DATA VALIDATION AND USABILITY

For the project activities, the general procedures for data validation and usability will be implemented as described below. These procedures will be adapted, if necessary, to meet project-specific requirements. In addition, data validation procedures will vary depending on the type of analytical laboratory used for the project.

5.1 Data Review, Validation, and Verification

Data generated will be reviewed for conformance with the QAPP, Work Plan, and other project requirements. QA information provided by the laboratory will be evaluated relative to the methods performed, the laboratory SOPs, the laboratory QAM, COC requests, project analytical requirements, and QAPP, as appropriate. The laboratory will be responsible for internal review of calibrations, raw data, and calculations. The final analytical report will be reviewed by the Laboratory Project Manager and other appropriate laboratory management personnel for compliance with the above-listed documents, including peer and supervisory review, before releasing data to the project team.

The Project Chemist and supporting staff will perform additional verification and validation of laboratory data and will review field documentation and data. Data verification will include completeness, correctness, and conformance evaluations against project requirements set forth in the QAPP, Work Plan, Laboratory Task Orders, Laboratory QAM, and/or analytical methods as applicable. Data validation will be performed to assess the quality and usability of the data generated.

Field record review will include instrument calibration logs, Field Logs, COC forms, and field parameter results. The field information assessment will evaluate the potential for impact to sample integrity and chemical data quality.

Chemical analytical data collected in support of the remedial and monitoring programs will be reviewed and qualified using guidelines established in the USEPA National Functional Guidelines (NFGs) modified to incorporate method- and project-specific requirements. The analytical data review will be performed as Validation Level II. The components included in the Level II validation are defined in Section 5.2.2.1. The validation level identifies the level of evaluation that will be performed on the data associated with samples. The levels are established based on the intended use of the data. For samples collected for this project, 100 percent of the data will undergo Level II data verification.

5.2 Validation and Verification Methods

The data review scheme for analytical results from the receipt of the analytical data through the validated report is described below. The laboratory is responsible for performing internal data review. The laboratory data review must include 100 percent analyst review, 100 percent peer review, and 100 percent review by the Laboratory Project Manager to verify that project-specific requirements are met. The laboratory QA officer must review 10 percent of the data packages. Laboratory reviews must be fully documented and available for review if requested or if a laboratory audit is performed. After receipt from the laboratory, project data will be validated using the following steps. Data validation and usability determinations as set forth in this QAPP will be followed unless specifically documented in amendments to the QAPP or the Work Plan.
5.2.1 Evaluation of Completeness

At a minimum, Level II data packages will be requested from the analytical laboratory. The Project Chemist verifies that the laboratory information matches the field information and that the following items are included in the data package:

- COC forms
- Sample receipt information
- Case narrative describing any out-of-control events and summarizing analytical procedures
- Data report forms (e.g., Form I)
- QA/QC summary forms
- Documentation of any QC problems.

If the data package is incomplete, the Project Chemist contacts the laboratory, which must provide missing information within a reasonable timeframe (i.e., 1 to 2 days).

5.2.2 Evaluation of Compliance

The data validation procedures are briefly outlined below:

- Level II validation will be used to check 100 percent field and laboratory QC data (LCS, MS/MSD, blanks) to verify that holding times and acceptance and performance criteria were met and to note any anomalous values. Appropriate data qualifiers will be applied to the data where deficiencies are identified.
- Ensure analytical problems and corrections are reported in the case narrative and that appropriate laboratory qualifiers are added.
- For any problems identified, review concerns with the laboratory, obtain additional information if necessary, and check related data to determine the extent of the error. Apply data qualifiers to the analytical results to indicate potential limitations on data usability.


5.2.2.1 Level II Validation

Level II data validation includes a review of sample documentation. Sample documentation includes Field Logs and chains of custody. The analytical report will be reviewed for completeness; for compliance with
COC requests; and for compliance with the SAP, QAPP, and Work Plan. The following components are included in the Level II validation:

- Blank contamination
  - Method blanks
  - Trip blanks
  - Field blanks
  - Equipment blanks
- MS and MSD recoveries
- MS/MSD RPD
- LCS and LCSD recoveries
- LCS/LCSD RPDs (when available)
- Surrogate recoveries
- Field duplicate RPDs
- Holding times
- Reporting limits
- Total versus dissolved concentrations.

Data qualifiers will be manually applied to the electronic data stored in the project database and to the original hard copy analytical reports.

5.2.2.2 Data Validation Reporting

The Project Chemist will perform the following reporting functions:

- Alert the Project Coordinators and/or QA Manager to any QC problems, obvious anomalous values, or discrepancies between the field and laboratory data, and resolve any issues
- Discuss QC problems in a data validation memo for each laboratory report
- Review the laboratory EDD and electronic field data, enter the data qualifiers into the database, and prepare analytical data summary tables. These tables, which summarize those samples and analytes for which detectable concentrations were exhibited, are prepared in addition to the complete analytical summary tables. The tables will include field QC samples
- At the completion of field and laboratory efforts, the Project Chemist will prepare a summary of the QC information. The summary will summarize planned versus actual field and laboratory activities and data usability concerns
- The Project Coordinators provide final QA/QC during the technical review of the data report.
5.2.3 Field Data Review

Field data are generated from in-field measurement, which may include water depth measurements, global positioning system (GPS) coordinate collection, or water quality parameters measured during groundwater sampling. The quality objective for the in-field measurement activities is to obtain accurate measurements using appropriate equipment. Data are generally recorded in Field Logs or collected and stored electronically, which are reviewed as part of QC inspections and audits. Field data are typically provided as an appendix to final reports. Field and laboratory data are generally assessed against specific criteria determined to be applicable for the project. Criteria must be evaluated before the assessment to verify the current values and applicability of the guidance.

5.3 Reconciliation with Data Quality Objectives

For routine assessments of data quality, the data validation procedures will be implemented as described in Section 5.2 and will assign appropriate data qualifiers to indicate limitations on the data. The Project Chemist will be responsible for evaluating precision, accuracy, representativeness, comparability, and completeness of the data using procedures described in Section 2.3 of this QAPP. Any deviations from the analytical DQOs for the project will be documented in the data validation memo provided to the data users for the project. The Project Chemist will work with the final users of the data in performing data quality assessments. The data quality assessment may include some or all of the following steps:

- Data determined to be incomplete or not usable for the project will be discussed with the project team. If critical data points are involved that impact the ability to complete the project objectives, the data users will report immediately to the Project Coordinators. The Project Coordinators will implement the necessary corrective actions (e.g., re-sampling).

- Data that are non-detect but have reporting limits elevated due to blank contamination or matrix interference will be compared to screening values. If reporting limits exceed the screening values, then the results will be handled as incomplete data as described above.

- Data qualified as estimated will be used for project decision-making. If an estimated result is close to a screening value, then there is uncertainty in any conclusions as to whether the result exceeds the screening value. The data user must evaluate the potential uncertainty in developing recommendations. If estimated results become critical data points in making final decisions, the Project Coordinators should evaluate the use of the results and may consider the data point incomplete.

In the validation process, there are two types of data validation codes that may be applied: those related to identification (confidence concerning the presence or absence of compounds) and those related to quantitation. Each of the standard data validation codes is defined below based on its hierarchy:
The assessment process involves comparing analytical results to screening values and background concentrations to determine whether the impacts present are project-related (i.e., above background levels) or significant (i.e., above screening values). Additional data assessment may be performed on a case-by-case basis.

<table>
<thead>
<tr>
<th>R</th>
<th>Data point is unusable due to serious deficiencies in analytical and QC criteria. The presence or absence of the analyte/compound cannot be verified.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UB</td>
<td>Not detected substantially above the level reported in laboratory or field blanks. For organics = 5X (10X for common lab contaminants) or for metals = 10X. Data point considered non-detect at the value qualified.</td>
</tr>
<tr>
<td>U</td>
<td>Analyte/Compound not detected. The associated value indicates the concentration above which the result would be considered a quantitative value.</td>
</tr>
<tr>
<td>J</td>
<td>Reported value is considered an approximate concentration below the quantitative reporting limit or due to QC failures.</td>
</tr>
<tr>
<td>UJ</td>
<td>Analyte/Compound not detected above the quantitation limit. However, the reported quantitation limit is approximate due to QC deficiencies.</td>
</tr>
</tbody>
</table>
6 REFERENCES


TABLES
<table>
<thead>
<tr>
<th>Name and Contact Information</th>
<th>Telephone/E-Mail</th>
<th>Project Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brian Mitchell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste Remediation and Permitting Branch</td>
<td>Phone: 913.551.7633</td>
<td>USEPA Region 7 Representative</td>
</tr>
<tr>
<td>USEPA Region 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air and Waste Management Division</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11201 Renner Boulevard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lenexa, Kansas 66219</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles Stotts, Chief</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Permit Section</td>
<td>Phone: 785.296.1609</td>
<td>KDHE Bureau of Waste Management Representative</td>
</tr>
<tr>
<td>Curtis State Office Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000 SW Jackson Street, Suite 410</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topeka, Kansas 66612-1366</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robert Vantuyl</td>
<td></td>
<td></td>
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<td>Ash Grove Cement Company</td>
<td>Phone: 913.451.8900</td>
<td>Ash Grove Representative</td>
</tr>
<tr>
<td>11011 Cody Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overland Park, Kansas 66210</td>
<td></td>
<td></td>
</tr>
<tr>
<td>John Shonfelt, P.G.</td>
<td></td>
<td></td>
</tr>
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<td>Arcadis U.S., Inc.</td>
<td>Phone: 913.998.6911</td>
<td>Project Manager</td>
</tr>
<tr>
<td>8725 Rosehill Rd, Suite 350</td>
<td></td>
<td>Kansas Registered Geologist</td>
</tr>
<tr>
<td>Lenexa, Kansas 66215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bretton Overholtzer, P.E.</td>
<td></td>
<td></td>
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<td>Kansas Professional Engineer</td>
</tr>
<tr>
<td>8725 Rosehill Rd, Suite 350</td>
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<td></td>
</tr>
<tr>
<td>Lenexa, Kansas 66215</td>
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</tr>
<tr>
<td>Royce Face, P.E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arcadis U.S., Inc.</td>
<td>Phone: 913.998.6915</td>
<td>Engineering Design</td>
</tr>
<tr>
<td>8725 Rosehill Rd, Suite 350</td>
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<td>Kansas Professional Engineer</td>
</tr>
<tr>
<td>Lenexa, Kansas 66215</td>
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<td></td>
</tr>
<tr>
<td>Allen Long, P.E.</td>
<td></td>
<td></td>
</tr>
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<td>Arcadis U.S., Inc.</td>
<td>Phone: 724.742.9180</td>
<td>Engineering Design</td>
</tr>
<tr>
<td>6041 Wallace Road Extension, Suite 300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wexford, Pennsylvania 15090</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tina Lloyd, P.G.</td>
<td></td>
<td></td>
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<td>Arcadis U.S., Inc.</td>
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<td>Quality Assurance Manager</td>
</tr>
<tr>
<td>8725 Rosehill, Suite 350</td>
<td></td>
<td>Kansas Registered Geologist</td>
</tr>
<tr>
<td>Lenexa, KS 66215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ben Doran</td>
<td></td>
<td></td>
</tr>
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<td>Arcadis U.S., Inc.</td>
<td>Phone: 913.998.6921</td>
<td>Health and Safety Manager</td>
</tr>
<tr>
<td>8725 Rosehill, Suite 350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lenexa, KS 66215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joe Houser</td>
<td></td>
<td></td>
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<tr>
<td>Arcadis U.S., Inc.</td>
<td>Phone: 315.671.9226</td>
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<td>110 West Fayette Street, Suite 300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syracuse, New York 13202</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name and Contact Information</td>
<td>Telephone/E-Mail</td>
<td>Project Role</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Ted Wall</td>
<td>Phone: 303.231.9115 <a href="mailto:ted.wall@arcadis.com">ted.wall@arcadis.com</a></td>
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<td>ARCADIS U.S., Inc.</td>
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<td>1687 Cole Boulevard, Suite 200 Lakewood, CO 80401</td>
<td></td>
<td></td>
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<tr>
<td>Mark Lupo</td>
<td>Phone: 713.453.4722 <a href="mailto:Mark.Lupo@arcadis.com">Mark.Lupo@arcadis.com</a></td>
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<td>10205 Westheimer Road, Suite 800 Houston, TX 77042</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darren Holmes</td>
<td>Phone: 407.221.9168 <a href="mailto:Darren.Holmes@arcadis.com">Darren.Holmes@arcadis.com</a></td>
<td>GIS Manager</td>
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<td>Arcadis U.S., Inc.</td>
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<tr>
<td>Donna Rydberg</td>
<td>Phone: 303.736.0100 <a href="mailto:donna.rydberg@testamericainc.com">donna.rydberg@testamericainc.com</a></td>
<td>Laboratory Project Manager</td>
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<tr>
<td>Test America, Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4955 Yarrow Street Arvada, Colorado 80002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Quality Objective</td>
<td>Project-Specific Action</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>Problem statement</td>
<td>The primary purpose of the proposed Corrective Measures Implementation (CMI) Work Plan is to comply with the requirements listed in the Final Remedy Decision for the Statement of Basis dated July 19, 2017 and the HSWA Permit (Permit). To achieve these goals, a CMI Work Plan will be implemented, which includes a Groundwater Monitoring Plan and additional requirements set forth in the HSWA permit.</td>
<td></td>
</tr>
</tbody>
</table>
| Identify the decision(s) | • Upgrade cover for SWMU #1-Paraffin Waste Disposal Landfill and annually inspect condition of cover; collect environmental samples to confirm conditions are below health-based goals (HBGs) and maximum contaminant levels (MCLs); and implement land use controls to prevent possible future exposures.  
• Maintain cover at SWMU #16-Industrial Waste Landfill, Permit No. 177, and design features to prevent trespassing or any activity that may damage the cover system. Design and implement a monitored natural attenuation (MNA) plan to remediate groundwater from the SWMU.  
• Maintain clay cover at north SWMU #17-Industrial Waste Landfill, and design features to prevent trespassing or any activity that may damage the cover system.  
• Design, install, and maintain cover for south SWMU #17-Industrial Waste Landfill and design features to prevent trespassing or any activity that may damage the cover system.  
• Design and implement a groundwater monitoring plan for the SWMU.  
• Maintain native soil cover for SWMU #23-Inactive Kiln Dust Fill Area and annually inspect condition of cover; collect environmental samples to confirm conditions are below MCLs and HBGs. Implement land use controls to prevent possible future exposures. |
| Identify inputs to the decision | • Collect groundwater samples at SWMU 1, 16, 17, and 23, and soil/sediment and surface water samples at SWMU 1 and 23 to monitor the progress of CMI activities.  
• Compare groundwater data to HBGs developed during the HHRA and U.S. Environmental Protection Agency (USEPA) MCLs.  
• Compare soil/sediment and surface water data to HBGs. |
| Develop the decision rule | The data will be summarized in a CMI Report and subsequent monitoring reports submitted to USEPA that will provide a summary of actions taken to comply with the Permit. |
| Specify limits on decision errors | Environmental sample results will be evaluated using a Statistically Significant Increase (SSI) calculations. Landfill cover and other site conditions will be monitored and evaluated annually. Data quality and usability will be determined in accordance with the criteria set forth in the Quality Assurance Project Plan (QAPP). Rejected data will not be used for decision-making purposes. |

CMI  Corrective Measures Implementation  
HBG  Health-based goal  
HSWA  Hazardous and Solid Waste Amendments  
SWMU  Solid Waste Management Unit  
MCL  Maximum Contaminant Level  
MNA  Monitored Natural Attenuation  
QAPP  Quality Assurance Project Plan  
USEPA  U.S. Environmental Protection Agency
# Table 3
Analytical Methods, Containers, Preservatives, and Holding Times
Quality Assurance Project Plan
Ash Grove Cement Company
Chanute, Kansas

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix</th>
<th>Analytical Method</th>
<th>Container</th>
<th>Preservative</th>
<th>Maximum Holding Time</th>
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<tr>
<td><strong>Soil Samples</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>VOCs</td>
<td>Soil</td>
<td>8260</td>
<td>2 x Sodium Bisulfate vials and 1 x Methanol vial and 1 x unpreserved vials and 1 x 2-oz G (TerraCore kit)</td>
<td>Cool 4°C</td>
<td>14 days</td>
</tr>
<tr>
<td></td>
<td>Soil</td>
<td>8260</td>
<td>3 x 25-g Encore and 1 x 2-oz G (EnCore kit)</td>
<td>Cool 4°C</td>
<td>48 hours to preservation for Encore™, then 14 days to analysis</td>
</tr>
<tr>
<td>SVOCs</td>
<td>Soil</td>
<td>8270</td>
<td>1 x 8 oz. amber glass jar</td>
<td>Cool 4°C</td>
<td>7 days</td>
</tr>
<tr>
<td>Metals</td>
<td>Soil</td>
<td>6010/6020</td>
<td>1 x 4 oz. glass jar</td>
<td>Cool 4°C</td>
<td>6 months</td>
</tr>
<tr>
<td><strong>Aqueous Samples – Primary Parameters</strong></td>
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<tr>
<td>VOCs</td>
<td>Water</td>
<td>8260</td>
<td>3 x 40-mL vial with Teflon-lined septum</td>
<td>pH &lt; 2 with HCl, Cool 4°C</td>
<td>14 days</td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>8260</td>
<td>3 x 40-mL vial with Teflon-lined septum</td>
<td>If effervescence is observed, eliminate HCl preservative and Cool 4°C</td>
<td>7 days</td>
</tr>
<tr>
<td>SVOCs</td>
<td>Water</td>
<td>8270</td>
<td>2 x 1L amber glass jar</td>
<td>Cool 4°C</td>
<td>14 days</td>
</tr>
<tr>
<td>Metals</td>
<td>Water</td>
<td>6010/6020</td>
<td>500-mL HDPE</td>
<td>pH&lt;2 with HNO3, Cool 4°C</td>
<td>6 months</td>
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<tr>
<td><strong>Aqueous Samples – MNA Parameters</strong></td>
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<tr>
<td>Metals, total (Fe, Mn, Ca, Mg)</td>
<td>Water</td>
<td>6010/6020</td>
<td>500-mL HDPE</td>
<td>pH&lt;2 with HNO3, Cool 4°C</td>
<td>6 months</td>
</tr>
<tr>
<td>Metals, dissolved (Fe, Mn)</td>
<td>Water</td>
<td>6010/6020</td>
<td>500-mL HDPE</td>
<td>Cool 4°C, Laboratory will filter and preserve</td>
<td>6 months</td>
</tr>
<tr>
<td>Total organic carbon (TOC)</td>
<td>Water</td>
<td>SM5310</td>
<td>250-mL HDPE</td>
<td>pH&lt;2 with H2SO4, Cool 4°C</td>
<td>28 days</td>
</tr>
<tr>
<td>Nitrate as N, Nitrite as N</td>
<td>Water</td>
<td>EPA 353.2</td>
<td>250-mL HDPE bottle</td>
<td>pH&lt;2 with H2SO4, Cool 4°C</td>
<td>48 hours</td>
</tr>
</tbody>
</table>
Table 3
Analytical Methods, Containers, Preservatives, and Holding Times
Quality Assurance Project Plan
Ash Grove Cement Company
Chanute, Kansas

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix</th>
<th>Analytical Method</th>
<th>Container</th>
<th>Preservative</th>
<th>Maximum Holding Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate and Chloride</td>
<td>Water</td>
<td>EPA 300.0</td>
<td>250-mL HDPE bottle</td>
<td>Cool 4°C</td>
<td>28 days</td>
</tr>
<tr>
<td>Methane</td>
<td>Water</td>
<td>AM20GAX, RSK175</td>
<td>2 x 40-mL vial with</td>
<td>Cool 4°C</td>
<td>7 days if unpreserved, 14 days preserved with HCl</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>impermeable septum</td>
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</tr>
<tr>
<td>Alkalinity</td>
<td>Water</td>
<td>SM2320B</td>
<td>250-mL HDPE bottle</td>
<td>Cool 4°C</td>
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<tr>
<td>Hardness</td>
<td>Water</td>
<td>SM2340B</td>
<td>250-mL HDPE bottle</td>
<td>pH&lt;2 with HNO3, Cool 4°C</td>
<td>6 months</td>
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<tr>
<td>Sodium</td>
<td>Water</td>
<td>6010 or 200.7</td>
<td>250-mL HDPE bottle</td>
<td>Cool 4°C</td>
<td>14 days</td>
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<tr>
<td>pH</td>
<td>Water</td>
<td>SM4500</td>
<td>Clean plastic or glass</td>
<td>Field</td>
<td>Within 15 minutes of sample collection</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>container</td>
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</tr>
<tr>
<td>Total Dissolved Solids (TDS)</td>
<td>Water</td>
<td>SM2540C</td>
<td>250-mL HDPE bottle</td>
<td>Cool 4°C</td>
<td>7 days</td>
</tr>
<tr>
<td>Total Suspended Solids (TSS)</td>
<td>Water</td>
<td>SM2540D</td>
<td>250-mL HDPE bottle</td>
<td>Cool 4°C</td>
<td>7 days</td>
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</table>

**Waste Characterization Parameters (if needed)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix</th>
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<th>Container</th>
<th>Preservative</th>
<th>Maximum Holding Time</th>
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</thead>
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<tr>
<td>VOCs</td>
<td>Aqueous</td>
<td>8260</td>
<td>3 x 40-mL vial with Teflon-lined</td>
<td>pH &lt; 2 with HCl, Cool 4°C</td>
<td>14 days</td>
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<tr>
<td></td>
<td>Waste</td>
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<td>septum</td>
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<tr>
<td>TCLP VOCs</td>
<td>Solid Waste</td>
<td>8260 (for leachate)</td>
<td>1 x 4-oz glass jar, no headspace</td>
<td>Cool 4°C</td>
<td>14 days from collection to leach; 7 days to analysis of leachate</td>
</tr>
<tr>
<td>TCLP Metals</td>
<td>Solid Waste</td>
<td>6020</td>
<td>1 x 8 oz. glass jar</td>
<td>Cool 4°C</td>
<td>6 months</td>
</tr>
<tr>
<td>TCLP SVOCs</td>
<td>Solid Waste</td>
<td>8270</td>
<td>1 x 8 oz. amber glass jar</td>
<td>Cool 4°C</td>
<td>14 days</td>
</tr>
<tr>
<td>Ignitability</td>
<td>Solid Waste</td>
<td>1010</td>
<td>1 x 8-oz G</td>
<td>NA</td>
<td>14 days</td>
</tr>
<tr>
<td>Reactivity</td>
<td>Solid Waste</td>
<td>9012A for Cyanide/9030/9034 for Sulfide</td>
<td>1 x 4-oz G</td>
<td>Cool 4°C</td>
<td>Cyanide 14 days / Sulfide 7 days</td>
</tr>
<tr>
<td>Corrosivity (pH)</td>
<td>Solid Waste</td>
<td>9045</td>
<td>1 x 2-oz G</td>
<td>NA</td>
<td>24 hours</td>
</tr>
</tbody>
</table>

Sample volumes may be combined for parameters where preservatives are the same and adequate sample volume is supplied to the laboratory. Volumes listed are based on sample containers and not minimum volumes required for some of the parameters listed. Three times the volume listed is required for samples to be used for MS/MSD testing. °C – Degrees Centigrade. G – Glass. H2SO4 – Sulfuric acid. HCl – Hydrochloric acid. HDPE – High Density Polyethylene. HNO3 – Nitric acid. L – Liter. mL – Milliliter. NA – Not Applicable. TCLP – Toxicity characteristic leaching procedure. VOCs – Volatile Organic Compounds.
Table 4  
Field Quality Control Sample Collection Guidelines  
Quality Assurance Project Plan  
Ash Grove Cement Company  
Chanute, Kansas

<table>
<thead>
<tr>
<th>QC Sample</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Duplicate</td>
<td>One per 20 samples (5%) per matrix for each analysis.</td>
</tr>
<tr>
<td>Equipment Rinsate Blank</td>
<td>One per non-dedicated, non-disposable equipment set per 20 samples (5%) collected for each analysis. Only equipment sets that are dedicated to sample depths or locations or disposable do not require equipment blanks.</td>
</tr>
<tr>
<td>Matrix Spike</td>
<td>One per 20 samples (5%) per matrix for each analysis.</td>
</tr>
<tr>
<td>Matrix Spike Duplicate</td>
<td>One per 20 samples (5%) per matrix for each analysis.</td>
</tr>
<tr>
<td>Trip Blank</td>
<td>One per shipment for each cooler in which samples for volatile organic compound (VOC) analysis are shipped. Trip blanks are analyzed for VOCs only. Trip blanks are shipped for both solid and aqueous matrices.</td>
</tr>
</tbody>
</table>
## Table 5
**Fixed-Base Laboratory Quality Control Sample Analysis Guidelines**

**Quality Assurance Project Plan**

**Ash Grove Cement Company**

**Chanute, Kansas**

<table>
<thead>
<tr>
<th>QC Sample</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method Blank</td>
<td>One per matrix per preparation batch for each analysis.</td>
</tr>
<tr>
<td>Lab Replicate</td>
<td>One per matrix per preparation batch for each analysis.</td>
</tr>
<tr>
<td>Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)</td>
<td>One LCS per matrix per preparation batch for each analysis. LCSD performance is optional.</td>
</tr>
<tr>
<td>Surrogate Spiking</td>
<td>All samples analyzed for organic methods as method and Standard Operating Procedure (SOP) appropriate.</td>
</tr>
<tr>
<td>Matrix Spike/Matrix Spike Duplicate (MS/MSD)</td>
<td>One pair per matrix per preparation batch for each analysis. The spike solution will contain a broad range of the analytes of concern, but may not contain all due to incompatibility, interaction, breakdown, availability, or multi-component compounds. The frequency of MS/MSD will be 1 set per 20 samples.</td>
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**Abbreviations:**
- QC: Quality Control
- LCS/LCSD: Laboratory Control Sample/Laboratory Control Sample Duplicate
- SOP: Standard Operating Procedure
- MS/MSD: Matrix Spike/Matrix Spike Duplicate
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<th>Description</th>
<th>Field Calibration Procedure</th>
<th>Performance Criteria</th>
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<td>pH/Conductivity/Temperature Meter</td>
<td>Meter designed for field use with battery operation. Range pH: 0 to 14 S.U. Minimum range conductivity: 0 to 2,000 µS</td>
<td>Instruments are factory-calibrated and automatically compensate for temperature. Calibration of the meters for pH will be completed each day immediately prior to use in accordance with SOPs and the manufacturer’s recommendations. In general, pH meter calibration will include two pH buffers bracketing expected pH range of samples to be measured (i.e., 7.00 and 4.00) with a verification of the slope using a third buffer (4.00 or 10.00). The electrode will be rinsed between buffers and stored in the manufacturer-recommended solutions between field measurements. Conductivity calibrations are conducted similar to the pH calibration utilizing two calibration standards and adjusting the meter to the appropriate values. Calibrations will be verified with a pH buffer at least every 4 hours and at the end of the sampling day.</td>
<td>pH: ± 0.05 S.U. Conductivity: ± 2% FSD</td>
<td>Sample Collection Personnel</td>
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<td>PID</td>
<td>Photoionization detector that is a portable, non-destructive trace gas analyzer. Unit must have rechargeable battery, a range of 0 to 2,000 ppm, and a 10.2 or 11.7 eV lamp. Calibration check gas (e.g., isobutylene must be provided with unit).</td>
<td>Instrument is calibrated internally prior to shipment from the rental or maintenance contractor. In the field, PIDs will be calibrated at the start of each day in accordance with manufacturer’s instructions. If a significant change in weather occurs during the day (i.e., change in humidity or temperature) or if the unit is turned off for an extended period, the instrument will be recalibrated prior to use. When a PID is used to screen samples in the field, periodic ambient readings will also be recorded in the field logs.</td>
<td>Meter must be able to adjust properly or the lamp may require cleaning.</td>
<td>Sample Collection Personnel, Site Safety Officer</td>
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<td>GPS</td>
<td>Trimble® GeoExplorer® 6000 series, or equivalent designed for field use with battery operation.</td>
<td>No calibration required.</td>
<td>&lt;1 meter accuracy</td>
<td>Sample Collection Personnel</td>
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**Micro Siemens**

**ppm** parts per million

**eV** electron volts

**GPS** Global Positioning System

**S.U.** Standard Units (S.U.)

**PID** Photoionization Detector

**SOP** Standard Operating Procedure
Title Page:

Quality Assurance Manual
Approval Signatures

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Laboratory Director - William S. Cicero
303-736-0100

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Quality Assurance Manager - Margaret S. Sleevi
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303-736-0100

4/10/17
Date

4/10/17
Date

4/10/17
Date

Company Confidential and Proprietary
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SECTION 3. INTRODUCTION, SCOPE AND APPLICABILITY

3.1 Introduction and Compliance References

TestAmerica Denver’s Quality Assurance Manual (QAM) is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving TestAmerica’s data quality goals. The laboratory maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality.

The QAM has been prepared to assure compliance with The NELAC Institute (TNI) Standard, dated 2009, Volume 1 Modules 2 and 4, ISO/IEC Guide 17025:2005(E). In addition, the policies and procedures outlined in this manual are compliant with TestAmerica’s Corporate Quality Management Plan (CQMP, CA-Q-M-002) and the various accreditation and certification programs listed in Appendix 3. The CQMP provides a summary of TestAmerica’s quality and data integrity system. It contains requirements and general guidelines under which all TestAmerica facilities shall conduct their operations.

The QAM has been prepared to be consistent with the requirements of the following documents:


• Nuclear Regulatory Commission (NRC) Quality Assurance Requirements.

• Toxic Substances Control Act (TSCA).

### 3.2 Terms and Definitions

A Quality Assurance Program is a company-wide system designed to ensure that data produced by the laboratory conforms to the standards set by state and/or federal regulations. The program functions at the management level through company goals and management policies, and at the analytical level through Standard Operating Procedures (SOPs) and quality control. The TestAmerica program is designed to minimize systematic error, encourage constructive, documented problem solving, and provide a framework for continuous improvement within the organization.

Refer to Appendix 2 for the Glossary/Acronyms.

### 3.3 Scope / Fields of Testing

The laboratory analyzes a broad range of environmental and industrial samples every month. Sample matrices vary among drinking water, effluent water, groundwater, hazardous waste, sludge and soils. The Quality Assurance Program contains specific procedures and methods to test samples of differing matrices for chemical, physical and biological parameters. The Program also contains guidelines on maintaining documentation of analytical processes, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all analytical requests are thoroughly evaluated before commitments are made to accept the work. Measurements are made using published reference methods or methods developed and validated by the laboratory.

The methods covered by this manual include the most frequently requested methodologies needed to provide analytical services in the United States and its territories. The specific list of test methods used by the laboratory can be found in the LIMS. The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet these requirements. All methods performed by the laboratory shall meet these criteria as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require criteria other than those contained in this manual. In these cases, the laboratory will abide by the requested criteria following review and acceptance of the requirements by the Laboratory Director and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory Director and the QA Manager must determine if it is in the lab’s best interest to follow the less stringent requirements.
3.4 Management of the Manual

3.4.1 Review Process

The template on which this manual is based is reviewed annually by Corporate Quality Management Personnel to assure that it remains in compliance with Section 3.1. This manual itself is reviewed annually by senior laboratory management to assure that it reflects current practices and meets the requirements of the laboratory’s clients and regulators as well as the CQMP. Occasionally, the manual may need changes in order to meet new or changing regulations and operations. The QA Manager will review the changes in the normal course of business and incorporate changes into revised sections of the document. All updates will be reviewed by the senior laboratory management staff. The laboratory updates and approves such changes according to its Document Control procedures (refer to SOPs DV-QA-001P and DV-QA-0010).

SECTION 4. MANAGEMENT REQUIREMENTS

4.1 Overview

TestAmerica Denver is a local operating unit of TestAmerica Laboratories, Inc. The organizational structure, responsibilities and authorities of the corporate staff of TestAmerica Laboratories, Inc. are presented in the CQMP. The laboratory has day-to-day independent operational authority overseen by corporate officers (e.g., President and Chief Executive Officer (CEO), Chief Operations Officer (COO), Vice President of Quality, etc.). The laboratory operational and support staff work under the direction of the Laboratory Director. The organizational structure for both Corporate and TestAmerica Denver is presented in Figure 4-1.

4.2 Roles and Responsibilities

In order for the Quality Assurance Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to the quality program. The following descriptions briefly define each role in its relationship to the Quality Assurance Program.

4.2.1 Additional Requirements for Laboratories

The responsibility for quality resides with every employee of the laboratory. All employees have access to the QAM, are trained to this manual, and are responsible for upholding the standards therein. Each person carries out his/her daily tasks in a manner consistent with the goals and in accordance with the procedures in this manual and the laboratory’s SOPs. This manual is specific to the operations of TestAmerica’s Denver laboratory.

4.2.2 President and Chief Executive Officer (CEO)

The President and CEO is a member of the Board of Directors and is ultimately responsible for the quality and performance of all TestAmerica facilities. The President and CEO establishes the overall quality standard and data integrity program for the Analytical Business, providing the necessary leadership and resources to assure that the standard and integrity program are met.
4.2.3 Chief Operations Officer (COO)

The COO reports directly to the President and CEO of TestAmerica. The COO is responsible for the operations of TestAmerica’s subsidiary companies and the company’s strategic growth.

4.2.4 Senior Vice President (SVP) of Operations & Client Service

The SVP of Operations and Client Services leads the Client Service Organization (CSO); and oversees the operations of all TestAmerica laboratories, the Corporate Technical Services group and the Sales Opportunity Optimization efforts. The SVP provides direction to the VPs of Operations, Client Service Directors, Manager of Project Managers, Director of Technical Services and a Director of Sales. The SVP of Operations and Client Services reports directly to the President and CEO of TestAmerica.

4.2.5 Vice President of Operations

Each VP of Operations (VPO) reports directly to the SVP of Operations and Client Services. Each VPO is responsible for the overall administrative and operational management of their respective laboratories. The VPO’s responsibilities include allocation of personnel and resources, long-term planning, goal setting, and achieving the financial, business, and quality objectives of TestAmerica. The VPO’s ensure timely compliance with Corporate Management directives, policies, and management systems reviews. The VPO’s are also responsible for restricting any laboratory from performing analyses that cannot be consistently and successfully performed to meet the standards set forth in this manual.

4.2.6 Vice President of Quality and Environmental Health and Safety (VP-QA/EHS)

The Vice President (VP) of QA/EHS reports directly to the President and CEO. With the aid of the Executive Committee, Laboratory Directors, Quality Directors, Safety Manager, EH&S Coordinators and QA Managers, the VP-QA/EHS has the responsibility for the establishment, general overview and corporate maintenance of the Quality Assurance and EH&S Programs within TestAmerica. Additional responsibilities include:

- Review of QA/QC and EH&S aspects of Corporate SOPs & Policies, national projects and expansions or changes in services.
- Work with various organizations outside of TestAmerica to further the development of quality and EHS standards and represent TestAmerica at various trade meetings.
- Prepare of a monthly report that includes quality metrics across the analytical laboratories and a summary of any quality related initiatives and issues.
- Prepare of a monthly report that includes EH&S metrics across the analytical laboratories and a summary of any EH&S related initiatives and issues.
- With the assistance of the Corporate Senior Management Teams and the EHS Directors, develop and implement the TestAmerica Environmental, Health and Safety Program.

4.2.7 Quality Assessment Director

The Quality Assessment Director reports to the VP-QA/EHS. The Quality Assessment Director has QA oversight of laboratories; responsible for the internal audit system, schedule and
procedure; monitors laboratory internal audit findings; identifies common laboratory weaknesses; and monitors corrective action closures. Together with the Quality Compliance Director, the Quality Systems Director, and the VP-QA/EHS, the Quality Assessment Director has the responsibility for the establishment, general overview and maintenance of the Analytical Quality Assurance Program within TestAmerica.

4.2.8 Quality Compliance Director

The Quality Compliance Director reports to the VP-QA/EHS. The Quality Compliance Director has QA oversight of laboratories; monitors and communicates DoD / DoE requirements; develops corporate tools for ensuring and improving compliance; develops corporate assessment tools; identifies common laboratory weaknesses; and monitors corrective action closures. Together with the Quality Assessment Director, Quality Systems Director and the VP-QA/EHS, the Quality Compliance Director has the responsibility for the establishment, general overview and maintenance of the Analytical Quality Assurance Program within TestAmerica.

4.2.9 Quality Systems Director

The Quality Systems Director reports to the VP-QA/EHS. The Quality Systems Director has QA oversight of laboratories; develops quality policies, procedures and management tools; monitors and communicates regulatory and certification requirements; identifies common laboratory weaknesses; and monitors corrective action closures. Together with the Quality Assessment Director, Quality Compliance Director and the VP-QA/EHS, the Quality Systems Director has the responsibility for the establishment, general overview and maintenance of the Analytical Quality Assurance Program within TestAmerica.

4.2.10 Quality Information Manager

The Quality Information Manager is responsible for managing all company official documents (e.g., Policies, Procedures, Work Instructions), the company’s accreditation database, intranet websites, external laboratory subcontracting, regulatory limits for clients on the company’s TotalAccess website; internal and external client support for various company groups (e.g., Client Services, EH&S, Legal, IT, Sales) for both quality and operational functions. The Quality Information Manager reports to the VP-QA/EHS; and works alongside the Quality Assessment, Quality Compliance and Quality System Directors and EHS Managers to support both the Analytical Quality Assurance and EHS Programs within TestAmerica.

4.2.11 Technical Services Director

The Technical Services Director is responsible for establishing, implementing and communicating TestAmerica’s Analytical Business’s Technical Policies, SOPs, and Manuals. Other responsibilities include conducting technical assessments as required, acting as a technical resource in national contracts review, coordinating new technologies, establishing best practices, advising staff on technology advances, innovations, and applications.

4.2.12 Ethics and Compliance Officers (ECOs)

TestAmerica has designated two senior members of the Corporate staff to fulfill the role of Ethics and Compliance Officer (ECO) – Corporate Counsel and VP of Human Resources and the VP-QA/EHS. Each ECO acts as a back-up to the other ECO and both are involved when
data investigations occur. Each ECO has a direct line of communication to the entire senior Corporate and lab management staff.

The ECOs ensure that the organization distributes the data integrity and ethical practices policies to all employees and ensures annual trainings and orientation of new hires to the ethics program and its policies. The ECO is responsible for establishing a mechanism to foster employee reporting of incidents of illegal, unethical, or improper practices in a safe and confidential environment.

The ECOs monitor and audit procedures to determine compliance with policies and to make recommendations for policy enhancements to the President and CEO, VPOs, Laboratory Director or other appropriate individuals within the laboratory. The ECO will assist the laboratory QA Manager in the coordination of internal auditing of ethical policy related activities and processes within the laboratory, in conjunction with the laboratories regular internal auditing function.

The ECOs will also participate in investigations of alleged violations of policies and work with the appropriate internal departments to investigate misconduct, remedy the situation, and prevent recurrence of any such activity.

4.2.13 **Chief Information Officer (CIO)**

The CIO is responsible for establishing, implementing and communicating TestAmerica’s Information Technology (IT) Policies, SOPs and Manuals. Other responsibilities include coordinating new technologies, development of electronic communication tools such as TestAmerica’s intranet and internet sites, ensuring data security and documentation of software, ensuring compliance with the NELAC standard, and assistance in establishing, updating, and maintaining Laboratory Information Management Systems (LIMS) at the various TestAmerica facilities.

4.2.14 **Environmental Health and Safety Managers (Corporate)**

The EHS Managers report directly to the VP-QA/EHS. The EHS Managers are responsible for the development and implementation of the TestAmerica Environmental, Health and Safety program. Responsibilities include:

- Consolidation and tracking all safety and health-related information and reports for the company, and managing compliance activities for TestAmerica locations.

- Coordination/preparation of the corporate Environmental, Health and Safety Manual Template that is used by each laboratory to prepare its own laboratory-specific Safety Manual/ CHP.

- Preparation of information and training materials for laboratory EHS Coordinators.

- Assistance in the internal and external coordination of employee exposure and medical monitoring programs to insure compliance with applicable safety and health regulations.

- Serving as Department of Transportation (DOT) focal point and providing technical assistance to location management.

- Serving as Hazardous Waste Management main contact and providing technical assistance to location management.
4.2.15 Laboratory Director

TestAmerica Denver’s Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to his/her respective VPO. The Laboratory Director provides the resources necessary to implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program.

Specific responsibilities include, but are not limited to:

- Providing one or more technical managers for the appropriate fields of testing. If the Technical Manager is absent for a period of time exceeding 15 consecutive calendar days, the Laboratory Director must designate another full time staff member meeting the qualifications of the Technical Manager to temporarily perform this function. If the absence exceeds 65 consecutive calendar days, the primary accrediting authority must be notified in writing.

- Ensuring that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented.

- Ensuring that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work.

- Ensuring TestAmerica’s human resource policies are adhered to and maintained.

- Ensuring that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.

- Ensuring that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs may be temporarily suspended by the Laboratory Director.

- Reviewing and approving all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.

- Pursuing and maintaining appropriate laboratory certification and contract approvals.

- Supporting ISO 17025 requirements.

- Supporting DoD ELAP requirements.

- Ensuring client specific reporting and quality control requirements are met.

- Directing the management team, consisting of the QA Manager, the Inorganic Operations Manager, the Organic Operations Manager, the EH&S Coordinator and the Office Manager as direct reports.
4.2.16 **Quality Assurance (QA) Manager**

The QA Manager has responsibility and authority to ensure the continuous implementation of the quality system.

The QA Manager reports directly to the Laboratory Director and to his/her Corporate Quality Director. This person is able to evaluate data objectively and perform assessments without outside (e.g., managerial) influence. Corporate QA may be used as a resource in dealing with regulatory requirements, certifications and other quality assurance related items. This person has documented training and/or experience in QA/QC procedures and the laboratory’s Quality System. The QA Manager directs the activities of the QA staff to accomplish specific responsibilities, which include, but are not limited to:

- Serving as the focal point for QA/QC in the laboratory.
- Having functions independent from laboratory operations for which he/she has quality assurance oversight.
- Maintaining and updating the QAM.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Training and advising the laboratory staff on quality assurance/quality control procedures that are pertinent to their daily activities.
- Having documented training and/or experience in QA/QC procedures and the laboratory’s Quality System.
- Having a general knowledge of the analytical test methods for which data audit/review is performed (and/or having the means of getting this information when needed).
- Arranging for or conducting internal audits on quality systems and the technical operation.
- Maintaining records of all ethics-related training, including the type and proof of attendance.
- Maintaining, improving, and evaluating the corrective action database and the corrective and preventive action systems.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs shall be investigated following procedures outlined in Section 12 and if deemed necessary may be temporarily suspended during the investigation.
- Objectively monitoring standards of performance in quality control and quality assurance without outside (e.g., managerial) influence.
- Coordinating document control of SOPs, MDLs, control limits, and miscellaneous forms and information.
• Reviewing a percentage of all final data reports for internal consistency. Reviewing Chain of Custody (COC), correspondence with the analytical request, batch QC status, completeness of any corrective action statements, manual calculations, format, holding time, sensibility and completeness of the project file contents.

• Reviewing external audit reports and data validation requests.

• Following-up with audits to ensure client QAPP requirements are met.

• Establishing reporting schedule and preparation of various quality reports for the Laboratory Director, clients and/or Corporate QA.

• Developing suggestions and recommendations to improve quality systems.

• Researching current state and federal requirements and guidelines.

• Directing the QA team to enable communication and to distribute duties and responsibilities.

• Ensuring communication with laboratory staff and monitoring standards of performance to ensure that systems are in place to produce the level of quality as defined in this document.

• Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs are temporarily suspended following the procedures outlined in Section 12.

• Evaluating the thoroughness and effectiveness of training.

• Assuring compliance with ISO 17025.

• Assuring compliance with the DoD/DOE QSM.

4.2.17 Quality Assurance Specialist

The Quality Assurance Specialist performs several roles. The QA Specialist reports to the facility QA Manager. The QA Specialist is responsible for QA documentation and involvement in the following activities:

• Assisting the QA Manager in performing the annual internal laboratory audits, compiling the evaluation, and coordinating the development of an action plan to address any deficiency identified.

• Facilitating external audits, coordinating with the QA Manager and Laboratory Staff to address any deficiencies noted at the time of the audit and subsequently presented in the final audit report.

• Assisting the QA Manager in the preparation of new SOPs and in the maintenance of existing SOPs, coordinating annual reviews and updates.

• Managing the performance testing (PT) studies, coordinating follow up studies for failed analytes and working with the QA Manager and Laboratory Staff to complete needed corrective action reports.
• Reviewing and maintaining personnel training records.

• Documenting control maintenance.

• Assisting the Quality Manager and Project Management Group in the review of program plans for consistency with organizational and contractual requirements. Summarize and convey to appropriate personnel anomalies or inconsistencies observed in the review process.

• Managing certifications and accreditations.

• Monitoring for compliance with the following QA Metrics: Temperature Monitoring of refrigeration units; thermometer calibrations; balance calibrations; Eppendorf/pipette calibrations; and proper standard/reagent storage.

• Periodically checking the proper use and review of instrument logs.

• Initiating the Mint-miner data file review process for organic instrumentation.

• Initiating the annual Instrument review.

• Assisting in the technical review of data packages which require QA review.

• Assisting the QA Manager in meeting the responsibilities of the QA Department as described in laboratory policies and SOPs.

4.2.18 Quality Assurance Assistant

The Quality Assurance Assistant performs several roles. The QA Assistant reports to the facility QA Manager. The QA Assistant is responsible for QA documentation and involvement in the following activities:

• Assisting the QA Manager in performing the annual internal laboratory audits, compiling the evaluation, and coordinating the development of an action plan to address any deficiency identified.

• Serving as a project manager for proficiency testing samples and other QC samples. Processes and reports QC samples as routine samples to appropriate agencies.

• Assisting the QA Manager in maintaining the laboratory’s reference data to keep it current and accurate.

• Preparing certification applications for states as directed by QA Manager.

• Reviewing and maintaining personnel training records.

• Performing document control maintenance.

• Assisting departments in generating MDL spreadsheets and calculations, reviewing MDL studies submitted to QA.

• Assisting in control limit generation.
• Ensuring maintenance of records archives.

• Maintaining historical indices for all technical records including SOPs, QC records, laboratory data, etc.

• Assisting the QA Manager in meeting the responsibilities of the QA Department as described in laboratory policies and SOPs.

4.2.19 Operations Manager (referred to in this document as Technical Manager)

The Inorganic and Organic Operations Managers (Technical Managers) report directly to the Laboratory Director. They are accountable for all analyses and analysts under their experienced supervision and for compliance with the ISO 17025 Standard. The scope of responsibility ranges from the new-hire process and existing technology through the ongoing training and development programs for existing analysts and new instrumentation. Specific responsibilities include, but are not limited to:

• Exercising day-to-day supervision of laboratory operations for the appropriate field of accreditation and reporting of results. Coordinating, writing, and reviewing preparation of all test methods, i.e., SOPs, with regard to quality, integrity, regulatory and optimum and efficient production techniques, and subsequent analyst training and interpretation of the SOPs for implementation and unusual project samples. They insure that the SOPs are properly managed and adhered to at the bench. They develop standard costing of SOPs to include supplies, labor, overhead, and capacity (design versus demonstrated versus first-run yield) utilization.

• Reviewing and approving, with input from the QA Manager, proposals from marketing, in accordance with an established procedure for the review of requests and contracts. This procedure addresses the adequate definition of methods to be used for analysis and any limitations, the laboratory’s capability and resources, the client’s expectations. Differences are resolved before the contract is signed and work begins. A system documenting any significant changes is maintained, as well as pertinent discussions with the client regarding their requirements or the results of the analyses during the performance of the contract. All work subcontracted by the laboratory must be approved by the client. Any deviations from the contract must be disclosed to the client. Once the work has begun, any amendments to the contract must be discussed with the client and so documented.

• Monitoring the validity of the analyses performed and data generated in the laboratory. This activity begins with reviewing and supporting all new business contracts, insuring data quality, analyzing internal and external non-conformances to identify root cause issues and implementing the resulting corrective and preventive actions, facilitating the data review process (training, development, and accountability at the bench), and providing technical and troubleshooting expertise on routine and unusual or complex problems.

• Providing training and development programs to applicable laboratory staff as new hires and, subsequently, on a scheduled basis. Training includes instruction on calculations, instrumentation management to include troubleshooting and preventive maintenance.

• Enhancing efficiency and improving quality through technical advances and improved LIMS utilization. Capital forecasting and instrument life cycle planning for second generation methods and instruments as well as asset inventory management.

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• Coordinating sample management from "cradle to grave," insuring that no time is lost in locating samples.

• Evaluating the level of internal/external non-conformances for all departments.

• Continuously evaluating turnaround time and addressing any problems that may hinder meeting the required and committed turnaround time from the various departments.

• Developing and improving the training of all analysts in cooperation with the Laboratory Director and QA Manager and in compliance with regulatory requirements.

• Working with the Department Managers/Supervisors to ensure that scheduled instrument maintenance is completed.

• Ensuring efficient utilization of supplies.

• Constantly monitoring and modifying the processing of samples through the departments.

• Fully supporting the quality system.

• Ensuring Department Managers/Supervisors schedule all QA/QC-related requirements for compliance, e.g., MDLs, control chart review, etc.

• Directing department personnel to communicate quality, technical, personnel, and instrumental issues for a consistent team approach.

• Coordinating audit responses with the QA Manager.

• Assuring compliance with ISO 17025.

• Assuring compliance with the DoD/DOE QSM.

4.2.20 Radiation Safety Officer

The Radiation Safety Officer (RSO) is responsible for implementing TestAmerica Denver's radiation safety program. The RSO reports directly to the Laboratory Director. The RSO’s duties consist of:

• Managing the personnel radiation dosimetry program

• Maintaining the Radioactive Materials License and radionuclide inventory

• Monitoring laboratory operations for compliance with the Radiation Safety Manual

• Training, documenting, and evaluating the TestAmerica Denver personnel for handling radioactive material

• Creating, releasing, and decontaminating Radiological Control Areas (RCAs)

• Monitoring and tracking radioactive materials
• Conducting the radioactive material waste disposal program in accordance with State and Federal regulations

• Maintaining all records related to the radiation safety program

4.2.21 **Employee Health and Safety Coordinator**

The Employee Health and Safety Coordinator (EH&S Coordinator) is responsible for administering the EH&S program that provides a safe, healthy working environment for all employees and the environment. The EH&S Coordinator reports directly to the Laboratory Director and the corporate Environmental Health and Safety Director. He/She monitors all areas for unsafe conditions, acts, and potential hazards. Specific responsibilities include, but are not limited to:

• Staying current with the hazardous waste regulations

• Continuing training on hazardous waste issues

• Reviewing and updating annually the Hazardous Waste Contingency Plan in the Environmental Health and Safety Manual

• Auditing the staff with regard to compliance with the Hazardous Waste Contingency Plan

• Contacting the hazardous waste subcontractors for review of procedures and opportunities for minimization of waste

• Conducting ongoing, necessary safety training and conducting new employee safety orientation

• Assisting in development and maintenance of the Chemical Hygiene/Safety Manual

• Administering dispersal of all Safety Data Sheet (SDS) information

• Performing regular chemical hygiene and housekeeping instruction

• Giving instruction on proper labeling and practice

• Serving as chairman of the laboratory safety committee

• Providing and training personnel on protective equipment

• Overseeing the inspection and maintenance of general safety equipment – fire extinguishers, safety showers, eyewash fountains, etc. and ensure prompt repairs as needed

• Supervising and scheduling fire drills and emergency evacuation drills

• Determining initial and subsequent exposure monitoring, if necessary, to determine potential employee exposure to chemicals used in the laboratory

• Conducting exposure monitoring assessments, as needed
• Determining when a complaint of possible over-exposure is “reasonable” and should be referred for medical consultation

• Assisting in the internal and external coordination of the medical consultation/monitoring program conducted by TestAmerica’s medical consultants

• Conducting weekly inspections of satellite accumulation areas and all hazardous waste storage areas

• Coordinating the proper storage, packing and disposal of laboratory wastes according to Department of Transportation (DOT) and Resource Conservation and Recovery Act (RCRA) regulations

• Maintaining waste disposal records

• Coordinating spill response activities including documentation for waste storage areas

4.2.22 Waste Disposal Technician

The Waste Disposal Technician is responsible for proper disposal of spent chemicals, process waste, and unused laboratory samples used in the laboratory according to corporate, federal, state, and local guidelines. The Waste Disposal Technician reports to the Hazardous Waste Specialist and EH&S Coordinator. The duties consist of:

• Packaging hazardous waste for transport per DOT, RCRA and TSCA guidelines

• Identifying waste streams and maintaining satellite accumulation areas

• Packaging expired chemicals for shipment or disposal

• Tracking volume of waste generated for reporting to corporate and EPA

• Preparing and tracking implementation of the Waste Minimization Plan

• Emptying satellite containers into bulk containers and returns to the laboratory for reuse

4.2.23 Department Manager/Supervisor

Department Managers/Supervisors report to the Operations Manager. At TestAmerica Denver these individuals may have the title of Department Manager I or II or Supervisor I or II. The title and level designation are based on the level of experience. He/she is accountable for all analyses and analysts under their experienced supervision and act as the Technical Managers in their assigned area in compliance with TNI requirements and for compliance with the ISO 17025 Standard. The scope of responsibility ranges from the new-hire process and existing technology through the ongoing training and development programs for existing analysts and new instrumentation. Specific responsibilities include, but are not limited to:

• Exercising day-to-day supervision of laboratory operations for the appropriate field of accreditation and reporting of results.

• Ensuring that analysts in their department adhere to applicable SOPs and the QA Manual. They perform frequent SOP and QA Manual review to determine if analysts are in
compliance and if new, modified, and optimized measures are feasible and should be added to these documents.

- Coordinating, writing, and reviewing documentation of all test methods, i.e., SOPs, with regard to quality, integrity, regulatory requirements and optimum and efficient production techniques, and subsequent analyst training and interpretation of the SOPs for implementation and unusual project samples.

- Reviewing and approving, with input from the QA Manager, Quality Assurance Project Plans (QAPPs). This procedure addresses the adequate definition of methods to be used for analysis and any limitations, the laboratory’s capability and resources and the client’s expectations. Differences are resolved before the contract is signed and work begins. A system documenting any significant changes is maintained, as well as pertinent discussions with the client regarding their requirements or the results of the analyses during the performance of the contract. Any deviations from the contract must be disclosed to the client. Once the work has begun, any amendments to the contract must be discussed with the client and so documented.

- Monitoring the validity of the analyses performed and data generated in the laboratory. This activity begins with reviewing and supporting all new business contracts, insuring data quality, analyzing internal and external non-conformances to identify root cause issues and implementing the resulting corrective and preventive actions, facilitating the data review process (training, development, and accountability at the bench), and providing technical and troubleshooting expertise on routine and unusual or complex problems.

- Providing training and development programs to applicable laboratory staff as new hires and, subsequently, on a scheduled basis. Training includes instruction on calculations, instrumentation management to include troubleshooting and preventive maintenance.

- Enhancing efficiency and improving quality through technical advances, improved LIMS utilization, capital forecasting and instrument life cycle planning for second generation methods and instruments as well as asset inventory management.

- Coordinating sample management from “cradle to grave,” insuring that no time is lost in locating samples.

- Scheduling all QA/QC-related requirements for compliance, e.g., MDLs, etc.

- Directing department personnel to communicate quality, technical, personnel, and instrumental issues for a consistent team approach.

- Coordinating audit responses with the QA Manager.

- Complying with ISO 17025, The NELAC Institute (TNI) Standard, DOD ELAP and the various QC programs implemented at the Denver laboratory.

- Participating in the selection, training (familiarization with SOP, QC, Safety and computer systems), developing performance objectives and standards of performance, appraising (measurement of objectives), scheduling, counseling, disciplining, and motivating analysts and documenting these activities in accordance with systems developed by the QA and Personnel Departments.
• Evaluating staffing sufficiency and overtime needs.

• Encouraging the development of analysts to become cross-trained in various methods and/or operate multiple instruments efficiently while performing maintenance and documentation, self-supervise, and function as a department team.

• Providing guidance to analysts in resolving problems encountered daily during sample prep/analysis in conjunction with the Operations Manager, and/or QA Manager. Each is responsible for 100% of the data review and documentation, non-conformance and corrective actions, the timely and accurate completion of performance evaluation samples and MDLs, for his/her department.

• Ensuring all logbooks are maintained, current, reviewed, and properly labeled or archived.

• Reporting all non-conformance conditions to the QA Manager, Operations Manager, and/or Laboratory Director.

• Ensuring that preventive maintenance is performed on instrumentation as detailed in the QA Manual or SOPs. He/She has responsibility for developing and implementing a system for preventive maintenance, troubleshooting, and repairing or arranging for repair of instruments.

• Maintaining adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.

• Achieving optimum turnaround time on analyses and compliance with holding times.

• Conducting efficiency and cost control evaluations on an ongoing basis to determine optimization of labor, supplies, overtime, first-run yield, capacity (designed vs. demonstrated), second- and third-generation production techniques/instruments, and long-term needs for budgetary planning.

• Developing and implementing calibration programs.

• Providing written responses to external and internal audit issues.

4.2.24 Laboratory Analysts

Laboratory analysts are responsible for conducting analysis and performing all tasks assigned to them by the group leader or supervisor. The Analyst position at TestAmerica Denver is divided into levels. These levels range from Analyst I to Analyst V. The level designation is based on experience, expertise, and responsibilities. The responsibilities of the analysts are listed below:

• Performing analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.

• Documenting standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on worklists, benchesheets, lab notebooks and/or the Non-Conformance Memo module in the LIMS.
- Reporting all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to their supervisor, the Technical Manager, and/or the QA Manager or member of QA staff.

- Performing 100% review of the data generated prior to entering and submitting for secondary level review.

- Suggesting method improvements to their supervisor, the Technical Manager, and the QA Manager. These improvements, if approved, will be incorporated. Providing ideas for the optimum performance of their assigned area, for example, through the proper cleaning and maintenance of the assigned instruments and equipment, are encouraged.

- Working cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

4.2.25 **Laboratory Technician**

Laboratory Technicians are responsible for the preparation of samples and performing all tasks assigned to them by the group leader or supervisor. The Laboratory Technician position at TestAmerica Denver is divided into three levels. These levels are Laboratory Technician I, Laboratory Technician II, and Laboratory Technician III. The level designation is based on experience, expertise, and responsibilities. The responsibilities of the Laboratory Technician are listed below:

- Retrieving samples from Sample Control for analysis

- Performing sample preparation by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.

- Documenting standard and sample preparation, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database.

- Reporting all non-conformance situations, sample preparation problems, matrix problems and QC failures, which might affect the reliability of the data, to their supervisor, the Technical Manager, and/or the QA Manager or member of QA staff.

- Working cohesively as a team member in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

4.2.26 **Laboratory Assistant**

The Laboratory Assistant position is an entry-level position to learn basic laboratory technician skills. The Laboratory Assistant reports to their group leader or supervisor. The Laboratory Assistant’s duties include the following:

- Assisting the Laboratory Technicians in preparation of samples for analysis

- Preparing routine forms and reports
4.2.27 **Sample Receiving Supervisor**

The Sample Receiving Supervisor reports to the Operations Manager. The responsibilities are outlined below:

- Managing department resources in cooperation.
- Serving as liaison between the Sample Receiving, the Customer Service Organization (CSO) and operations.
- Directing the logging of incoming samples into the LIMS
- Ensuring the verification of data entry from login
- Providing daily assessments of sample receipts
- Monitoring the preparation and shipment of bottle kits to clients
- Overseeing the receipt, log in, and storage of samples
- Scheduling couriers for sample pickup from customer sites

4.2.28 **Sample Control Technician**

The Sample Control Technician reports to the Sample Receiving Supervisor. The Sample Control Technician position at TestAmerica Denver is divided into levels. These levels range from Sample Control Technician I to Sample Control Technician IV. The level designation is based on experience and responsibilities of the Technician. The Sample Control Technician responsibilities include the following:

- Receiving and unloading samples or consignments in accordance with DOT regulations
- Verifying samples against the Chain of Custody (COC)
- Logging samples into the LIMS to assign a lot number for tracking purposes and distribute the paperwork to the Project Managers and Department Managers/Supervisors
- Labeling samples with lot number assigned and deliver the samples to the appropriate labs for analysis daily
- Monitoring freezer and cooler temperatures daily to confirm that the readings are within SOP guidelines
- Shipping all subcontracted samples to designated lab in accordance with DOT regulations as needed
4.2.29 **Shipping/Maintenance Technician**

The Shipping/Maintenance Technician reports to the Sample Receiving Supervisor. The Shipping/Maintenance Technician duties include the following:

- Maintaining the inventory control system
- Receiving and distributing incoming supplies
- Preparing and shipping bottle sampling kits to clients or on-site crews
- Maintaining bottle and cooler inventory
- Packing in-house samples for shipment to other laboratories

4.2.30 **Courier**

The Courier reports to the Sample Receiving Supervisor. The Courier’s duties include the following:

- Picking up and delivering samples and reports to clients and the laboratory
- Receiving and signing the chain of custody for samples
- Preparing and shipping bottle sampling kits to clients or on-site crews
- Performing preventative maintenance on company vehicles

4.2.31 **Manager of Client Relations Managers**

The Manager of Client Relations Managers mentors a regional team of Client Relations Managers (CRMs), coordinating workload and ensuring that bids and proposals are provided on schedule. The Manager of Client Relations Managers reports to the Client Services Director. The responsibilities of this position include:

- Managing the CRM team to ensure that bids are provided to clients in a timely manner
- Providing oversight to CRMs regarding pricing decisions
- Providing guidance to the CRMs for compilation of large bids and proposals such as strategy and content
- Providing guidance for professional development of the CRMs

4.2.32 **Client Relations Manager**

The Client Relations Manager (CRM) is accountable for new client setup, account maintenance, document review, quotes and proposals, and project kick-off. The CRM role fosters and develops client relationships in support of the CSO mission. The duties of this position include:

- Verifying that that lab certification meets project requirements for new quotes
Verifying that lab compound lists and limits meet project requirements for new quotes

Confirming that EDD format is available for new quotes

Engaging workshare labs, service centers and non-TA locations as needed for new quotes

Providing supporting documentation to the client as needed

Setting up new clients initiating project QAPP review with operations, QA and subcontract labs as needed

Initiating technical support from operations as needed

Providing quotes

Communicating with clients to ensure client requirements are being met and complaints are communicated to the appropriate personnel within TestAmerica for resolution

4.2.33 Manager of Project Management

The Manager of Project Management reports to the Regional Client Services Director and serves as the interface between the laboratory’s technical departments and the laboratory’s clients. The staff consists of the Project Management team. With the overall goal of total client satisfaction, the duties of this position are outlined below:

- Managing technical training and growth of the Project Management team
- Serving as technical liaison for the Project Management team
- Providing human resource management of the Project Management team
- Overseeing response to client inquiries concerning sample status
- Assisting clients regarding the resolution of problems concerning COC
- Ensuring that client specifications are met by communicating project and quality assurance requirements to the laboratory
- Notifying the supervisors of incoming projects and sample delivery schedules
- Being accountable to clients for communicating sample progress in daily status meeting with agreed-upon due dates
- Discussing with clients any project-related problems, resolving service issues, and coordinating technical details with the laboratory staff
- Monitoring the status of all data package projects in-house to ensure timely and accurate delivery of reports
- Informing clients of data package-related problems and resolve service issues
4.2.34  **Project Manager**

The Project Managers report to the Manager of Project Management (MPM) and serve as liaisons between the laboratory’s technical departments and the laboratory’s clients. At TestAmerica Denver there are two levels of Project Managers (I or II). The level designation is based on experience, expertise, and responsibilities. The Project Manager’s responsibilities include:

- Ensuring client specifications are met by communicating project and quality assurance requirements to the laboratory
- Notifying laboratory personnel of incoming projects and sample delivery schedules
- Monitoring the status of all projects in-house to ensure timely delivery of reports
- Informing clients of project-related problems, resolving service issues and coordinating technical issues with the laboratory staff
- Assisting clients regarding the resolution of problems concerning COC
- Coordinating client requests for sample containers and ensuring clients receive the proper sampling supplies
- Scheduling sample pick-ups from client offices or project sites and notifying the laboratory staff of incoming samples
- Coordinating subcontract work
- Responding to client inquiries concerning sample status
- Assisting clients with resolution of problems concerning Chains-of-Custody

4.2.35  **Manager of Project Management Assistants**

The Manager of Project Management Assistants (PMAs) reports to the Manager of Project Management. The Manager of PMAs responsibilities include:

- Supporting Project Management staff to meet the mission of the Client Service Organization
- Supervising the Project Management Assistants
- Managing technical training and growth of the Project Management Assistants team

4.2.36  **Project Management Assistant**

The Project Management Assistant reports to the Manager of Project Management Assistants and designated Project Managers. The Project Management Assistant assists the Project Manager in servicing the client’s needs and communicating those needs to the laboratory. The Project Management Assistant’s responsibilities include:

- Collating data reports, expanded deliverables, and electronic data deliverables (EDD’s) for
delivery to clients.

- Writing case narratives accompanying data packages to communicate anomalies to clients
- Proof reading and filing data reports received from the laboratory
- Assisting Project Managers in changing compound lists, TAT, and setting up tables in Word or Excel
- Monitoring report due dates for timely delivery
- Invoicing completed data packages
- Generating credit or debit invoices to ensure proper payment
- Copying and paginating reports

4.3 **Deputies**

The following table defines who assumes the responsibilities of key personnel in their absence. See WI-DV-0071 for the current list of personnel in these roles.

<table>
<thead>
<tr>
<th>Key Personnel</th>
<th>Deputy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Director</td>
<td>Administrative Duties: Office Manager</td>
</tr>
<tr>
<td></td>
<td>Technical and Operations Duties: Operations Managers</td>
</tr>
<tr>
<td>Quality Assurance Manager</td>
<td>Quality Assurance Specialist</td>
</tr>
<tr>
<td>Inorganic Operations Manager</td>
<td>Organic Operations Manager</td>
</tr>
<tr>
<td>Organic Operations Manager</td>
<td>Inorganic Operations Manager</td>
</tr>
<tr>
<td>EHS Coordinator</td>
<td>Backup EHS Coordinator</td>
</tr>
<tr>
<td>Radiation Safety Officer</td>
<td>Backup Radiation Safety Officer</td>
</tr>
<tr>
<td>CSO Manager of Project Management</td>
<td>CSO Manager of Project Management Assistants</td>
</tr>
</tbody>
</table>

Company Confidential and Proprietary
Figure 4-1. Corporate and Laboratory Organization Charts

The current version of this organization chart is available on Oasis.
The current version of this organization chart is available on the public drive:
G:\HR\Read\Org Charts.
Figure 4-1. Corporate and Laboratory Organization Charts (cont.)

The current version of this organization chart is available on the public drive: G:\HR\Read\Org Charts.
SECTION 5. QUALITY SYSTEM

5.1 Quality Policy Statement

It is TestAmerica’s Policy to:

- Provide data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols.
- Effectively manage all aspects of the laboratory and business operations by the highest ethical standards.
- Continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. TestAmerica recognizes that the implementation of a quality assurance program requires management’s commitment and support as well as the involvement of the entire staff.
- Provide clients with the highest level of professionalism and the best service practices in the industry.
- Comply with the ISO/IEC 17025:2005(E) International Standard, the 2009 TNI Standard and to continually improve the effectiveness of the management system.

Every staff member at the laboratory plays an integral part in quality assurance and is held responsible and accountable for the quality of their work. It is, therefore, required that all laboratory personnel are trained and agree to comply with applicable procedures and requirements established by this document.

5.2 Ethics and Data Integrity

TestAmerica is committed to ensuring the integrity of its data and meeting the quality needs of its clients. The elements of TestAmerica’s Ethics and Data Integrity Program include:

- An Ethics Policy (Corporate Policy CW-L-P-004) and Employee Ethics Statements.
- Ethics and Compliance Officers (ECOs).
- A Training Program.
- Self-governance through disciplinary action for violations.
- A Confidential mechanism for anonymously reporting alleged misconduct and a means for conducting internal investigations of all alleged misconduct. (Corporate SOP CW-L-S-002).
- Procedures and guidance for recalling data if necessary (Corporate SOP CW-Q-S-005).
- Effective external and internal monitoring system that includes procedures for internal audits (Section 15).

These elements assure that the laboratory is able to:

- Produce results, which are accurate and include QA/QC information that meet client pre-defined Data Quality Objectives (DQOs).
- Present services in a confidential, honest and forthright manner.
Provide employees with guidelines and an understanding of the Ethical and Quality Standards of this industry.

Operate the facilities in a manner that protects the environment and the health and safety of employees and the public.

Obey all pertinent federal, state and local laws and regulations and encourage other members of this industry to do the same.

Educate clients as to the extent and kinds of services available.

Assert competency only for work for which adequate personnel and equipment are available and for which adequate preparation has been made.

Promote the status of environmental laboratories, their employees, and the value of services rendered by them.

5.3 **Quality System Documentation**

The laboratory's Quality System is communicated through a variety of documents.

- **Quality Assurance Manual** – Each laboratory has a lab-specific quality assurance manual.
- **Corporate SOPs and Policies** – Corporate SOPs and Policies are developed for use by all relevant laboratories. They are incorporated into the laboratory's normal SOP distribution, training and tracking system. Corporate SOPs may be general or technical.
- **Work Instructions** – A subset of procedural steps, tasks or forms associated with an operation of a management system (e.g., checklists, preformatted bench sheets, forms).
- **Laboratory SOPs** – General and Technical
- **Laboratory Policy Memoranda** – Quality or Administrative policies issued by the QA Manager and/or Laboratory Director to address requirements not otherwise detailed in SOPs or Work Instructions.

5.3.1 **Order of Precedence**

In the event of a conflict or discrepancy between policies, the order of precedence is as follows:

- Corporate Quality Management Plan (CQMP)
- Corporate SOPs and Policies
- Laboratory Policy Memoranda
- Laboratory Quality Assurance Manual (QAM)
- Laboratory SOPs and Policies
- Other (Work Instructions (WI), memos, forms, flow charts, checklists, etc.)

**Note:** The laboratory has the responsibility and authority to operate in compliance with regulatory requirements of the jurisdiction in which the work is performed. Where the CQMP conflicts with those regulatory requirements, the regulatory requirements of the jurisdiction shall hold primacy. The laboratory's QAM shall take precedence over the CQMP in those cases.
5.4  **QA/QC Objectives for the Measurement of Data**

Quality Assurance (QA) and Quality Control (QC) are activities undertaken to achieve the goal of producing data that accurately characterize the sites or materials that have been sampled. Quality Assurance is generally understood to be more comprehensive than Quality Control. Quality Assurance can be defined as the integrated system of activities that ensures that a product or service meets defined standards.

Quality Control is generally understood to be limited to the analyses of samples and to be synonymous with the term “analytical quality control”. QC refers to the routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements. The QC program includes procedures for estimating and controlling precision and bias and for determining reporting limits.

Request for Proposals (RFPs) and Quality Assurance Project Plans (QAPP) provide a mechanism for the client and the laboratory to discuss the data quality objectives in order to ensure that analytical services closely correspond to client needs. The client is responsible for developing the QAPP. In order to ensure the ability of the laboratory to meet the Data Quality Objectives (DQOs) specified in the QAPP, clients are advised to allow time for the laboratory to review the QAPP before being finalized. Additionally, the laboratory will provide support to the client for developing the sections of the QAPP that concern laboratory activities.

Historically, laboratories have described their QC objectives in terms of precision, accuracy, representativeness, comparability, completeness, selectivity and sensitivity (PARCCSS).

5.4.1  **Precision**

The laboratory objective for precision is to meet the performance for precision demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Precision is defined as the degree of reproducibility of measurements under a given set of analytical conditions (exclusive of field sampling variability). Precision is documented on the basis of replicate analysis, usually duplicate or matrix spike (MS) duplicate samples.

5.4.2  **Accuracy**

The laboratory objective for accuracy is to meet the performance for accuracy demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Accuracy is defined as the degree of bias in a measurement system. Accuracy may be documented through the use of laboratory control samples (LCS) and/or MS. A statement of accuracy is expressed as an interval of acceptance recovery about the mean recovery.

5.4.3  **Representativeness**

The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a population or set of samples and is a measurement of both analytical and field sampling precision. The representativeness of the analytical data is a function of the procedures used in procuring and processing the samples. The representativeness can be documented by the relative percent difference between separately procured, but otherwise
identical samples or sample aliquots.

The representativeness of the data from the sampling sites depends on both the sampling procedures and the analytical procedures. The laboratory may provide guidance to the client regarding proper sampling and handling methods in order to assure the integrity of the samples.

5.4.4 Comparability

The comparability objective is to provide analytical data for which the accuracy, precision, representativeness and reporting limit statistics are similar to those quality indicators generated by other laboratories for similar samples, and data generated by the laboratory over time.

The comparability objective is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, by comparison of periodically generated statements of accuracy, precision and reporting limits with those of other laboratories.

5.4.5 Completeness

The completeness objective for data is 90% (or as specified by a particular project), expressed as the ratio of the valid data to the total data over the course of the project. Data will be considered valid if they are adequate for their intended use. Data usability will be defined in a QAPP, project scope or regulatory requirement. Data validation is the process for reviewing data to determine its usability and completeness. If the completeness objective is not met, actions will be taken internally and with the data user to improve performance. This may take the form of an audit to evaluate the methodology and procedures as possible sources for the difficulty or may result in a recommendation to use a different method.

5.4.6 Selectivity

Selectivity is defined as: The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. Target analytes are separated from non-target constituents and subsequently identified/detected through one or more of the following, depending on the analytical method: extractions (separation), digestions (separation), interelement corrections (separation), use of matrix modifiers (separation), specific retention times (separation and identification), confirmations with different columns or detectors (separation and identification), specific wavelengths (identification), specific mass spectra (identification), specific electrodes (separation and identification), etc.

5.4.7 Sensitivity

Sensitivity refers to the amount of analyte necessary to produce a detector response that can be reliably detected (Method Detection Limit) or quantified (Reporting Limit).

5.5 Criteria for Quality Indicators

The laboratory maintains a Quality Control Limit Summary in the LIMS referred to as a “Method Limit Group” that summarizes the precision and accuracy acceptability limits for each performed analysis. This summary includes an effective date, is updated each time new limits are generated and are managed by the laboratory’s QA department. Unless otherwise noted, limits within these tables are laboratory generated. Some acceptability limits are derived from US
EPA methods when they are required or other programs such as DoD/DOE QSM. Where US EPA method limits are not required or program limits are not available, the laboratory has developed limits from evaluation of data from similar matrices. Criteria for development of control limits are contained in SOP DV-QA-003P, *Quality Control Program*.

### 5.6 Statistical Quality Control

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846). The laboratory routinely utilizes statistically-derived limits to evaluate method performance and determine when corrective action is appropriate. The analysts are instructed to use the current limits in the Laboratory Information Management System (LIMS). Limits are entered into the Method Limit Groups according to the effective date. Historical limits can be obtained using the “Historical” feature in the LIMS. If a method defines the QC limits, the method limits are used.

If a method requires the generation of historical limits, the laboratory develops such limits from recent data in the QC database of the LIMS following the guidelines described in Section 24. All calculations and limits are documented and dated when approved and effective. On occasion, a client requests contract-specified limits for a specific project. These are stored in the project in the LIMS and are used only for samples assigned to that project.

As sample results and the related QC are entered into LIMS, the sample QC values are compared with the limits in LIMS to determine if they are within the acceptable range. The analyst then evaluates if the sample needs to be rerun or re-extracted/rerun or if a comment should be added to the report explaining the reason for the QC outlier.

#### 5.6.1 QC Charts

As the QC limits are calculated in the Control Chart Module in the LIMS, QC charts are generated showing warning and control limits for the purpose of evaluating trends. Refer to SOP DV-QA-003P for a description of the control chart process and evaluation of trends. The Department Managers/Supervisors evaluate these to determine if adjustments need to be made or for corrective actions to methods and submits requests for limits updates to the QA Manager. The QA manager assesses the limits to determine if they will be updated or requests corrective action to the method procedure. All findings are documented and kept on file.

### 5.7 Quality System Metrics

In addition to the QC parameters discussed above, the entire Quality System is evaluated on a monthly basis through the use of specific metrics (refer to Section 16). These metrics are used to drive continuous improvement in the laboratory’s Quality System.

### SECTION 6. DOCUMENT CONTROL

#### 6.1 Overview

The QA Department is responsible for the control of documents used in the laboratory to ensure that approved, up-to-date documents are in circulation and out-of-date (obsolete) documents are archived or destroyed. The following documents, at a minimum, must be controlled:

- Laboratory Quality Assurance Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- Corporate Policies and Procedures distributed outside the intranet

Corporate Quality posts Corporate Manuals, SOPs, Policies, Work Instructions, White Papers and Training Materials on the company intranet site. These Corporate documents are only considered controlled when they are read on the intranet site. Printed copies are considered uncontrolled unless the laboratory physically distributes them as controlled documents. A detailed description of the procedure for issuing, authorizing, controlling, distributing, and archiving Corporate documents is found in Corporate SOP CW-Q-S-001, Corporate Document Control and Archiving. The laboratory’s internal document control procedure is defined in SOP DV-QA-0010, Document Control.

The laboratory QA Department also maintains access to various references and document sources integral to the operation of the laboratory. This includes reference methods and regulations. Instrument manuals (hard or electronic copies) are also maintained by the laboratory.

The laboratory maintains control of records for raw analytical data and supporting records such as audit reports and responses, logbooks, standard logs, training files, MDL studies, Proficiency Testing (PT) studies, certifications and related correspondence, and corrective action reports. Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data and final reports.

### 6.2 Document Approval and Issue

The pertinent elements of a document control system for each document include a unique document title and number, pagination, the total number of pages of the item or an ‘end of document’ page, the effective date, revision number and the laboratory’s name. The QA personnel are responsible for the maintenance of this system.

Controlled documents are authorized by the QA Department. In order to develop a new document, a department manager/supervisor submits an electronic draft to the QA Department for suggestions and approval before use. Upon approval, QA personnel add the identifying version information to the document and retain that document as the official document on file. That document is then provided to all applicable operational units (may include electronic access). Controlled documents are identified as such and records of their distribution are kept by the QA Department. Document control may be achieved by either electronic or hardcopy distribution.

The QA Department maintains a list of the official versions of controlled documents.

Quality System Policies and Procedures will be reviewed at a minimum every year and revised as appropriate. Changes to documents occur when a procedural change warrants.

### 6.3 Procedures for Document Control Policy

For changes to the QA Manual, and SOPs refer to SOP DV-QA-001P, Preparation and Management of Standard Operating Procedures (SOPs) and Other Controlled Documents and
SOP DV-QA-0010, Document Control. Uncontrolled copies must not be used within the laboratory. Previous revisions and back-up data are stored by the QA department. Electronic copies are stored on the Public server in the QA folder (R:\QA\Read\SOPS\ESOPS\ALL) for the current revision.

Forms, worksheets, work instructions and information are organized by department and document type in the QA office. Electronic versions are kept on the network. The procedure for the care of these documents is in SOP DV-QA-001P and SOP DV-QA-0010.

6.4 Obsolete Documents

All invalid or obsolete documents are removed, or otherwise prevented from unintended use. The laboratory has specific procedures as described above to accomplish this. In general, obsolete documents are collected from employees according to distribution lists and are marked obsolete on the cover or destroyed. At least one copy of the obsolete document is archived according to SOP DV-QA-0005, Document Archiving Procedure.

SECTION 7. SERVICE TO THE CLIENT

7.1 Overview

The laboratory has established procedures for the review of work requests and contracts, oral or written. The procedures include evaluation of the laboratory's capability and resources to meet the contract's requirements within the requested time period. All requirements, including the methods to be used, must be adequately defined, documented and understood. For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily “fit” into a standard laboratory service or product. It is the laboratory's intent to provide both standard and customized environmental laboratory services to its clients.

A thorough review of technical and QC requirements contained in contracts is performed to ensure project success. The appropriateness of requested methods, and the lab's capability to perform them must be established. Projects, proposals and contracts are reviewed for adequately defined requirements and the laboratory's capability to meet those requirements. Alternate test methods that are capable of meeting the clients’ requirements may be proposed by the lab. A review of the lab's capability to analyze non-routine analytes is also part of this review process.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, sensitivity (detection and reporting levels), accuracy, and precision requirements (Percent Recovery and RPD). The reviewer ensures that the laboratory's test methods are suitable to achieve these requirements and that the laboratory holds the appropriate certifications and approvals to perform the work. The laboratory and any potential subcontract laboratories must be certified, as required, for all proposed tests.

The laboratory must determine if it has the necessary physical, personnel and information resources to meet the contract, and if the personnel have the expertise needed to perform the testing requested. Each proposal is checked for its impact on the capacity of the laboratory's equipment and personnel. As part of the review, the proposed turnaround time will be checked for feasibility.

Electronic or hard copy deliverable requirements are evaluated against the laboratory's capacity.
for production of the documentation.

If the laboratory cannot provide all services but intends to subcontract such services, whether to another TestAmerica facility or to an outside firm, this will be documented and discussed with the client prior to contract approval. (Refer to Section 8 for Subcontracting Procedures.)

The laboratory informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client’s requirements and the laboratory’s capability to meet those requirements is resolved in writing before acceptance of the contract. It is necessary that the contract be acceptable to both the laboratory and the client. Amendments initiated by the client and/or TestAmerica, are documented in writing.

All contracts, QAPPs, Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the project record.

The same contract review process used for the initial review is repeated when there are amendments to the original contract by the client, and the participating personnel are informed of the changes.

7.2 Review Sequence and Key Personnel

Appropriate personnel will review the work request at each stage of evaluation.

For routine projects and other simple tasks, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has any required certifications, that it can meet the client’s data quality and reporting requirements and that the lab has the capacity to meet the client’s turn around needs. It is recommended that, where there is a sales person assigned to the account, an attempt should be made to contact that sales person to inform them of the incoming samples.

For new, complex or large projects, the proposed contract is given to the Client Relations Manager or Proposal Team, who will decide which lab will receive the work based on the scope of work and other requirements, including certification, testing methodology, and available capacity to perform the work. The contract review process is outlined in TestAmerica’s Corporate SOP CA-L-P-002, Contract Compliance Program.

This review encompasses all facets of the operation. The scope of work is distributed to the appropriate personnel, as needed based on scope of contract, to evaluate all of the requirements shown above (not necessarily in the order below)

- Contract Administrator
- VP of Operations
- Laboratory Client Relations Manager
- Laboratory Project Manager
- Laboratory and/or Corporate Technical Managers / Directors
- Laboratory and/or Corporate Information Technology Managers/Directors
- Account Executives
• Laboratory and/or Corporate Quality
• Laboratory and/or Corporate Environmental Health and Safety Managers/Directors
• The Laboratory Director reviews the formal laboratory quote and makes final acceptance for their facility.

The Sales Director, Contract Administrator, Account Executive or Proposal Coordinator then submits the final proposal to the client. In the event that one of the above personnel is not available to review the contract, his or her back-up will fulfill the review requirements.

7.3 Documentation

Appropriate records are maintained for every contract or work request. All stages of the contract review process are documented and include records of any significant changes. The Contracts Department maintains copies of all signed contracts. TestAmerica Denver’s Customer Service Organization maintains copies of all signed contracts for reference locally on the network. The contract will be distributed to and maintained by the appropriate sales/marketing personnel and the Account Executive. A copy of the contract and formal quote will be filed with the laboratory PM.

Records are maintained of pertinent discussions with a client relating to the client’s requirements or the results of the work during the period of execution of the contract. The PM keeps a phone log of conversations with the client.

7.3.1 Project-Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, the laboratory assigns a PM to each client. It is the PM’s responsibility to ensure that project-specific technical and QC requirements are effectively evaluated and communicated to the laboratory personnel before and during the project. QA department involvement may be needed to assist in the evaluation of custom QC requirements.

PM’s are the primary client contact and they ensure resources are available to meet project requirements. Although PM’s do not have direct reports or staff in production, they coordinate opportunities and work with laboratory management and supervisory staff to ensure available resources are sufficient to perform work for the client’s project. Project management is positioned between the client and laboratory resources.

Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. The PM introduces new projects to the laboratory staff through project kick-off meetings or to the supervisory staff during production meetings. These meetings provide direction to the laboratory staff in order to maximize production and client satisfaction, while maintaining quality. In addition, project notes may be associated with each sample batch as a reminder upon sample receipt and analytical processing. Unique or large programs generally have a Quality Assurance Summary prepared by the PM. This summary is posted on the public Outlook folders for anyone in the lab to access. The Quality Assurance Summary documents all requirements that are non-standard that cannot effectively be done in TALS method comments.
During the project, any change that may occur within an active project is agreed upon between the client/regulatory agency and the PM/laboratory. These changes (e.g., use of a non-standard method or modification of a method) and approvals must be documented prior to implementation. Documentation pertains to any document, e.g., letter, e-mail, variance, contract addendum, which has been signed by both parties.

Such changes are also communicated to the laboratory during production meetings and updated in the Quality Assurance Summary, when applicable. Changes are also updated in the project notes and are introduced to the managers at these meetings or via email. The laboratory staff is introduced to the modified requirements via the PM, the Technical Manager or the individual laboratory supervisor. After the modification is implemented into the laboratory process, documentation of the modification is made in the case narrative of the data report(s).

The laboratory strongly encourages client visits to the laboratory and for formal/informal information sharing session with employees in order to effectively communicate ongoing client needs as well as project specific details for customized testing programs.

7.4 Special Services

The laboratory cooperates with clients and their representatives to monitor the laboratory’s performance in relation to work performed for the client. It is the laboratory’s goal to meet all client requirements in addition to statutory and regulatory requirements. The laboratory has procedures to ensure confidentiality to clients (Section 15 and 25).

**Note:** ISO/IEC 17025 states that a laboratory “shall afford clients or their representatives cooperation to clarify the client’s request”. This topic is discussed in Section 7.

The laboratory’s standard procedures for reporting data are described in Section 25. Special services are also available and provided upon request. These services include:

- Providing reasonable access for clients or their representatives to the relevant areas of the laboratory for the witnessing of tests performed for the client.
- Assisting client-specified third party data validators as specified in the client’s contract.
- Providing supplemental information pertaining to the analysis of their samples. **Note:** An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

7.5 Client Communication

Project managers are the primary communication link to the clients. They shall inform their clients of any delays in project completion as well as any non-conformances in either sample receipt or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

The Technical Manager, department managers / supervisors and/or the QA Manager are available to discuss any technical questions or concerns that the client may have.

7.6 Reporting

The laboratory works with its clients to produce any special communication reports required by the contract.
Client Surveys

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service. TestAmerica’s Sales and Marketing teams periodically develops lab and client specific surveys to assess client satisfaction.

SECTION 8. SUBCONTRACTING OF TESTS

8.1 Overview

For the purpose of this quality manual, the phrase subcontract laboratory refers to a laboratory external to the TestAmerica laboratories. The phrase "work sharing" refers to internal transfers of samples between the TestAmerica laboratories. The term outsourcing refers to the act of subcontracting tests.

When contracting with clients, the laboratory makes commitments regarding the services to be performed and the data quality for the results to be generated. When the need arises to outsource testing for clients because project scope, changes in laboratory capabilities, capacity or unforeseen circumstances, it must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments the laboratory has made to the client. Refer to TestAmerica’s Corporate SOPs on Subcontracting (CW-L-S-004) and the Work Sharing Process (CA-C-S-001).

When outsourcing analytical services, the laboratory will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this document, the requirements specified in TNI/ISO 17025 and/or the client’s Quality Assurance Project Plan (QAPP). All QC guidelines specific to the client’s analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report, as will non-TNI accredited work where required.

Project Managers (PMs), Client Relations Managers (CRM), or Account Executives (AE) for the Export Lab (TestAmerica laboratory that transfers samples to another laboratory) are responsible for obtaining client approval prior to subcontracting any samples. The laboratory will advise the client of a subcontract arrangement in writing and when possible approval from the client shall be retained in the project folder. Standard TestAmerica Terms and Conditions include the flexibility to subcontract samples within the TestAmerica laboratories. Therefore, additional advance notification to clients for intra-laboratory subcontracting is not necessary unless specifically required by a client contract.

Note: In addition to the client, some regulating agencies (e.g., USDA) or contracts (e.g., DoD or DOE projects) require notification prior to placing such work.

8.2 Qualifying and Monitoring Subcontractors

Whenever a PM (or Account Executive (AE) or Client Relationship Manager, etc.) becomes aware of a client requirement or laboratory need where samples must be outsourced to another laboratory, the other laboratory(s) shall be selected based on the following:

- Subcontractors specified by the client - In these circumstances, the client assumes
responsibility for the quality of the data generated from the use of a subcontractor.

- **Subcontractors reviewed by TestAmerica** – Firms which have been reviewed by the company and are known to meet standards for accreditations (e.g., State, TNI and DoD/DOE); technical specifications; legal and financial information.

A listing of vendors is available on the TestAmerica intranet site.

All TestAmerica laboratories are pre-qualified for work sharing provided they hold the appropriate accreditations, can adhere to the project/program requirements, and the client approved sending samples to that laboratory. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented). For DoD/DOE clients, the approval must be in writing. The originating laboratory is responsible for communicating all technical, quality, and deliverable requirements as well as other contract needs. (Corporate SOP No. CA-C-S-001, Work Sharing Process).

8.2.1 When the potential sub-contract laboratory has not been previously approved, Account Executives or PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Client Relations Manager (CRM) or Laboratory Director. The CRM or Laboratory Director requests that the PM begin the process of approving the subcontract laboratory as outlined in Corporate SOP No. CW-L-S-004, Subcontracting.

Once the appropriate accreditation and legal information is received by the laboratory, it is evaluated for acceptability (where applicable) and forwarded to the Corporate Quality Information Manager (QIM) for review. After the Corporate QIM reviews the documents for completeness, the information is forwarded to the Finance Department for formal signature and contracting with the laboratory. The approved vendor will be added to the approved subcontractor list on the intranet site and the finance group is concurrently notified for JD Edwards.

The client will assume responsibility for the quality of the data generated from the use of a subcontractor they have requested the lab to use. The qualified subcontractors on the intranet site are known to meet minimal standards. TestAmerica does not certify laboratories. The subcontractors on our approved list can only be recommended to the extent that we would use them.

8.3 **Oversight and Reporting**

8.3.1 The status and performance of qualified subcontractors will be monitored by the Corporate Quality department. Any problems identified will be brought to the attention of TestAmerica’s Corporate Finance, Legal and Corporate Quality personnel.

- Complaints shall be investigated. Documentation of the complaint, investigation and corrective action will be maintained in the subcontractor’s file on the intranet site. Complaints are posted using the Vendor Performance Report.

- Information shall be updated on the intranet when new information is received from the subcontracted laboratories.
Subcontractors in good standing will be retained on the intranet listing. CSO personnel will notify all TestAmerica laboratories, Corporate Quality and Corporate Contracts if any laboratory requires removal from the intranet site. This notification will be posted on the intranet site and e-mailed to all CSO Personnel, Laboratory Directors, QA Managers and Sales Personnel.

Prior to initially sending samples to the subcontracted laboratory, the PM confirms their certification status to determine if it is current and scope-inclusive. The information is documented within the project records.

8.3.2 For continued use of a subcontractor, verification of certification is placed upon the subcontractor for the defined project. Samples are subcontracted under Chain of Custody with the program defined as ‘Accreditation Required’ and the following statement for verification upon sample receipt:

**Note:** Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under Chain of Custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analytes/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

For TestAmerica laboratories, certifications can be viewed on the company's TotalAccess Database.

8.3.3 All subcontracted samples must be accompanied by a TestAmerica Chain of Custody (COC). A copy of the original COC sent by the client must be available in TALS for all samples workshared within TestAmerica. Client COCs are only forwarded to external subcontractors when samples are shipped directly from the project site to the subcontractor lab. Under routine circumstances, client COCs are not provided to external subcontractors.

Through communication with the subcontracted laboratory, the PM monitors the status of the subcontracted analyses, facilitates successful execution of the work, and ensures the timeliness and completeness of the analytical report.

Non-TNI accredited work must be identified in the subcontractor’s report as appropriate. If TNI accreditation is not required, the report does not need to include this information.

Reports submitted from subcontractor laboratories are not altered and are included in their original form in the final project report. This clearly identifies the data as being produced by a subcontractor facility. If subcontract laboratory data is incorporated into the laboratories EDD (i.e., imported), the report must explicitly indicate which lab produced the data for which methods and samples.

**Note:** The results submitted by a TestAmerica work sharing laboratory may be transferred electronically and the results reported by the TestAmerica work sharing lab are identified on the final report. The report must explicitly indicate which lab produced the data for which methods and samples. The final report must include a copy of the completed COC for all work sharing reports.
### 8.4 Contingency Planning

The full qualification of a subcontractor may be waived to meet emergency needs; however, this decision and justification must be documented in the project files, and the ‘Purchase Order Terms And Conditions For Subcontracted Laboratory Services’ must be sent with the samples and COC.

In the event this provision is utilized, the laboratory (e.g., PM) will be required to verify and document the applicable accreditations of the subcontractor. All other quality and accreditation requirements will still be applicable, but the subcontractor need not have signed a subcontract with TestAmerica at this time.

The use of any emergency subcontractor will require the PM to complete a JDE New Vendor Add Form in order to process payment to the vendor and add them to TALS. This form requires the user to define the subcontractor’s category/s of testing and the reason for testing.

### SECTION 9. PURCHASING SERVICES AND SUPPLIES

#### 9.1 Overview

Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, which may affect quality, all purchases from specific vendors are approved by a member of the supervisory or management staff. Capital expenditures are made in accordance with TestAmerica’s Capital Expenditure, Controlled Purchase Requests and Fixed Asset Capitalization, SOP CW-F-S-007.

 Contracts will be signed in accordance with TestAmerica’s Company-Wide Authorization Matrix, Policy CW-F-P-002. Request for Proposals (RFP’s) will be issued where more information is required from the potential vendors than just price. Process details are available in TestAmerica’s Corporate Procurement and Contracts Policy (Policy CW-F-P-004). RFP’s allow TestAmerica to determine if a vendor is capable of meeting requirements such as supplying all of the TestAmerica facilities, meeting required quality standards and adhering to necessary ethical and environmental standards. The RFP process also allows potential vendors to outline any additional capabilities they may offer.

#### 9.2 Glassware

Glassware used for volumetric measurements must be Class A or verified for accuracy according to laboratory procedure. Pyrex (or equivalent) glass should be used where possible. For safety purposes, thick-wall glassware should be used where available.

#### 9.3 Reagents, Standards and Supplies

Purchasing guidelines for equipment, consumables, and reagents must meet the requirements of the specific method and testing procedures for which they are being purchased. Solvents and acids are pre-tested in accordance with TestAmerica’s Corporate SOP on Acid and Solvent...
Lot Testing and Approval, SOP CA-Q-S-001 and CA-Q-S-001 DV-1, *Procedure for Testing Acetonitrile and Solvents from CYCLE-TAINERS®*. Approval information for the solvents and acids tested under SOP CA-Q-S-001 is stored on the TestAmerica SharePoint, under Solvent Approvals. A master list of all tested materials, as well as the certificates of analysis for the materials, is stored in the same location.

### 9.3.1 Purchasing

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Materials used in the analytical process must be of a known quality. The wide variety of materials and reagents available makes it advisable to specify recommendations for the name, brand, and grade of materials to be used in any determination. This information is contained in the method SOP. The analyst completes the order template when requesting reagents, standards, or supplies or the analyst may check the item out of the on-site consignment system that contains items approved for laboratory use.

The analyst must provide the master item number (from the master item list that has been approved by the Technical Manager), item description, package size, catalogue page number, and the quantity needed. If an item being ordered is not the exact item requested, approval must be obtained from the Technical Manager prior to placing the order. The purchasing manager or designee places the order.

### 9.3.2 Receiving

It is the responsibility of the purchasing manager or designee to receive the shipment. It is the responsibility of the analyst who ordered the materials to document the date materials were received. Once the ordered reagents or materials are received, the analyst compares the information on the label or packaging to the original order to ensure that the purchase meets the quality level specified. This is documented through the addition of the received date and initials on the packing sheet. These are scanned and saved in the department.

The purchasing manager verifies the lot numbers of received solvents and acids against the pre-approval lists. If a received material is listed as unapproved, or is not listed, it is sequestered and returned to the vendor. Alternatively, the laboratory may test the material for the intended use, and if it is acceptable, document the approval on the approval list. Records of any testing performed locally are maintained on the shared “public” folder on the computer network.

Materials may not be released for use in the laboratory until they have been inspected, verified as suitable for use, and the inspection/verification has been documented as described in WI-DV-0098, *Acceptance of Materials Used for Testing*.

Safety Data Sheets (SDSs) are available online through the Company's intranet website. Anyone may review these for relevant information on the safe handling and emergency precautions of on-site chemicals.

### 9.3.3 Specifications

Methods in use in the laboratory specify the grade of reagent that must be used in the procedure. If the quality of the reagent is not specified, analytical reagent grade will be used. It
is the responsibility of the analyst to check the procedure carefully for the suitability of grade of reagent.

Chemicals must not be used past the manufacturer’s expiration date and must not be used past the expiration time noted in a method SOP. If expiration dates are not provided, the laboratory may contact the manufacturer to determine an expiration date.

The laboratory assumes a five year expiration date on inorganic dry chemicals and solvents unless noted otherwise by the manufacturer or by the reference source method. Chemicals/solvents should not be used past the manufacturer’s or SOPs expiration date unless ‘verified’ as described below.

- An expiration date **cannot** be extended if the dry chemical/solvent is discolored or appears otherwise physically degraded. The dry chemical/solvent must be discarded.

- Expiration dates can be extended if the dry chemical/solvent is found to be satisfactory based on acceptable performance of quality control samples (Continuing Calibration Verification (CCV), Blanks, Laboratory Control Sample (LCS), etc.).

- If the dry chemical/solvent is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical/solvent is compared to an unexpired independent source in performing the method and the performance of the dry chemical/solvent is found to be satisfactory. The comparison must show that the dry chemical/solvent meets CCV limits. The comparison studies are attached to the new entry for the standard in the TALS reagent module as described in SOP DV-QA-0015, **Verification and Storage of Chemical Standards and Reagents**.

Wherever possible, standards must be traceable to national or international standards of measurement or to national or international reference materials. Records to that effect are available to the user.

Compressed gases in use are checked for pressure and secure positioning daily. To prevent a tank from going to dryness, or introducing potential impurities, the pressure should be closely watched as it decreases to approximately 15% of the original reading, at which point it should be replaced. For example, a standard sized laboratory gas cylinder containing 3,000 psig of gas should be replaced when it drops to approximately 500 psig. The quality of the gases must meet method or manufacturer specification or be of a grade that does not cause any analytical interference.

Water used in the preparation of standards or reagents must have a specific conductivity of less than 1- μmho/cm (or specific resistivity of greater than 1.0 megohm-cm) at 25°C. The specific conductivity is checked and recorded daily. If the water’s specific conductivity is greater than the specified limit, the Facility Manager and QA Manager (or designee) must be notified immediately in order to notify all departments, decide on cessation (based on intended use) of activities, and make arrangements for correction. See SOP DV-QA-0026, **DI Water Monitoring**.

The laboratory may purchase reagent grade (or other similar quality) water for use in the laboratory. This water must be certified “clean” by the supplier for all target analytes or otherwise verified by the laboratory prior to use. This verification is documented.
Standard lots are verified before first time use if the laboratory switches manufacturers or has historically had a problem with the type of standard.

Purchased bottleware used for sampling must be certified clean and the certificates must be maintained. If uncertified sampling bottleware is purchased, all lots must be verified clean prior to use. This verification must be maintained.

Records of manufacturer's certification and traceability statements are maintained in electronic files. These records include date of receipt, lot number (when applicable), and expiration date (when applicable). Incorporation of the item into the record indicates that the analyst has compared the new certificate with the previous one for the same purpose and that no difference is noted, unless approved and so documented by the QA Manager or designee. For all standards recorded in the Reagent Module in the LIMS, the certificate of analysis must be attached to the record for the source material. See SOP DV-QA-0015, Verification and Storage of Chemical Standards and Reagents.

9.3.4 Storage

Reagent and chemical storage is important from the aspects of both integrity and safety. Light-sensitive reagents may be stored in brown-glass containers. Storage conditions are per the Corporate Environmental Health and Safety Manual (Corp. Doc. CW-E-M-001) and method SOPs or manufacturer instructions.

9.4 Purchase of Equipment / Instruments / Software

When a new piece of equipment is needed, either for additional capacity or for replacing inoperable equipment, the analyst or supervisor makes a supply request to the Technical Manager and/or the Laboratory Director. If they agree with the request, the procedures outlined in TestAmerica’s Corporate Policy CA-T-P-001, Qualified Products List, are followed. A decision is made as to which piece of equipment can best satisfy the requirements. The appropriate written requests are completed and purchasing places the order.

Upon receipt of a new or used piece of equipment, an identification name is assigned and added to the equipment list. IT must also be notified so that they can synchronize the instrument for back-ups. The equipment’s capability is assessed to determine if it is adequate or not for the specific application. For instruments, a calibration curve is generated, followed by MDLs, Demonstration of Capabilities (DOCs), and other relevant criteria (refer to Section 19). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the IT Department or QA Department. Software certificates supplied by the vendors are filed with the LIMS Administrator or Data Center Manager, as appropriate. The manufacturer’s operation manual is retained at the bench or available through the laboratory’s computer network.

9.5 Services

Service to analytical instruments (except analytical balances) is performed on an as needed basis. Routine preventative maintenance is discussed in Section 20. The need for service is determined by analysts and/or Department Managers/Supervisors. The service providers that perform the services are approved by the Technical Manager and/or Laboratory Director.

Analytical balances are serviced and calibrated annually in accordance with SOP DV-QA-0014, Selecting and Using Balances. The calibration and maintenance services are performed on-
site, and the balances are returned to use immediately following successful calibration. When the calibration certificates are received (usually within two weeks of the service), they are reviewed, and documentation of the review is filed with the certificates. If the calibration was unsuccessful, the balance is immediately removed from service and segregated pending either further maintenance or disposal.

Calibration services for support equipment such as thermometers, weight sets, autopipettors, etc., are obtained from vendors with current and valid ISO 17025 accreditation for calibration of the specific piece of equipment. Prior to utilizing the vendor’s services, the vendor’s accreditation status is verified. Once the equipment has been calibrated, the calibration certificates are reviewed by the QA department, and documentation of the review is filed with the calibration certificates.

9.6 Suppliers

TestAmerica selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts). This process is defined in the Procurement and Contracts Policy (Policy CW-F-P-004). The level of control used in the selection process is dependent on the anticipated spending amount and the potential impact on TestAmerica business. Vendors that provide test and measuring equipment, solvents, standards, certified containers, instrument related service contracts or subcontract laboratory services shall be subject to more rigorous controls than vendors that provide off-the-shelf items of defined quality that meet the end use requirements. The JD Edwards purchasing system includes all suppliers/vendors that have been approved for use.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on packing slips or other supply receipt documents. The purchasing documents contain the data that adequately describe the services and supplies ordered.

Any issues of vendor performance are to be reported immediately by the laboratory staff to the Corporate Purchasing Group by completing a Vendor Performance Report.

The Corporate Purchasing Group will work through the appropriate channels to gather the information required to clearly identify the problem and will contact the vendor to report the problem and to make any necessary arrangements for exchange, return authorization, credit, etc.

As deemed appropriate, the Vendor Performance Reports will be summarized and reviewed to determine corrective action necessary, or service improvements required by vendors.

The laboratory has access to a listing of all approved suppliers of critical consumables, supplies and services. This information is provided through the JD Edwards purchasing system.

9.6.1 New Vendor Procedure

TestAmerica employees who wish to request the addition of a new vendor must complete a J.D. Edwards Vendor Add Request Form.

New vendors are evaluated based upon criteria appropriate to the products or services provided as well as their ability to provide those products and services at a competitive cost. Vendors are also evaluated to determine if there are ethical reasons or potential conflicts of interest with
TestAmerica employees that would make it prohibitive to do business with them as well as their financial stability. The QA Department and/or the Director of Technical Services are consulted with vendor and product selection that have an impact on quality.

SECTION 10. COMPLAINTS

10.1 Overview

The laboratory considers an effective client complaint handling process to be of significant business and strategic value. Listening to and documenting client concerns captures ‘client knowledge’ that enables the laboratory’s operations to continually improve processes and client satisfaction. An effective client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

A client complaint is any expression of dissatisfaction with any aspect of the laboratory’s business services (e.g., communications, responsiveness, data, reports, invoicing and other functions) expressed by any party, whether received verbally or in written form. Client inquiries, complaints or noted discrepancies are documented, communicated to management, and addressed promptly and thoroughly.

The laboratory has procedures for addressing both external and internal complaints with the goal of providing satisfactory resolution to complaints in a timely and professional manner.

The nature of the complaint is identified, documented and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA Department must evaluate whether a special audit must be conducted to assist in resolving the issue. A written confirmation or letter to the client, outlining the issue and response taken is recommended as part of the overall action taken.

The process of complaint resolution and documentation utilizes the procedures outlined in Section 12 (Corrective Actions) and is documented following SOP DV-QA-013P, Customer Complaints.

10.2 External Complaints

An employee that receives a complaint initiates the complaint resolution process by first documenting the complaint according to SOP DV-QA-013P, Customer Complaints.

Complaints fall into two categories: correctable and non-correctable. An example of a correctable complaint would be one where a report re-issue would resolve the complaint. An example of a non-correctable complaint would be one where a client complains that their data was repeatedly late. Non-correctable complaints should be reviewed for preventive action measures to reduce the likelihood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving and Documenting Complaints
- Complaint Investigation and Service Recovery
- Process Improvement
The laboratory shall inform the initiator of the complaint of the results of the investigation and the corrective action taken, if any.

10.3 Internal Complaints

Internal complaints include, but are not limited to: errors and non-conformances, training issues, internal audit findings, and deviations from methods. Corrective actions may be initiated by any staff member who observes a nonconformance and shall follow the procedures outlined in Section 12. In addition, Corporate Management, Sales and Marketing and IT may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 12.

10.4 Management Review

The number and nature of client complaints is reported by the QA Manager to the laboratory and Quality Director in the QA monthly report. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Annual Management Review (Section 16).

SECTION 11. CONTROL OF NON-CONFORMING WORK

11.1 Overview

When data discrepancies are discovered or deviations and departures from laboratory SOPs, policies and/or client requests have occurred, corrective action is taken immediately. First, the laboratory evaluates the significance of the nonconforming work. Then, a corrective action plan is initiated based on the outcome of the evaluation. If it is determined that the nonconforming work is an isolated incident, the plan could be as simple as adding a qualifier to the final results and/or making a notation in the case narrative. If it is determined that the nonconforming work is a systematic or improper practices issue, the corrective action plan could include a more in depth investigation and a possible suspension of an analytical method. In all cases, the actions taken are documented using the laboratory’s corrective action system (refer to Section 12).

Due to the frequently unique nature of environmental samples, sometimes departures from documented policies and procedures are needed. When an analyst encounters such a situation, the problem is presented to the supervisor for resolution. The supervisor may elect to discuss it with the Technical Manager or have a representative contact the client to decide on a logical course of action. Once an approach is agreed upon, the analyst documents it using the laboratories corrective action system described in Section 12. This information can then be supplied to the client in the form of a footnote or a case narrative with the report. Refer to SOP DV-QA-0031, Nonconformance and Corrective Action System for the procedure to handle such situations.

Project Management may encounter situations where a client may request that a special procedure be applied to a sample that is not standard lab practice. Based on a technical evaluation, the lab may accept or opt to reject the request based on technical or ethical merit. An example might be the need to report a compound that the lab does not normally report. The lab would not have validated the method for this compound following the procedures in Section 19. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Technical Manager or Department Supervisor and QA Manager, documented and included in the project folder. Deviations must also be noted on
the final report with a statement that the compound is not reported in compliance with TNI (or the analytical method) requirements and the reason. The laboratory must also disclose if an analyte is not listed on the appropriate accreditation or certification documents for a given state when that status is available. Data being reported to a non-TNI state would need to note the change made to how the method is normally run.

11.2 Responsibilities and Authorities

Under certain circumstances, the Laboratory Director, the Technical Manager, or a member of the QA team may authorize departures from documented procedures or policies. The departures may be a result of procedural changes due to the nature of the sample; a one-time procedure for a client; QC failures with insufficient sample to reanalyze, etc. In most cases, the client will be informed of the departure prior to the reporting of the data. Any departures must be well documented using the laboratory’s corrective action procedures using a Nonconformance Memo (NCM). This information may also be documented in the batch record, logbooks and/or data review checklists as appropriate. Any impacted data must be referenced in a case narrative and/or flagged with an appropriate data qualifier.

Any misrepresentation or possible misrepresentation of analytical data discovered by any laboratory staff member must be reported to facility Senior Management within 24-hours. The Senior Management staff is comprised of the Laboratory Director, the QA Manager, and the Technical Manager. The reporting of issues involving alleged violations of the company’s Data Integrity or Manual Integration procedures must be conveyed to an ECO, (e.g., VP-QA/EHS) and the laboratory’s Quality Director within 24 hours of discovery.

Whether an inaccurate result was reported due to calculation or quantitation errors, data entry errors, improper practices, or failure to follow SOPs, the data must be evaluated to determine the possible effect.

The Laboratory Director, QA Manager, ECOs, and the Quality Directors have the authority and responsibility to halt work, withhold final reports, or suspend an analysis for due cause as well as authorize the resumption of work.

11.3 Evaluation of Significance and Actions Taken

For each nonconforming issue reported, an evaluation of its significance and the level of management involvement needed is made. This includes reviewing its impact on the final data, whether or not it is an isolated or systematic issue, and how it relates to any special client requirements.

Corporate SOP entitled Data Recalls (CW-Q-S-005) is the procedure to be followed when it is discovered that erroneous or biased data may have been reported to clients or regulatory agencies.

Corporate SOP entitled Internal Investigation (CW-L-S-002) is the procedure to be followed for investigation and correction of situations involved alleged incidents of misconduct or violation of the company’s ethics policy.

Laboratory level decisions are documented and approved using the laboratory’s standard nonconformance/corrective action reporting described in SOP DV-QA-0031 Non-Conformance and Corrective Action System, and SOP DV-QA-0034, Root Cause Analysis, Corrective Actions.
and Preventive Action Plans, in lieu of the data recall determination form contained in TestAmerica’s Corporate SOP CW-Q-S-005.

11.4 Prevention of Nonconforming Work

If it is determined that the nonconforming work could recur, further corrective actions must be made following the laboratory’s corrective action system. Periodically as defined by the laboratory’s preventive action schedule. The QA Department evaluates non-conformances to determine if any nonconforming work has been repeated multiple times. If so, the laboratory’s corrective action process may be followed.

11.5 Method Suspension / Restriction (Stop Work Procedures)

In some cases, it may be necessary to suspend/restrict the use of a method or target compound which constitutes significant risk and/or liability to the laboratory. Suspension/restriction procedures can be initiated by any of the persons noted in Section 11.2, Paragraph 5.

Prior to suspension/restriction, confidentiality will be respected, and the problem with the required corrective and preventive action will be stated in writing and presented to the Laboratory Director.

The Laboratory Director shall arrange for the appropriate personnel to meet with the QA Manager as needed. This meeting shall be held to confirm that there is a problem, that suspension/restriction of the method is required and will be concluded with a discussion of the steps necessary to bring the method/target or test fully back on line. In some cases, that may not be necessary if all appropriate personnel have already agreed there is a problem and there is agreement on the steps needed to bring the method, target or test fully back on line. The QA Manager will initiate a corrective action report as described in Section 12 if one has not already been started. A copy of any meeting notes and agreed upon steps should be faxed or e-mailed by the laboratory to the appropriate VPO and member of Corporate QA. This fax/e-mail acts as notification of the incident.

After suspension/restriction, the lab will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. The report must not be posted for viewing on the internet. It is the responsibility of the Laboratory Director to hold all reporting and to notify all relevant laboratory personnel regarding the suspension/restriction (e.g., Project Management, Log-in, etc.). Analysis may proceed in some instances depending on the non-conformance issue.

Within 72 hours, the QA Manager will determine if compliance is now met and reports can be released, OR determine the plan of action to bring work into compliance, and release work. A team, with all principals involved (Laboratory Director, Technical Manager, QA Manager) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. Project Management and the Directors of Client Services and Sales and Marketing must be notified if clients must be notified or if the suspension/restriction affects the laboratory’s ability to accept work. The QA Manager must approve start-up or elimination of any restrictions after all corrective action is complete. This approval is given by final signature on the completed corrective action report.

Communications to all external parties (e.g., clients) who need to be notified will be made as quickly as possible. Reports will be revised and reissued as part of the corrective action as
identified by the investigation and corrective action plan. The procedures to be used for investigation and notification are described in SOP CW-L-S-002, Internal Investigation, SOP CW-Q-S-005, Data Recalls, and SOP DV-QA-019P, Results and Report Revisions, as applicable.

SECTION 12. CORRECTIVE ACTION

12.1 Overview

A major component of TestAmerica’s Quality Assurance (QA) Program is the problem investigation and feedback mechanism designed to keep the laboratory staff informed on quality related issues and to provide insight to problem resolution. When nonconforming work or departures from policies and procedures in the quality system or technical operations are identified, the corrective action procedure provides a systematic approach to assess the issues, restore the laboratory’s system integrity, and prevent reoccurrence. Corrective actions are documented using Non-Conformance Memos (NCM) and Corrective Action Reports (CAR) (refer to Figure 12-1).

12.2 General

Problems within the quality system or within analytical operations may be discovered in a variety of ways, such as QC sample failures, internal or external audits, proficiency testing (PT) performance, client complaints, staff observation, etc.

The purpose of a corrective action system is to:

- Identify non-conformance events and assign responsibility(s) for investigating.
- Resolve non-conformance events and assign responsibility for any required corrective action.
- Identify systematic problems before they become serious.
- Identify and track client complaints and provide resolution.

12.2.1 Non-Conformance Memo (NCM) is used to document the following types of corrective actions:

- Deviations from an established procedure or SOP
- QC outside of limits (non-matrix related)
- Isolated reporting / calculation errors
- Client complaints
- Discrepancies in materials / goods received vs. manufacturer packing slips.

12.2.2 Corrective Action Report (CAR) is used to document the following types of corrective actions:

- Questionable trends that are found in the review of NCMs.
- Issues found while reviewing NCMs that warrant further investigation.
- Internal and external audit findings.
- Failed or unacceptable PT results.
- Corrective actions that cross multiple departments in the laboratory.
- Systematic reporting / calculation errors
- Client complaints
- Data recall investigations
- Identified poor process or method performance trends
- Excessive revised reports
- Health and Safety violations identified in audits

This will provide background documentation to enable root cause analysis and preventive action.

12.3 Closed Loop Corrective Action Process

Any employee in the company can initiate a corrective action. There are four main components to a closed-loop corrective action process once an issue has been identified: Cause Analysis, Selection and Implementation of Corrective Actions (both short and long term), Monitoring of the Corrective Actions, and Follow-up.

12.3.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. An NCM or Corrective Action Report (CAR) must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Table 12-1 provides some general guidelines on determining responsibility for assessment.
- The cause analysis step is the key to the process as a long term corrective action cannot be determined until the cause is determined.
- If the cause is not readily obvious, the Technical Manager, Laboratory Director, or QA Manager (or QA designee) is consulted.

12.3.2 Selection and Implementation of Corrective Actions

- Where corrective action is needed, the laboratory shall identify potential corrective actions. The action(s) most likely to eliminate the problem and prevent recurrence are selected and implemented. Responsibility for implementation is assigned.
- Corrective actions shall be to a degree appropriate to the magnitude of the problem identified through the cause analysis.
- Whatever corrective action is determined to be appropriate, the laboratory shall document and implement the changes. The NCM or CAR is used for this documentation.

12.3.3 Root Cause Analysis

Root Cause Analysis is a class of problem solving (investigative) methods aimed at identifying the basic or causal factor(s) that underlie variation in performance or the occurrence of a significant failure. The root cause may be buried under seemingly innocuous events, many steps preceding the perceived failure. At first glance, the immediate response is typically
directed at a symptom and not the cause. Typically, root cause analysis would be best with three or more incidents to triangulate a weakness. Corporate SOP CA-Q-S-009, *Root Cause Analysis* describes the procedure.

Systematically analyze and document the root causes of the more significant problems that are reported. Identify, track, and implement the corrective actions required to reduce the likelihood of recurrence of significant incidents. Trend the root cause data from these incidents to identify root causes that, when corrected, can lead to dramatic improvements in performance by eliminating entire classes of problems.

Identify the one event associated with the problem and ask why this event occurred. Brainstorm the root causes of failures; for example, by asking why events occurred or conditions existed; and then why the cause occurred five consecutive times until you get to the root cause. For each of these sub events or causes, ask why it occurred. Repeat the process for the other events associated with the incident.

Root cause analysis does not mean the investigation is over. Look at technique, or other systems outside the normal indicators. Often creative thinking will find root causes that ordinarily would be missed, and continue to plague the laboratory or operation.

### 12.3.4 Monitoring of the Corrective Actions

- The Technical Manager and QA Manager are responsible to ensure that the corrective action taken was effective.

- Ineffective actions are documented and re-evaluated until acceptable resolution is achieved. Technical Managers are accountable to the Laboratory Director to ensure final acceptable resolution is achieved and documented appropriately.

- Each CAR is entered into a database for tracking purposes and at least monthly a summary of all corrective actions is printed out for review to aid in ensuring that the corrective actions have taken effect.

- TestAmerica laboratories began using the Incident/Corrective Action Tracker (iCAT) database developed by the company in 2015. An incident is an event triggering the need for one or more corrective actions as distinct from a corrective action, a potential deficiency stemming from an incident that requires investigation and possibly fixing. The database is independent of TALS, available to all local and corporate managers, and capable of notifying and tracking multiple corrective actions per event, dates, and personnel. iCAT allows associated document upload, categorization (such as, external/internal audit, client service concerns, data quality issues, proficiency testing, etc.), and trend analysis. The Denver Laboratory also uses its previous audit database to provide custom reports for tracking and trending.

- The QA Manager reviews NCMs and CARs for trends. Highlights are included in the QA monthly report (refer to Section 16). If a significant trend develops that adversely affects quality, an audit of the area is performed and corrective action implemented.

- Any out-of-control situations that are not addressed acceptably at the laboratory level may be reported to the Corporate Quality Director by the QA Manager, indicating the nature of the out-of-control situation and problems encountered in solving the situation.
12.3.5 Follow-up Audits

- Follow-up audits may be initiated by the QA Manager and shall be performed as soon as possible when the identification of a nonconformance casts doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with state or federal requirements.

- These audits often follow the implementation of the corrective actions to verify effectiveness. An additional audit would only be necessary when a critical issue or risk to business is discovered.

(Also refer to Section 15.1.4, Special Audits.)

12.4 Technical Corrective Actions

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs, the laboratory has general procedures to be followed to determine when departures from the documented policies and procedures and quality control have occurred (refer to Section 11). The documentation of these procedures is through the use of an NCM or CAR.

Table 12-1 includes examples of general technical corrective actions. For specific criteria and corrective actions, refer to the analytical methods or specific method SOPs. The laboratory may also maintain Work Instructions on these items that are available upon request.

Table 12-1 provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The table also provides general guidance on how a data set should be treated if associated QC measurements are unacceptable. Specific procedures are included in Method SOPs, Work Instructions, and the QAM Sections 19 and 20. All corrective actions are reviewed monthly, at a minimum, by the QA Manager and highlights are included in the QA monthly report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If the deficiency does not impair the usability of the results, data will be reported with an appropriate data qualifier and/or the deficiency will be noted in the case narrative. Where sample results may be impaired, the Project Manager is notified by an NCM and appropriate corrective action (e.g., reanalysis) is taken and documented.

12.5 Basic Corrections

When mistakes occur in records, each mistake shall be crossed-out, [not obliterated (e.g., no white-out)], and the correct value entered alongside. All such corrections shall be initialed (or signed) and dated by the person making the correction. In the case of records stored electronically, the original "uncorrected" file must be maintained intact and a second "corrected" file is created.

This same process applies to adding additional information to a record. All additions made later than the initial documentation must also be initialed (or signed) and dated.

When corrections are due to reasons other than obvious transcription errors, the reason for the corrections (or additions) shall also be documented.
**TestAmerica Corrective Action Plan**

<table>
<thead>
<tr>
<th>TAL Audit #</th>
<th>Program:</th>
<th>Requirements Document:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose:</td>
<td>Not entered</td>
<td>Company Auditing:</td>
</tr>
<tr>
<td>Date Audited:</td>
<td>Lead Auditor:</td>
<td></td>
</tr>
<tr>
<td>Date Report Received:</td>
<td>Response Due Date:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TAL Issue Number</th>
<th>Status:</th>
<th>Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Citation:</td>
<td>Lab Process:</td>
<td>Lab Section:</td>
</tr>
<tr>
<td>Client Issue #:</td>
<td>Type of Issue:</td>
<td>Method #:</td>
</tr>
</tbody>
</table>

**Finding Description:**

**Cause Analysis:**

**Corrective Action Plan:**

**Lab Responsible Party:**

**Planned Completion Date:**
<table>
<thead>
<tr>
<th>QC Activity (Individual Responsible for Initiation/Assessment)</th>
<th>Acceptance Criteria</th>
<th>Recommended Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Instrument Blank (Analyst, Data Reviewer)</td>
<td>Instrument response &lt; ½ RL (or method specific criteria).</td>
<td>- Prepare another blank. - If same response, determine cause of contamination: reagents, environment, instrument equipment failure, etc.</td>
</tr>
<tr>
<td>Initial Calibration Standards (Analyst, Data Reviewer)</td>
<td>Correlation coefficient &gt; 0.99 or method or program requirement. - % Recovery within acceptance range. - See details in Method SOP.</td>
<td>- Reanalyze standards. - If still unacceptable, remake standards and recalibrate instrument.</td>
</tr>
<tr>
<td>Independent Calibration Verification (Second Source) (Analyst, Data Reviewer)</td>
<td>- % Recovery within control limits as defined in Method SOPs.</td>
<td>- Remake and reanalyze standard. - If still unacceptable, then remake calibration standards or use new primary standards and recalibrate instrument.</td>
</tr>
<tr>
<td>Continuing Calibration Standards (Analyst, Data Reviewer)</td>
<td>% Recovery within control limits as defined in Method SOPs.</td>
<td>- Reanalyze standard. - If still unacceptable, then recalibrate and rerun affected samples.</td>
</tr>
<tr>
<td>Matrix Spike / Matrix Spike Duplicate (MS/MSD) (Analyst, Data Reviewer)</td>
<td>- % Recovery within limits documented in the LIMS.</td>
<td>- If the acceptance criteria for duplicates or matrix spikes are not met because of matrix interferences, the acceptance of the analytical batch is determined by the validity of the LCS. - If the LCS is within acceptable limits the batch is acceptable. - The results of the duplicates, matrix spikes and the LCS are reported with the data set. - For matrix spike or duplicate results outside criteria the data for that sample shall be reported with qualifiers.</td>
</tr>
<tr>
<td>Laboratory Control Sample (LCS) (Analyst, Data Reviewer)</td>
<td>- % Recovery within limits documented in the LIMS.</td>
<td>- Batch must be re-prepared and re-analyzed. This includes any allowable marginal exceedance. When not using marginal exceedances, the following exceptions apply: 1) when the acceptance criteria for the positive control are exceeded high (i.e., high bias) and there are associated samples that are non-detects, then those non-detects may be reported with data qualifying codes; 2) when the acceptance criteria for the positive control are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum</td>
</tr>
</tbody>
</table>

**NOTE:** The laboratory must eliminate lab error as the cause of the deviation.
<table>
<thead>
<tr>
<th>QC Activity (Individual Responsible for Initiation/Assessment)</th>
<th>Acceptance Criteria</th>
<th>Recommended Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surrogates (Analyst, Data Reviewer)</td>
<td>- % Recovery within limits of method or within three standard deviations of the historical mean as documented in the LIMS.</td>
<td>- Individual sample must be repeated. Place comment in LIMS. - Surrogate results outside criteria shall be reported with qualifiers.</td>
</tr>
<tr>
<td>Method Blank (MB) (Analyst, Data Reviewer)</td>
<td>&lt; ½ Reporting Limit</td>
<td>- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e., digest or extract) entire sample batch. Report blank results. - Qualify the result(s) if the concentration of a targeted analyte in the MB is at or above one-half the reporting limit AND is &gt; 1/10 of the amount measured in the sample. See SOP DV-QA-003P.</td>
</tr>
<tr>
<td>Proficiency Testing (PT) Samples (Department Manager(s) /Supervisor(s), QA Manager)</td>
<td>- Criteria supplied by PT Supplier.</td>
<td>- Any failures or warnings must be investigated for cause. Failures may result in the need to repeat a PT sample to show the problem is corrected.</td>
</tr>
<tr>
<td>Internal / External Audits (QA Manager, Department Manager(s) /Supervisor(s), Technical Manager, Laboratory Director)</td>
<td>- Defined in Quality System documentation such as SOPs, QAM, etc.</td>
<td>- Non-conformances must be investigated through CAR system and necessary corrections must be made.</td>
</tr>
<tr>
<td>Reporting / Calculation Errors (Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Technical Manager, Department Manager(s) /Supervisor(s), QA Manager, Corporate QA, Corporate Management)</td>
<td>- SOP CW-Q-S-005, Data Recalls</td>
<td>- Corrective action is determined by type of error. Follow the procedures in SOP CW-L-S-002 and SOP DV-QA-019P.</td>
</tr>
<tr>
<td>Client Complaints (Project Managers, Lab Director/Manager, Sales)</td>
<td>-[Issue specific]</td>
<td>- Corrective action is determined by the type of complaint. For example, a complaint regarding an incorrect address on a report will result in the</td>
</tr>
</tbody>
</table>
QC Activity (Individual Responsible for Initiation/Assessment) | Acceptance Criteria | Recommended Corrective Action
--- | --- | ---
and Marketing) | report being corrected and then follow-up must be performed on the reasons the address was incorrect (e.g., database needs to be updated). See SOP DV-QA-013P. |  
QA Monthly Report (QA Manager, Lab Director/Technical Manager) | - QAM, SOPs. | - Corrective action is determined by the type of issue. For example, CARs for the month are reviewed and possible trends are investigated.  
Health and Safety Violation (EHS Coordinator, Lab Director/Technical Manager, Department Manager(s)/Supervisor(s)) | - Environmental Health and Safety (EHS) Manual. | - Non-conformance is investigated and corrected through EHS procedures.  

Note:
1. Except as noted below for certain compounds, the method blank should be below one-half the reporting limit. Concentrations up to five times the reporting limit will be allowed for the ubiquitous laboratory and reagent contaminants: methylene chloride, acetone, 2-butanone, phthalates, sodium, zinc, and iron, provided they appear in similar levels in the reagent blank and samples. This allowance presumes that the reporting limit is significantly below any regulatory limit to which the data are to be compared and that blank subtraction will not occur.

SECTION 13. PREVENTIVE ACTION / IMPROVEMENT

13.1 Overview

The laboratory’s preventive action programs improve or eliminate potential causes of nonconforming product and/or nonconformance to the quality system. This preventive action process is a proactive and continuous process of improvement activities that can be initiated through feedback from clients, employees, business providers, and affiliates. The QA Department has the overall responsibility to ensure that the preventive action process is in place, and that relevant information on actions is submitted for management review.

Dedicating resources to an effective preventive action system emphasizes the laboratory’s commitment to its Quality Program. It is beneficial to identify and address negative trends before they develop into complaints, problems and corrective actions. Additionally, the laboratory continually strives to improve customer service and client satisfaction through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered through any of the following:

- review of the monthly QA Metrics Report,
- trending NCMs,
• review of control charts and QC results,
• trending proficiency testing (PT) results,
• performance of management system reviews,
• trending client complaints,
• review of processing operations, or
• staff observations.

The monthly Management Systems Metrics Report shows performance indicators in all areas of the laboratory and quality system. These areas include revised reports, corrective actions, audit findings, internal auditing and data authenticity audits, client complaints, PT samples, holding time violations, SOPs, ethics training, etc. The metrics report is reviewed monthly by laboratory management, Corporate QA and TestAmerica’s Executive Committee. These metrics are used to evaluate the management and quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

Items identified as continuous improvement opportunities to the management system may be issued as goals from the annual management systems review, recommendations from internal audits, white papers, Lesson Learned, Technical Services audit report, Technical Best Practices, or as Corporate or management initiatives.

The laboratory’s corrective action process is integral to implementation of preventive actions. A critical piece of the corrective action process is the implementation of actions to prevent further occurrence of a non-compliance event. Historical review of corrective action and non-conformances provides a valuable mechanism for identifying preventive action opportunities.

13.1.1 The following elements are part of a preventive action/process improvement system:

• **Identification** of an opportunity for preventive action or process improvement.
• **Identification of process** for the preventive action or improvement.
• **Definition of the measurements** to assess the effectiveness of the process once undertaken.
• **Execution** of the preventive action or improvement.
• **Evaluation** of the plan using the defined measurements.
• **Verification** of the effectiveness of the preventive action or improvement.
• **Documentation** of any permanent changes to the Quality System as a result of the Preventive Action or Process Improvement to close out the process. Documentation of Preventive Action/Process improvement is incorporated into the monthly QA reports, corrective action process and management review.

13.1.2 Any Preventive Actions/Process Improvement undertaken or attempted shall be taken into account during the annual Management Systems Review (Section 16). A highly detailed report is not required; however, a summary of successes and failures within the preventive action program is sufficient to provide management with a measurement for evaluation.
13.2 Management of Change

The Management of Change process is designed to manage significant events and changes that occur within the laboratory. Through these procedures, the potential risks inherent with a new event or change are identified and evaluated. The risks are minimized or eliminated through pre-planning and the development of preventive measures. The types of changes covered under this system include: Facility Changes, Major Accreditation Changes, Addition or Deletion to Laboratory’s Capabilities or Instrumentation, Key Personnel Changes, Laboratory Information Management System (LIMS) changes. This process is discussed in further detail in SOP DV-QA-028P, Management of Change.

SECTION 14. CONTROL OF RECORDS

The laboratory maintains a records management system appropriate to its needs and that complies with applicable standards or regulations as required. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the analytical report for a minimum of five years after it has been issued. Exceptions for programs with longer retention requirements are discussed in Section 14.1.2.

14.1 Overview

The laboratory has established procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. A record index is listed in Table 14-1. More detailed information on retention of specific records is provided in CW-L-P-001, Records Retention Policy and CW-L-WI-001, TestAmerica Records Retention/Storage Schedule. Quality records are maintained by the QA department in a database or electronic files that list the contents of archived data, which is backed up as part of the regular laboratory backup. Records are of two types; either electronic or hard copy paper formats depending on whether the record is computer or hand generated (some records may be in both formats). Technical records are maintained by the Department Manager/Supervisor or their designee.

Table 14-1. Record Index

<table>
<thead>
<tr>
<th>Record Types ¹</th>
<th>Retention Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Records</td>
<td>5 Years from analytical report issue*</td>
</tr>
<tr>
<td>- Raw Data</td>
<td></td>
</tr>
<tr>
<td>- Logbooks²</td>
<td></td>
</tr>
<tr>
<td>- Standards</td>
<td></td>
</tr>
<tr>
<td>- Certificates</td>
<td></td>
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<tr>
<td>- Analytical Records</td>
<td></td>
</tr>
<tr>
<td>- MDLs/IDLs/DOCs</td>
<td></td>
</tr>
<tr>
<td>- Lab Reports</td>
<td></td>
</tr>
<tr>
<td>Official Documents</td>
<td>Indefinitely</td>
</tr>
<tr>
<td>- Quality Assurance Manual (QAM)</td>
<td></td>
</tr>
<tr>
<td>- Work Instructions</td>
<td></td>
</tr>
<tr>
<td>- Policies</td>
<td></td>
</tr>
<tr>
<td>- SOPs</td>
<td></td>
</tr>
<tr>
<td>- Policy Memoranda</td>
<td></td>
</tr>
<tr>
<td>- Manuals</td>
<td></td>
</tr>
<tr>
<td>- Published Methods</td>
<td></td>
</tr>
</tbody>
</table>

¹ Differentiation between technical and official documents is maintained.

² Logbooks include notebooks (hardcopy).

*Minimum duration for quality records as required by regulation.
Table 14-1. Record Index¹

<table>
<thead>
<tr>
<th>Record Types ¹:</th>
<th>Retention Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>QA Records - Certifications - Method and Software Validation / Verification Data</td>
<td>Indefinitely</td>
</tr>
<tr>
<td>QA Records - Internal and External Audits/Responses - Corrective/Preventive Actions - Management Reviews - Data Investigation</td>
<td>5 Years from archival* Data Investigation: 5 years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)</td>
</tr>
<tr>
<td>Project Records - Sample Receipt and COC Documents - Contracts and Amendments - Correspondence - QAPP - SAP - Telephone Logbooks - Lab Reports</td>
<td>5 Years from analytical report issue*</td>
</tr>
<tr>
<td>Administrative Records - Financial and Business Operations - EH&amp;S Manual, Permits - Disposal Records - Employee Handbook - Personnel files, Employee Signature and Initials, Administrative Training Records (e.g., Ethics)</td>
<td>Refer to CW-L-WI-001</td>
</tr>
<tr>
<td>Administrative Records - Administrative Policies</td>
<td>Indefinitely</td>
</tr>
<tr>
<td>Administrative Records - Technical Training Records</td>
<td>7 years</td>
</tr>
<tr>
<td>Administrative Records - Legal Records</td>
<td>Indefinitely</td>
</tr>
<tr>
<td>Administrative Records - HR Records</td>
<td>Refer to CW-L-WI-001</td>
</tr>
<tr>
<td>Administrative Records - IT Records</td>
<td>Refer to CW-L-WI-001</td>
</tr>
<tr>
<td>Administrative Records - Corporate Governance Records</td>
<td>Refer to CW-L-WI-001</td>
</tr>
<tr>
<td>Administrative Records - Sales &amp; Marketing</td>
<td>5 years</td>
</tr>
<tr>
<td>Administrative Records - Real Estate</td>
<td>Indefinitely</td>
</tr>
</tbody>
</table>

¹ Record Types encompass hardcopy and electronic records.

² Examples of Logbook types: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature (hardcopy or electronic records).

* Exceptions listed in Table 14-2.

14.1.1 All records are stored and retained in such a way that they are secure and readily retrievable at the laboratory facility or the Iron Mountain data storage facility that provides a suitable environment to prevent damage or deterioration and to prevent loss. All records shall be protected against fire, theft, loss, environmental deterioration, and vermin. In the case of electronic records, electronic or magnetic sources, storage media are protected from deterioration caused by magnetic fields and/or electronic deterioration.

Access to the data is limited to laboratory and company employees and shall be documented with an access log. Records archived off-site are stored in a secure location where a record is maintained of any entry into the storage facility. Whether on-site or off-site storage is used, logs are maintained in each storage box to note removal and return of records. Records are
maintained for a minimum of five years unless otherwise specified by a client or regulatory requirement.

For raw data and project records, record retention shall be calculated from the date the project report is issued. For other records, such as Controlled Documents, QA, or Administrative Records, the retention time is calculated from the date the record is formally retired. Records related to the programs listed in Table 14-2 have lengthier retention requirements and are subject to the requirements in Section 14.1.3.

14.1.2 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 14-2 with their retention requirements. In these cases, the longer retention requirement is enacted. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data.

Table 14-2. Example: Special Record Retention Requirements

<table>
<thead>
<tr>
<th>Program</th>
<th>Retention Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking Water – All States</td>
<td>10 years (lab reports and raw data)</td>
</tr>
<tr>
<td></td>
<td>10 years - Radiochemistry (project records)</td>
</tr>
<tr>
<td>Drinking Water Lead and Copper Rule</td>
<td>12 years (project records)</td>
</tr>
<tr>
<td>Commonwealth of MA – All environmental data 310 CMR 42.14</td>
<td>10 years</td>
</tr>
<tr>
<td>FIFRA – 40 CFR Part 160</td>
<td>Retain for life of research or marketing permit for pesticides regulated by EPA</td>
</tr>
<tr>
<td>Housing and Urban Development (HUD) Environmental Lead Testing</td>
<td>10 years</td>
</tr>
<tr>
<td>Alaska</td>
<td>10 years</td>
</tr>
<tr>
<td>Louisiana – All</td>
<td>10 years</td>
</tr>
<tr>
<td>Michigan Department of Environmental Quality – all environmental data</td>
<td>10 years</td>
</tr>
<tr>
<td>Navy Facilities Engineering Service Center (NFESC)</td>
<td>10 years</td>
</tr>
<tr>
<td>Ohio VAP</td>
<td>10 years and State contacted prior to disposal</td>
</tr>
<tr>
<td>TSCA - 40 CFR Part 792</td>
<td>10 years after publication of final test rule or negotiated test agreement</td>
</tr>
<tr>
<td>OSHA</td>
<td>30 years</td>
</tr>
</tbody>
</table>

1Note: Extended retention requirements must be noted with the archive documents or addressed in facility-specific records retention procedures.

14.1.3 The laboratory has procedures to protect and back-up records stored electronically and to prevent unauthorized access to or amendment of these records. All analytical data are maintained as hard copy or in a secure readable electronic format. For analytical reports that are maintained as copies in PDF format, refer to Section 19.14.1 for more information. In addition, refer to SOP DV-QA-025P, Electronic Data Backup.
14.1.4 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data, as well as rapid recovery of historical data. (Records stored off site should be accessible within 2 days of a request for such records). The history of the sample from when the laboratory took possession of the samples must be readily understood through the documentation. This shall include inter-laboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, sample receipt, preparation, or testing. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the COC is maintained electronically with the project records. (Only the state of California requires the original COC be maintained.) The chain of custody would indicate the name of the sampler. If any sampling notes are provided with a work order, they are kept with the project record in the LIMS. All other documents are scanned and attached to the project record in the LIMS.

- All information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification are documented.

- The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes (e.g., set format for naming electronic files, set format for what is included with a given analytical data set per SOP DV-QA-0005, Document Archiving Procedure). Instrument data are stored sequentially by instrument. A given day’s analyses are maintained in the order of the analysis. Run logs are maintained for each instrument or method; a copy of each day’s run log or instrument sequence is stored with the data to aid in re-constructing an analytical sequence. Where an analysis is performed without an instrument, bound logbooks or electronic bench sheets are used to record and file data. Standard and reagent information is entered into the LIMS for each method as required.

- Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

- The reason for a signature or initials on a document is clearly indicated in the records such as “sampled by,” “prepared by,” “reviewed by”, or “analyzed by”.

- All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent dark ink.

- Hard copy data may be scanned into PDF format for record storage as long as the scanning process can be verified in order to ensure that no data are lost. The data files and storage media must be tested to verify the laboratory’s ability to retrieve the information prior to the destruction of the hard copy that was scanned.

- Also refer to Section 19.14.1 ‘Computer and Electronic Data Related Requirements’.

14.2 Technical and Analytical Records

14.2.1 The laboratory retains records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each analytical report issued, for a minimum of five years unless otherwise specified by a client or regulatory requirement. The records for each analysis shall contain sufficient information to enable the analysis to be repeated under conditions as close as possible to the original. The records shall include the identity of laboratory personnel responsible for the sampling, performance of each analysis and reviewing results.
14.2.2 Observations, data and calculations are recorded real-time and are identifiable to the specific task.

14.2.3 Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include:

- laboratory sample ID code;
- date of analysis; time of analysis is also required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., drying times, incubations, etc.); instrumental analyses have the date and time of analysis recorded as part of their general operations. Where a time critical step exists in an analysis, location for such a time is included as part of the documentation in a specific logbook, on a benchsheet or in the batch information in the LIMS.
- instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically described in Method SOPs.
- analysis type;
- all manual calculations and manual integrations;
- analyst's or operator's initials/signature;
- sample preparation including cleanup, separation protocols, incubation periods or subculture, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents;
- test results;
- standard and reagent origin, receipt, preparation, and use;
- calibration criteria, frequency and acceptance criteria;
- data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;
- quality control protocols and assessment;
- electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and
- method performance criteria including expected quality control requirements. These are indicated both in the LIMS and on specific analytical report formats.

14.2.4 All logbooks used during receipt, preparation, storage, analysis, and reporting of samples or monitoring of support equipment shall undergo a documented supervisory or peer review on a bi-monthly basis.

14.3 Laboratory Support Activities

In addition to documenting all the above-mentioned activities, the following are retained QA records and project records (previous discussions in this section relate where and how these data are stored):

- all original raw data, whether hard copy or electronic, for calibrations, samples and quality
control measures, including analysts’ work sheets and data output records (chromatograms, strip charts, and other instrument response readout records);

- a written description or reference to the specific test method used which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value;
- copies of final reports;
- archived SOPs;
- correspondence relating to laboratory activities for a specific project;
- all corrective action reports, audits and audit responses;
- proficiency test results and raw data; and
- results of data review, verification, and crosschecking procedures

14.3.1 Sample Handling Records

Records of all procedures to which a sample is subjected while in the possession of the laboratory are maintained. These include but are not limited to records pertaining to:

- sample preservation including appropriateness of sample container and compliance with holding time requirement;
- sample identification, receipt, acceptance or rejection and login;
- sample storage and tracking including shipping receipts, sample transmittal / COC forms; and
- procedures for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

14.4 Administrative Records

The laboratory also maintains the administrative records in either electronic or hard copy form. Refer to Table 14-1.

14.5 Records Management, Storage and Disposal

All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. Certification related records are available upon request.

All information necessary for the historical reconstruction of data is maintained by the laboratory. Records that are stored only on electronic media must be supported by the hardware and software necessary for their retrieval.

Records that are stored or generated by computers or personal computers have hard copy, write-protected backup copies, or an electronic audit trail controlling access.

The laboratory has a record management system (a.k.a., document control) for control of instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting. Logbooks are issued on a per instrument basis, and are numbered sequentially. All data are recorded sequentially within a series of sequential logbooks or directly in the LIMS.

Company Confidential and Proprietary
or on batch-specific bench sheets. Scanned copies of bench sheets are filed sequentially on the laboratory network or attached specifically to the batch in the LIMS. Standards are maintained in the LIMS – no logbooks are used to record that data. Records are considered archived when noted as such in the records management system (a.k.a., document control).

14.5.1 Transfer of Ownership

In the event that the laboratory transfers ownership or goes out of business, the laboratory shall ensure that the records are maintained or transferred according to client’s instructions. Upon ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed. In the event of the closure of the laboratory, all records will revert to the control of the corporate headquarters. Should the entire company cease to exist, as much notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

14.5.2 Records Disposal

Records are removed from the archive and destroyed after 5 years unless otherwise specified by a client or regulatory requirement. On a project specific or program basis, clients may need to be notified prior to record destruction. Records are destroyed in a manner that ensures their confidentiality such as shredding, mutilation or incineration. (Refer to Tables 14-1 and 14-2).

Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

If a third party records management company is hired to dispose of records, a “Certificate of Destruction” is required.

SECTION 15. AUDITS

15.1 Internal Audits

Internal audits are performed to verify that laboratory operations comply with the requirements of the lab’s quality system and with the external quality programs under which the laboratory operates. Audits are planned and organized by the QA staff. Personnel conducting the audits should be independent of the area being evaluated. Auditors will have sufficient authority, access to work areas, and organizational freedom necessary to observe all activities affecting quality and to report the assessments to laboratory management and, when requested, to corporate management.

Audits are conducted and documented as described in the TestAmerica Corporate SOP on Internal Auditing, SOP CW-Q-S-003. The types and frequency of routine internal audits are described in Table 15-1. Special or ad hoc assessments may be conducted as needed under the direction of the QA staff.
### Table 15-1. Types of Internal Audits and Frequency

<table>
<thead>
<tr>
<th>Description</th>
<th>Performed by</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Systems Audits</td>
<td>QA Department, QA approved designee, or Corporate QA</td>
<td>All areas of the laboratory annually</td>
</tr>
<tr>
<td>Method Audits</td>
<td>Joint responsibility:</td>
<td>QA Technical Audits Frequency: 50% of methods annually</td>
</tr>
<tr>
<td>QA Technical Audits</td>
<td>a) QA Manager or designee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Technical Manager or Designee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Refer to CW-Q-S-003)</td>
<td></td>
</tr>
<tr>
<td>SOP Method Compliance</td>
<td>Joint responsibility:</td>
<td>SOP Compliance Review Frequency: 100% of SOPs annually</td>
</tr>
<tr>
<td></td>
<td>a) QA Manager or designee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Technical Manager or Designee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Refer to CW-Q-S-003)</td>
<td></td>
</tr>
<tr>
<td>Special</td>
<td>QA Department or Designee</td>
<td>Surveillance or spot checks performed as needed, e.g., to confirm corrective actions from other audits.</td>
</tr>
<tr>
<td>Performance Testing</td>
<td>Analysts with QA oversight</td>
<td>Two successful per year for each TNI-field of testing or as dictated by regulatory requirements</td>
</tr>
</tbody>
</table>

#### 15.1.1 Annual Quality Systems Audit

An annual quality systems audit is required to ensure compliance to analytical methods and SOPs, TestAmerica’s Data Integrity and Ethics Policies, TNI quality systems, client and state requirements, and the effectiveness of the internal controls of the analytical process, including but not limited to data review, quality controls, preventive action and corrective action. The completeness of earlier corrective actions is assessed for effectiveness and sustainability. The audit is divided into sections for each operating or support area of the lab, and the audit is comprehensive for a given area. The audits may be performed on a rotating schedule throughout the year to ensure adequate coverage of all areas. This schedule may change as situations in the laboratory warrant.

#### 15.1.2 QA Technical Audits

QA technical audits assess data authenticity and analyst integrity. These audits are based on client projects, associated sample delivery groups, and the methods performed. Reported results are compared to raw data to verify the authenticity of results. The validity of calibrations and QC results are compared to data qualifiers, footnotes, and case narratives. Documentation is assessed by examining run logs and records of manual integrations. Manual calculations are checked. Where possible, electronic audit miner programs (e.g., Chrom AuditMiner) are used to identify unusual manipulations of the data deserving closer scrutiny. QA technical audits will include all methods within a two-year period.

#### 15.1.3 SOP Method Compliance

Compliance of all SOPs with the source methods and compliance of the operational groups with
the SOPs will be assessed by the Technical Manager or qualified designee at least annually. It is also recommended that the work of each newly hired analyst is assessed within 3 months of working independently, (e.g., completion of method IDOC). In addition, as analysts add methods to their capabilities, (new IDOC) reviews of the analyst work products will be performed within 3 months of completing the documented training.

15.1.4 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, PT results, data audits, system audits, validation comments, regulatory audits or suspected ethical improprieties. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

15.1.5 Performance Testing

The laboratory participates semi-annually in performance audits conducted through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: Nonpotable Water (WP), Soil, and Underground Storage Tank (UST).

It is TestAmerica’s policy that PT samples be treated as typical samples in the production process. Furthermore, where PT samples present special or unique problems, in the regular production process they may need to be treated differently, as would any special or unique request submitted by any client. The QA Manager must be consulted and in agreement with any decisions made to treat a PT sample differently due to some special circumstance.

Written responses to unacceptable PT results are required. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

15.2 External Audits

External audits are performed when certifying agencies or clients conduct on-site inspections or submit performance testing samples for analysis. It is TestAmerica’s policy to cooperate fully with regulatory authorities and clients. The laboratory makes every effort to provide the auditors with access to personnel, documentation, and assistance. Laboratory supervisors are responsible for providing corrective actions to the QA Manager who coordinates the response for any deficiencies discovered during an external audit. Audit responses are due in the time allotted by the client or agency performing the audit. When requested, a copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

The laboratory cooperates with clients and their representatives to monitor the laboratory’s performance in relation to work performed for the client. The client may only view data and systems related directly to the client’s work. All efforts are made to keep other client information confidential.

15.2.1 Confidential Business Information (CBI) Considerations

During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as “a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment.” When
information is claimed as business confidential, the laboratory must place on (or attach to) the information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend or other suitable form of notice, employing language such as “trade secret”, “proprietary” or “company confidential”. Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may not be obscured from the information. Additional information regarding CBI can be found in the 2009 TNI standards.

15.3 Audit Findings

Audit findings are documented using the corrective action process and database. The laboratory’s corrective action responses for both types of audits may include action plans that could not be completed within a predefined timeframe. In these instances, a completion date must be set and agreed to by operations management and the QA Manager.

Developing and implementing corrective actions to findings is the responsibility of the Department Manager/Supervisor where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report. When requested, a copy of the audit report and the laboratory’s corrective action plan will be forwarded to Corporate Quality.

If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory’s test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

Clients must be notified promptly in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any test report or amendment to a test report. The investigation must begin within 24-hours of discovery of the problem and all efforts are made to notify the client within two weeks after the completion of the investigation.

SECTION 16. MANAGEMENT REVIEWS

16.1 Quality Assurance Report

A comprehensive QA Report shall be prepared each month by the laboratory’s QA Department and forwarded to the Laboratory Director, their Quality Director as well as the VPO. All aspects of the QA system are reviewed to evaluate the suitability of policies and procedures. During the course of the year, the Laboratory Director, VPO or Corporate QA may request that additional information be added to the report.

On a monthly basis, Corporate QA compiles information from all the monthly laboratory reports. The Corporate Quality Directors prepare a report that includes a compilation of all metrics and notable information and concerns regarding the QA programs within the laboratories. The report also includes a listing of new regulations that may potentially impact the laboratories. This report is presented to the Senior Management Team and VPs of Operations.
16.2 **Annual Management Review**

The senior lab management team (Laboratory Director, Technical Manager, and QA Manager) conducts a review annually of its quality systems and LIMS to ensure its continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. It will also provide a platform for defining goals, objectives and action items that feed into the laboratory planning system. Corporate Operations and Corporate QA personnel are included in this meeting at the discretion of the Laboratory Director. The LIMS review consists of examining any audits, complaints or concerns that have been raised through the year that are related to the LIMS. The laboratory will summarize any critical findings that cannot be solved by the lab and report them to Corporate IT.

This management systems review (Corporate SOP CW-Q-S-004 and Work Instruction CW-Q-WI-003) uses information generated during the preceding year to assess the “big picture” by ensuring that routine actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review should keep the quality systems current and effective, therefore, the annual review is a formal senior management process to review specific existing documentation. Significant issues from the following documentation are compiled or summarized by the QA Manager prior to the review meeting:

- Matters arising from the previous annual review.
- Prior Monthly QA Reports issues.
- Laboratory QA Metrics.
- Review of report reissue requests.
- Review of client feedback and complaints.
- Issues arising from any prior management or staff meetings.
- Minutes from prior senior lab management meetings. Issues that may be raised from these meetings include:
  - Adequacy of staff, equipment and facility resources.
  - Adequacy of policies and procedures.
  - Future plans for resources and testing capability and capacity.
- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data integrity.
- Review radiation safety practices:
  - Radiation health and safety
  - Radioactive hazardous waste management
  - Radioactive materials management

A report is generated by the QA Manager and management. The report is distributed to the appropriate VPO and the Quality Director. The report includes, but is not limited to:

- The date of the review and the names and titles of participants.
- A reference to the existing data quality related documents and topics that were reviewed.
• Quality system or operational changes or improvements that will be made as a result of the review [e.g., an implementation schedule including assigned responsibilities for the changes (Action Table)].

Changes to the quality systems requiring update to the laboratory QA Manual shall be included in the next revision of the QA Manual.

16.3 Potential Integrity Related Managerial Reviews

Potential integrity issues (data or business related) must be handled and reviewed in a confidential manner until such time as a follow-up evaluation, full investigation, or other appropriate actions have been completed and issues clarified. TestAmerica’s Corporate Internal Investigation SOP shall be followed (SOP CW-L-S-002). All investigations that result in finding of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

TestAmerica’s President and CEO, COO, VP of Client Services, VPs of Operations and Quality Directors receive a monthly report from the VP-QA/EHS summarizing any current data integrity or data recall investigations. The VPs of Operations are also made aware of progress on these issues for their specific labs.

SECTION 17. PERSONNEL

17.1 Overview

The laboratory’s management believes that its highly qualified and professional staff is the single most important aspect in assuring a high level of data quality and service. The staff consists of professionals and support personnel as outlined in the organization chart in Figure 4-1.

All personnel must demonstrate competence in the areas where they have responsibility. Any staff that is undergoing training shall have appropriate supervision until they have demonstrated their ability to perform their job function on their own. Staff shall be qualified for their tasks based on appropriate education, training, experience and/or demonstrated skills as required.

The laboratory employs sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned responsibilities.

All personnel are responsible for complying with all QA/QC requirements that pertain to the laboratory and their area of responsibility. Each staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular area of responsibility. Technical staff must also have a general knowledge of lab operations, test methods, QA/QC procedures and records management.

Laboratory management is responsible for formulating goals for lab staff with respect to education, training and skills and ensuring that the laboratory has a policy and procedures for identifying training needs and providing training of personnel. The training shall be relevant to the present and anticipated responsibilities of the lab staff.

The laboratory only uses personnel that are employed by or under contract to, the laboratory. Contracted personnel, when used, must meet competency standards of the laboratory and work in accordance to the laboratory’s quality system.
17.2 Education and Experience Requirements for Technical Personnel

The laboratory makes every effort to hire analytical staffs that possess a college degree (AA, BA, or BS) in an applied science with some chemistry in the curriculum. Exceptions can be made based upon the individual’s experience and ability to learn. Selection of qualified candidates for laboratory employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Minimum education and training requirements for TestAmerica employees are outlined in job descriptions and are generally summarized for analytical staff in the table below.

The laboratory maintains job descriptions for all personnel who manage, perform or verify work affecting the quality of the environmental testing the laboratory performs. Job Descriptions are located on the TestAmerica intranet site’s Human Resources web-page (Also see Section 4 for position descriptions/responsibilities).

Experience and specialized training are occasionally accepted in lieu of a college degree (basic lab skills such as using a balance, colony counting, aseptic or quantitation techniques, etc., are also considered).

As a general rule for analytical staff:

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Education</th>
<th>Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extractions, Digestions, some electrode methods (pH, DO, Redox, etc.), or Titrmetric and Gravimetric Analyses</td>
<td>H.S. Diploma</td>
<td>On the job training (OJT)</td>
</tr>
<tr>
<td>GFAA, CVAA, Single component or short list Chromatography (e.g., Fuels, BTEX-GC, IC</td>
<td>A college degree in an applied science or 2 years of college and at least 1 year of college chemistry</td>
<td>or 2 years prior analytical experience is required</td>
</tr>
<tr>
<td>ICP, ICPMS, Long List or complex chromatography (e.g., Pesticides, PCB, Herbicides, HPLC, etc.), GCMS</td>
<td>A college degree in an applied science or 2 years of college chemistry</td>
<td>or 5 years of prior analytical experience</td>
</tr>
<tr>
<td>Spectral Interpretation</td>
<td>A college degree in an applied science or 2 years of college chemistry</td>
<td>and 2 years relevant experience or 5 years of prior analytical experience</td>
</tr>
<tr>
<td>Department Managers/Supervisors – General</td>
<td>Bachelor’s Degree in an applied science or engineering with 24 semester hours in chemistry</td>
<td>and 2 years experience in environmental analysis of representative analytes for which they will oversee</td>
</tr>
<tr>
<td></td>
<td>An advanced (MS, PhD.) degree may substitute for one year of experience</td>
<td></td>
</tr>
<tr>
<td>Specialty</td>
<td>Education</td>
<td>Experience</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Department Managers/Supervisors – Wet Chem</td>
<td>Associates degree in an applied science or</td>
<td>and 2 years relevant</td>
</tr>
<tr>
<td>only (no advanced instrumentation)</td>
<td>engineering or 2 years of college with</td>
<td>experience</td>
</tr>
<tr>
<td></td>
<td>16 semester hours in chemistry</td>
<td></td>
</tr>
</tbody>
</table>

When an analyst does not meet these requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Department Manager/Supervisor, and are considered an analyst in training. The person supervising an analyst in training is accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

17.3 Training

The laboratory is committed to furthering the professional and technical development of employees at all levels.

Orientation to the laboratory’s policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. Below are examples of various areas of required employee training:

<table>
<thead>
<tr>
<th>Required Training</th>
<th>Time Frame</th>
<th>Employee Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Health and Safety</td>
<td>Prior to lab work</td>
<td>All</td>
</tr>
<tr>
<td>Ethics – New Hires</td>
<td>1 week of hire</td>
<td>All</td>
</tr>
<tr>
<td>Ethics – Comprehensive</td>
<td>90 days of hire</td>
<td>All</td>
</tr>
<tr>
<td>Data Integrity</td>
<td>30 days of hire</td>
<td>Technical and PMs</td>
</tr>
<tr>
<td>Quality Assurance</td>
<td>90 days of hire</td>
<td>All</td>
</tr>
<tr>
<td>Radiation Safety</td>
<td>30 days of hire</td>
<td>All</td>
</tr>
<tr>
<td>Ethics – Comprehensive Refresher</td>
<td>Annually</td>
<td>All</td>
</tr>
<tr>
<td>Initial Demonstration of Capability</td>
<td>Prior to unsupervised method performance</td>
<td>Technical</td>
</tr>
<tr>
<td>(DOC)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The laboratory maintains records of relevant authorization/competence, education, professional qualifications, training, skills and experience of technical personnel (including contracted personnel) as well as the date that approval/authorization was given. These records are kept on file at the laboratory. Also refer to “Demonstration of Capability” in Section 19.

The training of technical staff is kept up to date by:

- Documentation in each employee’s training file that they have read, understood and agreed to follow the most recent version of the laboratory QA Manual and SOPs in their area of responsibility. This documentation is updated as SOPs are updated.
- Documentation from any training courses or workshops on specific equipment, analytical techniques or other relevant topics are maintained in their training file.
- Documentation of proficiency (refer to Section 19).
Evidence of annual ethics training and an Ethics Agreement signed by each staff member (renewed each year).

A Confidentiality Agreement signed by each staff member signed at the time of employment.

Documentation and attestation forms on employment status and records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics violations), maintained by Human Resources in the employee’s secured personnel file.

Evidence of successful training could include such items as:

- Adequate documentation of training within operational areas, including one-on-one technical training for individual technologies, and particularly for people cross-trained.
- Analysts' knowledge to refer to QA Manual for quality issues.
- Analysts following SOPs, i.e., practice matches SOPs.
- Analysts regularly communicate to supervisors and QA if SOPs need revision, rather than waiting for auditors to find problems.

Further details of the laboratory's training program are described in SOPs DV-QA-0024, Training and DV-QA-0037, New Employee and On-going Training.

17.4 Data Integrity and Ethics Training Program

Establishing and maintaining a high ethical standard is an important element of a Quality System. Ethics and data integrity training is integral to the success of TestAmerica and is provided for each employee at TestAmerica. It is a formal part of the initial employee orientation within 1 week of hire followed by technical data integrity training within 30 days, comprehensive training within 90 days, and an annual refresher for all employees. Senior management at each facility performs the ethics training for their staff.

In order to ensure that all personnel understand the importance TestAmerica places on maintaining high ethical standards at all times; TestAmerica has established a Corporate Ethics Policy (Policy CW-L-P-004) and an Ethics Statement. All initial and annual training is documented by signature on the signed Ethics Statement demonstrating that the employee has participated in the training and understands their obligations related to ethical behavior and data integrity.

Violations of this Ethics Policy will not be tolerated. Employees who violate this policy will be subject to disciplinary actions up to and including termination. Criminal violations may also be referred to the Government for prosecution. In addition, such actions could jeopardize TestAmerica's ability to do work on government contracts, and for that reason, TestAmerica has a Zero Tolerance approach to such violations.

Employees are trained as to the legal and environmental repercussions that result from data misrepresentation. Key topics covered in the presentation include:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting.
- Ethics Policy
- How and when to report ethical/data integrity issues. Confidential reporting.
• Record keeping.
• Discussion regarding data integrity procedures.
• Specific examples of breaches of ethical behavior (e.g., peak shaving, altering data or computer clocks, improper macros, etc., accepting/offering kickbacks, illegal accounting practices, unfair competition/collusion)
• Internal monitoring, investigations and data recalls.
• Consequences for infractions including potential for immediate termination, debarment, or criminal prosecution.
• Importance of proper written narration / data qualification by the analyst and project manager with respect to those cases where the data may still be usable but are in one sense or another partially deficient.

Additionally, a data integrity hotline (1-800-736-9407) is maintained by TestAmerica and administered by the Corporate Quality Department.

SECTION 18. ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS

18.1 Overview

The laboratory is a 54,000 ft\(^2\) secure laboratory facility with controlled access and designed to accommodate an efficient workflow and to provide a safe and comfortable work environment for employees. All visitors sign in and are escorted by laboratory personnel. Access is controlled by various measures.

The laboratory is equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. The laboratory provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, etc., OSHA and other regulatory agency guidelines regarding required amounts of bench and fume hood space, lighting, ventilation (temperature and humidity controlled), access, and safety equipment are met or exceeded.

Traffic flow through sample preparation and analysis areas is minimized to reduce the likelihood of contamination. Adequate floor space and bench top area is provided to allow unencumbered sample preparation and analysis space. Sufficient space is also provided for storage of reagents and media, glassware, and portable equipment. Ample space is also provided for refrigerated sample storage before analysis and archival storage of samples after analysis. Laboratory HVAC and deionized water systems are designed to minimize potential trace contaminants.

The laboratory is separated into specific areas for sample receiving, sample preparation, organic sample analysis, inorganic sample analysis, and administrative functions.

18.2 Environment

Laboratory accommodation, test areas, energy sources, and lighting are adequate to facilitate proper performance of tests. The facility is equipped with heating, ventilation, and air conditioning (HVAC) systems appropriate to the needs of environmental testing performed at this laboratory.
The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of any measurements.

The laboratory provides for the effective monitoring, control and recording of environmental conditions that may affect the results of environmental tests as required by the relevant specifications, methods, and procedures. Such environmental conditions include humidity, voltage, temperature, and vibration levels in the laboratory.

When any of the method or regulatory required environmental conditions change to a point where they may adversely affect test results, analytical testing will be discontinued until the environmental conditions are returned to the required levels.

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

18.3 Work Areas

There is effective separation between neighboring areas when the activities therein are incompatible with each other such as:

- Volatile organic chemical handling areas, including sample preparation and waste disposal, and volatile organic chemical analysis areas.

Access to and use of all areas affecting the quality of analytical testing is defined and controlled by secure access to the laboratory building as described below in the Building Security section.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality. These measures include regular cleaning to control dirt and dust within the laboratory. Work areas are available to ensure an unencumbered work area. Work areas include:

- Access and entryways to the laboratory.
- Sample receipt areas.
- Sample storage areas.
- Chemical and waste storage areas.
- Data handling and storage areas.
- Sample processing areas.
- Sample analysis areas.

18.4 Floor Plan

A floor plan can be found in Appendix 1.

18.5 Building Security

Building keys and alarm codes are distributed to employees as necessary.

Visitors to the laboratory sign in and out in a visitor's logbook. A visitor is defined as any person who visits the laboratory who is not an employee of the laboratory. In addition to signing into
the laboratory, the Environmental, Health and Safety Manual contains requirements for visitors and vendors. There are specific safety forms that must be reviewed and signed. Visitors (with the exception of company employees) are escorted by laboratory personnel at all times. Contractors may work in the building without an escort at all times as long as his/her location is noted in the visitor’s logbook.

SECTION 19. TEST METHODS AND METHOD VALIDATION

19.1 Overview

The laboratory uses methods that are appropriate to meet clients’ requirements and that are within the scope of the laboratory’s capabilities. These include sampling, handling, transport, storage and preparation of samples, and, where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of environmental data.

Instructions are available in the laboratory for the operation of equipment as well as for the handling and preparation of samples. All instructions, Standard Operating Procedures (SOPs), reference methods and manuals relevant to the working of the laboratory are readily available to all staff. Deviations from published methods are documented (with justification) in the laboratory’s approved SOPs. SOPs are submitted to clients for review at their request. Significant deviations from published methods require client approval and regulatory approval where applicable.

19.2 Standard Operating Procedures (SOPS)

The laboratory maintains SOPs that accurately reflect all phases of the laboratory such as assessing data integrity, corrective actions, handling customer complaints as well as all analytical methods and sampling procedures. The method SOPs are derived from the most recently promulgated/approved, published methods and are specifically adapted to the laboratory facility. Modifications or clarifications to published methods are clearly noted in the SOPs. All SOPs are controlled in the laboratory.

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for writing an SOP are incorporated by reference to TestAmerica’s Corporate SOP entitled Writing a Standard Operating Procedure, CW-Q-S-002 and are detailed in the laboratory’s SOP DV-QA-001P.
- SOPs are reviewed at a minimum of every year, and where necessary, revised to ensure continuing suitability and compliance with applicable requirements.

19.3 Laboratory Methods Manual

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP.

Note: If more stringent standards or requirements are included in a mandated test method or regulation than those specified in this manual, the laboratory shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed. Any exceptions or deviations from the referenced methods or regulations are noted in the specific analytical SOP.
The laboratory maintains an SOP Index for both technical and non-technical SOPs. Technical SOPs are maintained to describe a specific test method. Non-technical SOPs are maintained to describe functions and processes not related to a specific test method.

19.4 **Selection of Methods**

Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized. Once client methodology requirements are established, this and other pertinent information is summarized by the Project Manager. These mechanisms ensure that the proper analytical methods are applied when the samples arrive for log-in. For non-routine analytical services (e.g., special matrices, non-routine compound lists), the method of choice is selected based on client needs and available technology. The methods selected should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required precision and accuracy.

19.4.1 **Sources of Methods**

Routine analytical services are performed using standard EPA-approved methodology. In some cases, modification of standard approved methods may be necessary to provide accurate analyses of particularly complex matrices. When the use of specific methods for sample analysis is mandated through project or regulatory requirements, only those methods shall be used.

When clients do not specify the method to be used or methods are not required, the methods used will be clearly validated and documented in an SOP and available to clients and/or the end user of the data.

The analytical methods used by the laboratory are those currently accepted and approved by the U. S. EPA and the state or territory from which the samples were collected. Reference methods include:

- *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures; 40CFR Part 136 as amended by Method Update Rule; May 18, 2012*
- *Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100, August 1993.*
- *Technical Notes on Drinking Water Methods, EPA-600/R94-173, October 1994*
September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008; Final Update V, August 2015.

- **Code of Federal Regulations (CFR) 40**, Parts 136, 141, 172, 173, 178, 179 and 261
- **RSK SOP-175** Revision 0, R.S. Kerr Environmental Research Laboratory; August 11, 1994.
- **Alaska Method AK102**, “For the Determination of Diesel Range Organics”, Version 04/08/02.
- **Alaska Method AK103**, “For the Determination of Residual Range Organics”, Version 04/08/02.
- **Kansas Method for the Determination of Low-range Hydrocarbons (LRH)**, Kansas Department of Health and Environment, Office of Laboratory Services and Bureau of Environmental Remediation, Revision 1.0, Nov. 2015.
- **Kansas Method for the Determination of Mid-Range Hydrocarbons (MRH) and High-Range Hydrocarbons (HRH)**, Revision 1.0, Kansas Department of Health and Environment, Nov 2015.
- **Methods 8020/8015 (modified) Gasoline Range Organics (GRO)**, Oklahoma Department of Environmental Quality Revision 4.0, 02/24/96.
- **Methods 8000/8100 (modified) Diesel Range Organics (DRO)**, Oklahoma Department of Environmental Quality, October 22, 1997, Rev. 4.1.

The laboratory reviews updated versions to all the aforementioned references for adaptation based upon capabilities, instrumentation, etc., and implements them as appropriate. As such, the laboratory strives to perform only the latest versions of each approved method as regulations allow or require.

Other reference procedures for non-routine analyses may include methods established by specific states (e.g., Underground Storage Tank methods), ASTM or equipment manufacturers. Sample type, source, and the governing regulatory agency requiring the analysis will determine the method utilized.

The laboratory shall inform the client when a method proposed by the client may be inappropriate or out of date. After the client has been informed, and they wish to proceed contrary to the laboratory’s recommendation, it will be documented.

### 19.4.2 Demonstration of Capability

Before the laboratory may institute a new method and begin reporting results, the laboratory shall confirm that it can properly operate the method. In general, this demonstration does not test the performance of the method in real world samples, but in an applicable and available
clean matrix sample. If the method is for the testing of analytes that are not conducive to spiking, demonstration of capability may be performed on quality control samples.

A demonstration of capability (DOC), is performed whenever there is a change in instrument type (e.g., new instrumentation), matrix, method or personnel (e.g., analyst hasn’t performed the test within the last twelve months) as described in SOP DV-QA-0024, *Training*.

**Note:** The laboratory shall have a DOC for all analytes included in the methods that the laboratory performs, and proficiency DOCs for each analyst shall include all analytes that the laboratory routinely performs. Addition of non-routine analytes does not require new DOCs for all analysts if those analysts are already qualified for routine analytes tested using identical chemistry and instrument conditions.

The initial demonstration of capability must be thoroughly documented and approved by the Department Manager/Supervisor and QA Manager prior to independently analyzing client samples. All associated documentation must be retained in accordance with the laboratories archiving procedures.

The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct an MDL study (when applicable). There may be other requirements as stated within the published method or regulations (i.e., retention time window study).

**Note:** In some instances, a situation may arise where a client requests that an unusual analyte be reported using a method where this analyte is not normally reported. If the analyte is being reported for regulatory purposes, the method must meet all procedures outlined within this QA Manual (SOP, MDL, and Demonstration of Capability). If the client states that the information is not for regulatory purposes, the result may be reported as long as the following criteria are met:

- The instrument is calibrated for the analyte to be reported using the criteria for the method and ICV/CCV criteria are met (unless an ICV/CCV is not required by the method or criteria are per project DQOs).
- The laboratory’s nominal or default reporting limit (RL) is equal to the quantitation limit (QL), must be at or above the lowest non-zero standard in the calibration curve and must be reliably determined. Project RLs are client specified reporting levels which may be higher than the QL. Results reported below the QL must be qualified as estimated values. Also see Section 19.6.1.3, Relationship of Limit of Detection (LOD) to Quantitation Limit (QL).
- The client request is documented and the lab informs the client of its procedure for working with unusual compounds. The final report must be footnoted: *Reporting Limit based on the low standard of the calibration curve* and the case narrative must include a statement that the results for this analyte are not for compliance purposes.

### 19.4.3 Initial Demonstration of Capability (IDOC) Procedures

**19.4.3.1** Refer to SOP DV-QA-0024, *Training*.

**Note:** Results of successive LCS analyses can be used to fulfill the DOC requirement.
A certification statement (refer to Figure 19-1) shall be used to document the completion of each initial demonstration of capability. A copy of the certification is archived in the analyst’s training folder.

19.5 Laboratory Developed Methods and Non-Standard Methods

Any new method developed by the laboratory must be fully defined in an SOP and validated by qualified personnel with adequate resources to perform the method. Method specifications and the relation to client requirements must be clearly conveyed to the client if the method is a non-standard method (not a published or routinely accepted method). The client must also be in agreement to the use of the non-standard method.

19.6 Validation of Methods

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

All non-standard methods, laboratory designed/developed methods, standard methods used outside of their scope, and major modifications to published methods must be validated to confirm they are fit for their intended use. The validation will be as extensive as necessary to meet the needs of the given application. The results are documented with the validation procedure used and contain a statement as to the fitness for use.

19.6.1 Method Validation and Verification Activities for All New Methods

While method validation can take various courses, the following activities can be required as part of method validation. Method validation records are designated QC records and are archived accordingly.

19.6.1.1 Determination of Method Selectivity

Method selectivity is the demonstrated ability to discriminate the analyte(s) of interest from other compounds in the specific matrix or matrices from other analytes or interference. In some cases to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

19.6.1.2 Determination of Method Sensitivity

Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set of samples. Where estimations and/or demonstrations of sensitivity are required by regulation or client agreement, such as the procedure in 40 CFR Part 136 Appendix B, under the Clean Water Act, these shall be followed.

19.6.1.3 Relationship of Limit of Detection (LOD) to the Quantitation Limit (QL)

An important characteristic of expression of sensitivity is the difference in the LOD and the QL. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The QL is the minimum concentration of analyte that can be quantitatively determined with acceptable precision and bias. For most instrumental measurement systems, there is a region where semi-quantitative data are generated around the LOD (both above and below the estimated MDL or LOD) and below the QL. In this region, detection of an analyte may be
confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the QL, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be estimated. If data are to be reported in this region, it must be done with a qualification that denotes the semi-quantitative nature of the result.

19.6.1.4 Determination of Interferences

A determination that the method is free from interferences in a blank matrix is performed.

19.6.1.5 Determination of Range

Where appropriate to the method, the quantitation range is determined by comparison of the response of an analyte in a curve to established or targeted criteria. Generally the upper quantitation limit is defined by highest acceptable calibration concentration. The lower quantitation limit or QL cannot be lower than the lowest non-zero calibration level, and may be constrained by required levels of bias and precision.

19.6.1.6 Determination of Accuracy and Precision

Accuracy and precision studies are generally performed using replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

19.6.1.7 Documentation of Method

The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, describing the specific differences in the new method in a revision of the existing SOP is acceptable in place of a separate SOP.

19.6.1.8 Continued Demonstration of Method Performance

Continued demonstration of Method Performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as LCS, method blanks and periodic PT samples.

19.7 Method Detection Limits (MDL) / Limits of Detection (LOD)

Method detection limits (MDL) are initially determined in accordance with 40 CFR Part 136, Appendix B or alternatively by other technically acceptable practices that have been accepted by regulators. MDL is also sometimes referred to as Limit of Detection (LOD). The MDL theoretically represents the concentration level for each analyte within a method at which the Analyst is 99% confident that the true value can be differentiated from blanks. The MDL is determined for each analyte initially during the method validation process and updated as required in the analytical methods, whenever there is a significant change in the procedure or equipment, or based on project specific requirements. Generally, the analyst prepares at least seven replicates of solution spiked at one to five times the estimated method detection limit (most often at the lowest standard in the calibration curve) into the applicable matrix with all the analytes of interest. Each of these aliquots is extracted (including any applicable clean-up procedures) and
analyzed in the same manner as the samples. Where possible, the seven replicates should be analyzed over 2-4 days to provide a more realistic MDL. To allow for some flexibility, this low level sample may be analyzed every batch or every week or some other frequency rather than doing the study all at once. In addition, a larger number of data points may be used if the appropriate t-value multiplier is used.

Refer to the Corporate SOP CA-Q-S-006, Detection Limits and the laboratory’s SOP DV-QA-005P, Determination of Method Detection Limits for details on the laboratory’s MDL process.

NOTE: The LOD referenced above is the Limit of Detection per the TNI definition, equivalent to the MDL. The LOD in the DoD/DOE QSM is the spike level at which the method detection limit is verified. The latter LOD is 2-4 times the MDL (i.e., 2-4x the TNI LOD).

19.8 Instrument Detection Limits (IDL)

The IDL is sometimes used to assess the reasonableness of the MDLs or in some cases required by the analytical method or program requirements. IDLs are most often used in metals analyses but may be useful in demonstration of instrument performance in other areas.

IDLs are calculated to determine an instrument’s sensitivity independent of any preparation method. IDLs are calculated either using seven replicate spike analyses, like the MDL but without sample preparation, or by the analysis of ten instrument blanks and calculating three times the absolute value of the standard deviation.

If the IDL is greater than the MDL, it may be used as the reported MDL.

19.9 Verification of Detection and Reporting Limits

Once the MDL is determined, it must be verified on each instrument used for the given method. TestAmerica defines the DoD/DOE QSM Detection Limit (DL) as being equal to the MDL. TestAmerica also defines the DoD/DOE QSM Limit of Detection (LOD) as being equal to the lowest concentration standard that successfully verifies the MDL, also referred to as the MDLV standard. MDL and MDLV standards are extracted/digested and analyzed through the entire analytical process. The MDL and MDLV determinations do not apply to methods that are not readily spiked (e.g., pH, turbidity, etc.) or where the lab does not report to the MDL. If the MDLV standard is not successful, then the laboratory will redevelop their MDL or perform and pass two consecutive MDLVs at a higher concentration and set the LOD at the higher concentration. Initial and quarterly verification is required for all methods listed in the laboratory’s DoD ELAP Scope of Accreditation. For methods that are not listed in this Scope of Accreditation, annual verification is performed. If an analyte is not on the laboratory’s DoD ELAP accreditation, the MDL must be verified annually. Refer to the laboratory SOP DV-QA-005P, Determination of Method Detection Limits for further details.

The laboratory quantitation limit is equivalent to the DoD/DOE Limit of Quantitation (LOQ), which is at a concentration equal to or greater than the lowest non-zero calibration standard. The DoD/DOE QSM requires the laboratory to perform an initial characterization of the bias and precision at the LOQ and quarterly LOQ verifications thereafter. If the quarterly verification results are not consistent with three-standard deviation confidence limits established initially, then the bias and precision will be reevaluated and clients contacted for any ongoing projects. For DoD/DOE projects, TestAmerica makes a distinction between the Reporting Limit (RL) and the LOQ unless the client has requested other reporting formats. The RL is a level at or above
the LOQ that is used for specific project reporting purposes, as agreed to between the laboratory and the client. The RL cannot be lower than the LOQ concentration, but may be higher. If an analyte is not on the laboratory’s DoD ELAP accreditation the LOQ must be verified at least annually unless an annual MDL verification is performed.

19.10 **Retention Time Windows**

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis each analyte will have a specific time of elution from the column to the detector. This is known as the analyte’s retention time. The variance in the expected time of elution is defined as the retention time window. As the key to analyte identification in chromatography, retention time windows must be established on every column for every analyte used for that method. These records are kept with the files associated with an instrument for later quantitation of the analytes. Complete details are available in the laboratory SOPs.

19.11 **Evaluation of Selectivity**

The laboratory evaluates selectivity by following the checks within the applicable analytical methods, which include mass spectral tuning, second column confirmation, ICP interelement interference checks, chromatography retention time windows, sample blanks, spectrochemical, atomic absorption or fluorescence profiles, co-precipitation evaluations and specific electrode response factors.

19.12 **Estimation of Uncertainty of Measurement**

19.12.1 Uncertainty is “a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand” (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1). Knowledge of the uncertainty of a measurement provides additional confidence in a result’s validity. Its value accounts for all the factors which could possibly affect the result, such as adequacy of analyte definition, sampling, matrix effects and interferences, climatic conditions, variances in weights, volumes, and standards, analytical procedure, and random variation. Some national accreditation organizations require the use of an “expanded uncertainty”: the range within which the value of the measurand is believed to lie within at least a 95% confidence level with the coverage factor k=2.

19.12.2 Uncertainty is not error. Error is a single value, the difference between the true result and the measured result. On environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error. Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to be Gaussian in distribution, and reducible by increasing the number of measurements.

19.12.3 The minimum uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte. The LCS limits are used to assess the performance of the measurement system since they take into consideration all of the laboratory variables associated with a given test over time (except for variability associated with the sampling and the variability due to matrix effects). The percent
recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

19.12.4 To calculate the uncertainty for the specific result reported, multiply the result by the decimal of the lower end of the LCS range percent value for the lower end of the uncertainty range, and multiply the result by the decimal of the upper end of the LCS range percent value for the upper end of the uncertainty range. These calculated values represent uncertainties at approximately the 99% confidence level with a coverage factor of $k = 3$. As an example, for a reported result of 1.0 mg/L with an LCS recovery range of 50 to 150%, the estimated uncertainty in the result would be $1.0 \pm 0.5$ mg/L.

19.12.5 In the case where a well-recognized test method specifies limits to the values of major sources of uncertainty of measurement (e.g., 524.2, 525, etc.) and specifies the form of presentation of calculated results, no further discussion of uncertainty is required.

19.13 Sample Reanalysis Guidelines

Because there is a certain level of uncertainty with any analytical measurement, a sample re-preparation (where appropriate) and subsequent analysis (hereafter referred to as ‘reanalysis’) may result in either a higher or lower value from an initial sample analysis. There are also variables that may be present (e.g., sample homogeneity, analyte precipitation over time, etc.) that may affect the results of a reanalysis. Based on the above comments, the laboratory will reanalyze samples at a client’s request with the following caveats.

**Note:** Client specific Contractual Terms and Conditions for reanalysis protocols may supersede the following items.

- Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within $\pm 1$ reporting limit for samples $\leq 5x$ the reporting limit, the original analysis will be reported. At the client’s request, both results may be reported on the same report but not on two separate reports.

- If the reanalysis does not agree (as defined above) with the original result, then the laboratory will investigate the discrepancy. If no additional data are available (e.g., historical data, matrix interference, non-routine sample matrix, etc.) it may be necessary to reanalyze the sample a third time for confirmation if sufficient sample is available.

- Any potential charges related to reanalysis are discussed in the contract terms and conditions or discussed at the time of the request. The client will typically be charged for reanalysis unless it is determined that the lab was in error.

- Due to the potential for increased variability, reanalysis may not be applicable to Non-homogenous, Encore, and Sodium Bisulfate preserved samples. See the Department Manager/Supervisor, Technical Manager or Laboratory Director if unsure.

19.14 Control of Data

The laboratory has policies and procedures in place to ensure the authenticity, integrity, and accuracy of the analytical data generated by the laboratory.
19.14.1 **Computer and Electronic Data Related Requirements**

The three basic objectives of the laboratory’s computer security procedures and policies are shown below. The laboratory is currently running the TestAmerica Laboratory Information Management System (TALS) which is a custom in-house developed LIMS system that has been highly customized to meet the needs of the laboratory. It is referred to as LIMS for the remainder of this section. The LIMS utilizes Sequel Server which is an industry standard relational database platform. It is referred to as Database for the remainder of this section.

19.14.1.1 **Maintain the Database Integrity:** Assurance that data are reliable and accurate through data verification (review) procedures, password-protecting access, anti-virus protection, data change requirements, as well as an internal LIMS permissions procedure.

- LIMS Database Integrity is achieved through data input validation, internal user controls, and data change requirements.
- Spreadsheets and other software developed in-house must be verified with documentation through hand calculations prior to use. Cells containing calculations must be lock-protected and controlled. More detail is provided in SOP DV-QA-0010, *Document Control*.
- Instrument hardware and software adjustments are safeguarded through maintenance logs, audit trails and controlled access.

19.14.1.2 **Ensure Information Availability:** Protection against loss of information or service is ensured through scheduled back-ups, stable file server network architecture, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented. More detail is provided in SOP DV-QA-025P, *Electronic Data Backup*.

19.14.1.3 **Maintain Confidentiality:** Ensure data confidentiality through physical access controls such as password protection or website access approval when electronically transmitting data. See Policies CW-I-P-007, *Computer Systems Password Policy* and CW-I-P-001, *Internet Access and Use Policy*.

19.14.2 **Data Reduction**

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., Wet Chemistry, the data are reduced by the analyst and then verified by the Data Reviewer prior to updating the data in LIMS. This review is documented on the data review checklist. These checklists are saved electronically.

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method or per manufacturer’s indication; otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

19.14.2.1 All raw data must be retained in the worklist folder, computer file (if appropriate), and/or runlog. All criteria pertinent to the method must be recorded. The documentation is recorded at the time observations or calculations are made and must be signed or initialed/dated (month/day/year). It must be easily identifiable who performed which tasks if multiple people were involved.

19.14.2.2 In general, concentration results are reported in milligrams per liter (mg/L) or micrograms per liter (μg/L) for liquids and milligrams per kilogram (mg/kg) or micrograms per kilogram (μg/kg) for solids. For values greater than 10,000 mg/L, results can be reported in percent, i.e., 10,000 mg/L = 1%. Units are defined in each laboratory SOP.

19.14.2.3 In reporting, the analyst or the instrument output records the raw data result using values of known certainty plus one uncertain digit. If final calculations are performed external to LIMS, the results should be entered in LIMS with at least three significant figures. In general, results are reported to two significant figures on the final report. Refer to SOP DV-QA-004P, Rounding and Significant Figures for details regarding the number of significant figures to report for each step in the process.

19.14.2.4 For those methods that do not have an instrument printout or an instrumental output compatible with the LIMS System, the raw results and dilution factors are entered directly into LIMS by the analyst, and the software calculates the final result for the analytical report. LIMS has a defined significant figure criterion for each analyte.

19.14.2.5 The laboratory strives to import data directly from instruments or calculation spreadsheets to ensure that the reported data are free from transcription and calculation errors. For those analyses with an instrumental output compatible with the LIMS, the raw results and dilution factors are transferred into LIMS electronically after reviewing the quantitation report, and removing unrequested or poor spectrally-matched compounds. The analyst verifies that the data were uploaded correctly. All electronic data files are transferred to the server and eventually to a tape file.

19.14.3 Logbook / Worksheet Use Guidelines

Logbooks and worksheets are filled out ‘real time’, i.e., observations and measurements are recorded as they are made, and have enough information on them to trace the events of the applicable analysis/task. (e.g., calibrations, standards, analyst, sample ID, date, time on short holding time tests, temperatures when applicable, calculations are traceable, etc.)

- Corrections are made following the procedures outlined in Section 12.
- Logbooks are controlled by the QA department. A record is maintained of all paper logbooks used in the laboratory.
- Unused portions of pages must be “Z”’d out, signed and dated.
Worksheets and electronic forms are created with the approval of the QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

19.14.4 Review / Verification Procedures

Review procedures are outlined in several SOPs (e.g., DV-QA-0003, Sample Management and Chain of Custody, DV-QA-0020, Data Review, and DV-QA-0022, Data Package Assembly), to ensure that reported data are free from calculation and transcription errors, and that QC parameters have been reviewed and evaluated before data are reported. The laboratory also has an SOP discussing Manual Integrations to ensure the authenticity of the data (DV-QA-011P, Acceptable Manual Integration Practices). The general review concepts are discussed below, more specific information can be found in the SOPs.

19.14.4.1 Log-In Review - The data review process starts at the sample receipt stage. Sample control personnel review chain-of-custody forms and project instructions from the project management group. This is the basis of the sample information and analytical instructions entered into the LIMS. The log-in instructions are reviewed by the personnel entering the information, and a second level review is conducted by the project management staff.

19.14.4.2 First Level Data Review - The next level of data review occurs with the analysts. As data are generated, analysts review their work to ensure that the results meet project and SOP requirements. First level reviews include inspection of all raw data (e.g., instrument output for continuous analyzers, chromatograms, spectra, and manual integrations), evaluation of calibration/calibration verification data in the day's analytical run, evaluation of QC data, and reliability of sample results. The analyst transfers data into LIMS, data qualifiers are verified or added as needed. All first level reviews are documented.

19.14.4.3 Second Level Data Review – All analytical data are subject to review by a second qualified analyst or supervisor. Second level reviews include inspection of all raw data (e.g., instrument output, chromatograms, and spectra) including 100% of data associated with any changes made by the primary analyst, such as manual integrations or reassignment of peaks to different analytes, or elimination of false negative analytes. The second review also includes evaluation of initial calibration/calibration verification data in the day's analytical run, evaluation of QC data, reliability of sample results, qualifiers and NCM narratives. Manual calculations are checked in second level review. All second level reviews are documented.

Issues that deem further review include the following:

- QC data are outside the specified control limits for accuracy and precision
- Reviewed sample data do not match with reported results
- Unusual reporting limit changes are observed
- Samples having unusually high results
- Samples exceeding a known regulatory limit
- Raw data indicating some type of contamination or poor technique
- Inconsistent peak integration
- Transcription errors
- Results outside of calibration range
19.14.4.4 Unacceptable analytical results may require reanalysis of the samples. Any problems are brought to the attention of the Laboratory Director, Project Manager, Quality Assurance Manager, Technical Manager, Department Manager/Supervisor, or Quality Director for further investigation. Corrective action is initiated whenever necessary.

19.14.4.5 The results are then entered or directly transferred into the computer database and a hard copy (or .pdf) is printed for the client.

19.14.4.6 As a final review prior to the release of the report, the Project Manager reviews the results for appropriateness and completeness. This review and approval ensures that client requirements have been met and that the final report has been properly completed. The process includes, but is not limited to, verifying that the COC is followed, cover letters/narratives are present, flags are appropriate, and project specific requirements are met. The Project Manager may also evaluate the validity of results for different test methods given expected chemical relationships.

19.14.4.7 Any project that requires a data package is subject to a tertiary data review for transcription errors and acceptable quality control requirements. The Project Manager then signs the final report. When complete, the report is sent out to the client.

19.14.4.8 A visual summary of the flow of samples and information through the laboratory, as well as data review and validation, is presented in Figure 19-2.

19.14.5 Manual Integrations

Computerized data systems provide the analyst with the ability to re-integrate raw instrument data in order to optimize the interpretation of the data. Though manual integration of data is an invaluable tool for resolving variations in instrument performance and some sample matrix problems, when used improperly, this technique would make unacceptable data appear to meet quality control acceptance limits. Improper re-integrations lead to legally indefensible data, a poor reputation, or possible laboratory decertification. Because guidelines for re-integration of data are not provided in the methods and most methods were written prior to widespread implementation of computerized data systems, the laboratory trains all analytical staff on proper manual integration techniques using TestAmerica’s Corporate SOP (CA-Q-S-002) as the guideline for the internal SOP DV-QA-011P, Acceptable Manual Integration Practices.

19.14.5.1 The analyst must adjust the baseline or the area of a peak in some situations, for example when two compounds are not adequately resolved or when a peak shoulder needs to be separated from the peak of interest. The analyst must use professional judgment and common sense to determine when manual integration is required. Analysts are encouraged to ask for assistance from a senior analyst or manager when in doubt.

19.14.5.2 Analysts shall not increase or decrease peak areas for the sole purpose of achieving acceptable QC recoveries that would have otherwise been unacceptable. The intentional recording or reporting of incorrect information (or the intentional omission of correct information) is against company principles and policy and is grounds for immediate termination.
19.14.5.3 Client samples, performance evaluation samples, and quality control samples are all treated equally when determining whether or not a peak area or baseline should be manually adjusted.

19.14.5.4 All manual integrations receive a second level review. Manual integrations must be indicated on an expanded scale “after” chromatograms such that the integration performed can be easily evaluated during data review. Expanded scale “before” chromatograms are also required for all manual integrations on QC parameters (calibrations, calibration verifications, laboratory control samples, internal standards, surrogates, etc.).
Figure 19-1. Example - Demonstration of Capability Documentation

<table>
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<tr>
<th>Analyst Name</th>
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<tbody>
<tr>
<td>Date</td>
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<tr>
<td>SOP Number</td>
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<tr>
<td>Method</td>
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<tr>
<td>Analysis</td>
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<td>Matrix</td>
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</tbody>
</table>

We the undersigned, CERTIFY that:

1. The analyst identified above, using the cited test method with the specifications in the cited SOP, which is in use at this facility for the analysis of samples under the TestAmerica Quality Assurance Manual, has met the Initial or Ongoing Demonstration of Capability.
2. The test method was performed by the analyst identified on this certification following the TestAmerica SOP and source method.
3. A copy of the laboratory-specific SOP and source method is available for all personnel on-site. These documents have been reviewed by the analyst as part of this Demonstration of Capability.
4. The data associated with the initial/ongoing demonstration of capability are true, accurate, complete and self-explanatory (*). These data are attached to this certification statement.
5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well organized and available for review by authorized inspectors.

Comments/Observations:

<table>
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<tr>
<th>Analyst’s Name (Print)</th>
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<td>Margaret S. Sleevi</td>
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QA Manager’s Name | Signature & Date

* True: Consistent with supporting data.
Accurate: Based on good laboratory practices consistent with sound scientific principles/practices.
Complete: Includes the results of all supporting performance testing.
Self-explanatory: Data properly labeled and stored so that the results are traceable and require no additional explanation.
Figure 19-2. Example: Work Flow
SECTION 20. EQUIPMENT and CALIBRATIONS

20.1 Overview

Instrumentation is purchased on the basis of accuracy, dependability, efficiency and sensitivity. The laboratory is furnished with all items of sampling, preparation, analytical testing and measurement equipment necessary to correctly perform the tests for which the laboratory has capabilities. Each piece of equipment is capable of achieving the required accuracy and complies with specifications relevant to the method being performed. Before being placed into use, the equipment (including sampling equipment) is calibrated and checked to establish that it meets its intended specification. The calibration routines for analytical instruments establish the range of quantitation. Calibration procedures are specified in laboratory SOPs. A list of laboratory instrumentation and support equipment is presented in Table 20-1.

Equipment is only operated by authorized and trained personnel. Manufacturer's instructions for equipment use are readily accessible to all appropriate laboratory personnel.

20.2 Preventive Maintenance

The laboratory follows a well-defined maintenance program to ensure proper equipment operation and to prevent the failure of laboratory equipment or instrumentation during use. This program of preventive maintenance helps to avoid delays due to instrument failure.

Routine preventive maintenance procedures and frequency, such as cleaning and replacements, should be performed according to the procedures outlined in the manufacturer's manual. Qualified personnel must also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to continually meet one of the quality control criteria.

Table 20-2 lists examples of scheduled routine maintenance. It is the responsibility of each Department Manager/Supervisor to ensure that instrument maintenance logs are kept for all equipment in his/her department. Preventative maintenance procedures are also outlined in analytical SOPs or instrument manuals. (Note: for some equipment, the log used to monitor performance is also the maintenance log.

Instrument maintenance logs are controlled and are used to document instrument problems, instrument repair and maintenance activities. Maintenance logs shall be kept for all major pieces of equipment. Instrument maintenance logs may also be used to specify instrument parameters.

- Documentation must include all major maintenance activities such as contracted preventive maintenance and service and in-house activities such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning and adjustments.
- Each entry in the instrument log includes the analyst's initials, the date, a detailed description of the problem (or maintenance needed/scheduled), a detailed explanation of the solution or maintenance performed, and a verification that the equipment is functioning properly (state what was used to determine a return to control, e.g., CCV run on 'date' was acceptable, or instrument recalibrated on 'date' with acceptable verification, etc.) must also be documented in the instrument records.
When maintenance or repair is performed by an outside agency, service receipts detailing the service performed can be affixed into the logbooks adjacent to pages describing the maintenance performed. This taped in page must be signed across the page entered, the tape and the logbook so that it is clear that a page is missing if only half a signature is found in the logbook. Alternatively the maintenance event can be documented in the log and the location where the service receipts are stored referenced in this entry.

If an instrument requires repair (subjected to overloading or mishandling, gives suspect results, or otherwise has shown to be defective or outside of specified limits) it shall be taken out of operation and tagged as out-of-service or otherwise isolated until such a time as the repairs have been made and the instrument can be demonstrated as operational by calibration and/or verification or other test to demonstrate acceptable performance. The laboratory shall examine the effect of this defect on previous analyses.

In the event of equipment malfunction that cannot be resolved, service shall be obtained from the instrument vendor manufacturer, or qualified service technician, if such a service can be tendered. If on-site service is unavailable, arrangements shall be made to have the instrument shipped back to the manufacturer for repair. Back up instruments, which have been approved, for the analysis shall perform the analysis normally carried out by the malfunctioning instrument. If the back-up is not available and the analysis cannot be carried out within the needed timeframe, the samples shall be subcontracted.

At a minimum, if an instrument is sent out for service or transferred to/from another facility, it must be recalibrated and the laboratory MDL verified (using an MDLV) prior to return to lab operations. If equipment is transferred from another facility and the method and/or analytes have not previously been performed the lab must complete a method validation for those analytes.

20.3 Support Equipment

This section applies to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices, thermal/pressure sample preparation devices and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All raw data records associated with the support equipment are retained to document instrument performance.

20.3.1 Weights and Balances

The accuracy of the balances used in the laboratory is checked every working day, before use. All balances are placed on stable counter tops.

Each balance is checked prior to initial serviceable use with at least two certified ASTM type 1 weights spanning its range of use (weights that have been calibrated to ASTM type 1 weights may also be used for daily verification). ASTM type 1 weights used only for calibration of other weights (and no other purpose) are inspected for corrosion, damage or nicks at least annually and if no damage is observed, they are calibrated at least every 5 years by an outside calibration laboratory. Any weights (including ASTM Type 1) used for daily balance checks or other purposes are recalibrated/recertified annually to NIST standards (this may be done internally if laboratory maintains “calibration only” ASTM type 1 weights).
All balances are serviced annually by a qualified service representative, who supplies the laboratory with a certificate that identifies traceability of the calibration to the NIST standards.

All of this information is recorded in logs, and the recalibration/recertification certificates are kept on file. Refer to SOP DV-QA-0014, Selecting and Using Balances.

### 20.3.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to ± 0.1 pH units, and have a scale readability of at least 0.05 pH units. The meters automatically compensate for the temperature, and are calibrated with at least two working range buffer solutions before each use.

Conductivity meters are calibrated before each use with a known standard to demonstrate the meters do not exceed an error of 1% or one μmhos/cm. The cell constant must be verified annually.

Turbidity meters are calibrated at least monthly and the calibration is verified before each use against the three calibration standards.

All of this information is documented in logs, on bench sheets or in the batch record. Consult pH, Conductivity, and Turbidity SOPs for further information.

### 20.3.3 Thermometers

All thermometers are calibrated on an annual basis with a NIST-traceable thermometer. IR thermometers, digital probes and thermocouples are calibrated quarterly.

- If the temperature measuring device is used over a range of 10°C or less, then a single point verification within the range of use is acceptable;
- If the temperature measuring device is used over a range of greater than 10°C, then the verification must bracket the range of use.

IR Thermometers should be calibrated over the full range of use, including ambient, iced (4°C) and frozen (0°C to -5°C), per the Drinking Water Manual.

The mercury NIST thermometer is recalibrated every five years and the digital NIST thermometer is recalibrated annually (unless thermometer has been exposed to temperature extremes or apparent separation of internal liquid) by an approved outside service and the provided certificate of traceability is kept on file. The NIST thermometer(s) have increments of 1 degree, and have ranges applicable to method and certification requirements. The NIST traceable thermometer is used for no other purpose than to calibrate other thermometers.

Internal calibration records are documented in electronic spreadsheets. Certificates documenting calibration by outside vendors is maintained in files in the QA office. Monitoring method-specific temperatures, including incubators, heating blocks, water baths, and ovens, is documented in method-specific logbooks or batch records. More information on this subject can be found in SOP DV-QA-0001, Thermometer Calibration Procedure.

### 20.3.4 Refrigerators/Freezer Units, Waterbaths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample and standard storage are monitored 7 days a week.
Ovens, waterbaths and incubators are monitored on days of use. All of this equipment has a unique identification number, and is assigned a unique thermometer for monitoring.

Sample storage refrigerator temperatures are kept between > 0ºC and ≤ 6 ºC.

Specific temperature settings/ranges for other refrigerators, ovens, waterbaths, and incubators can be found in method specific SOPs.

All of this information is documented in Daily Temperature Logs, log tag (datalogger) downloads method-specific logbooks, or batch records. See SOP DV-QA-0012, Monitoring Refrigerator Temperature and Power Failure Contingency Plan or method specific SOPs.

20.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices (except Class A Glassware and Glass microliter syringes) are given unique identification numbers and the delivery volumes are verified gravimetrically, daily (if used).

For those dispensers that are not used for analytical measurements, a label is applied to the device stating that it is not calibrated. Any device not regularly verified cannot be used for any quantitative measurements.

Micro-syringes are purchased from Hamilton Company. Each syringe is traceable to NIST. The laboratory keeps on file an “Accuracy and Precision Statement of Conformance” from Hamilton attesting established accuracy.

Refer to SOP DV-QA-0008, Volumetric Verification.

20.4 Instrument Calibrations

Calibration of analytical instrumentation is essential to the production of quality data. Strict calibration procedures are followed for each method. These procedures are designed to determine and document the method detection limits, the working range of the analytical instrumentation and any fluctuations that may occur from day to day.

Sufficient raw data records are retained to allow an outside party to reconstruct all facets of the initial calibration. Records contain, but are not limited to, the following: calibration date, method, instrument, analyst(s) initials or signatures, analysis date, analytes, concentration, response, type of calibration (Avg RF, curve, or other calculations that may be used to reduce instrument responses to concentration).

Sample results must be quantitated from the initial calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method or program.

If the initial calibration results are outside of the acceptance criteria, corrective action is performed and any affected samples are reanalyzed if possible. If the reanalysis is not possible, any data associated with an unacceptable initial calibration will be reported with appropriate data qualifiers (refer to Section 12).
Note: Instruments are calibrated initially and as needed after that and at least annually. Isotope dilution methods are calibrated initially and as needed. There is no minimum requirement for recalibration for isotope dilution methods.

20.4.1 Calibration Standards

Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP. If a reference method does not specify the number of calibration standards, a minimum of 3 calibration points will be used.

Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to national or international standards of measurement, or to national or international standard reference materials.

The lowest concentration calibration standard that is analyzed during an initial calibration must be at or below the stated reporting limit for the method based on the final volume of extract (or sample).

The other concentrations define the working range of the instrument/method or correspond to the expected range of concentrations found in actual samples that are also within the working range of the instrument/method. Results of samples not bracketed by initial instrument calibration standards (within calibration range to at least the same number of significant figures used to report the data) must be reported as having less certainty, e.g., defined qualifiers or flags (additional information may be included in the case narrative). The exceptions to these rules are ICP and ICPMS methods which define the working range with periodic linear dynamic range studies, rather than through the range of concentrations of daily calibration standards.

All initial calibrations are verified with a standard obtained from a second source and traceable to a national standard, when available (or vendor certified different lot if a second source is not available). For unique situations, such as Disodium Iminodiacetate (IDA) analysis where no other source or lot is available, a standard made by a different analyst at a different time or a different preparation would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

20.4.1.1 Calibration Verification

The calibration relationship established during the initial calibration must be verified initially and at least daily as specified in the laboratory method SOPs in accordance with the referenced analytical methods and in the 2009 TNI Standard. The process of calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. Initial calibration verification is with a standard source secondary (second source standard) to the calibration standards, but continuing calibration verifications may use the same source standards as the calibration curve.

Note: The process of calibration verification referred to here is fundamentally different from the approach called "calibration" in some methods. As described in those methods, the calibration factors or response factors calculated during calibration are used to update the calibration factors or response factors used for sample quantitation. This approach, while employed in other EPA programs, amounts to a daily single-point calibration.
All target analytes and surrogates, including those reported as non-detects, must be included in periodic calibration verifications for purposes of retention time confirmation and to demonstrate that calibration verification criteria are being met, i.e., RPD, per 2009 TNI Std. EL-V1M4 Sec. 1.7.2.

All samples must be bracketed by periodic analyses of standards that meet the QC acceptance criteria (e.g., calibration and retention time). The frequency is found in the determinative methods or SOPs.

**Note:** If an internal standard calibration is being used (e.g., GC or GCMS) then bracketing calibration verification standards are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

Generally, the initial calibrations must be verified at the beginning of each 12-hour analytical shift during which samples are analyzed. (Some methods may specify more or less frequent verifications). The 12-hour analytical shift begins with the injection of the calibration verification standard (or the MS tuning standard in MS methods). The shift ends after the completion of the analysis of the last sample, QC, or standard that can be injected within 12-hours of the beginning of the shift.

A continuing instrument calibration verification (CCV) must be repeated at the beginning and, for methods that have quantitation by external calibration models, at the end of each analytical batch. Some methods have more frequent CCV requirements see specific SOPs. Most Inorganic methods require the CCV to be analyzed after ever ten samples or injections, including matrix or batch QC samples.

If the results of a CCV are outside the established acceptance criteria and analysis of a second consecutive (and immediate) CCV fails to produce results within acceptance criteria, corrective action shall be performed. Once corrective actions have been completed and documented, the laboratory shall demonstrate acceptable instrument / method performance by analyzing two consecutive CCVs, or a new initial instrument calibration shall be performed.

Sample analyses and reporting of data may not occur or continue until the analytical system is calibrated or calibration verified. However, data associated with an unacceptable calibration verification may be fully useable under the following special conditions and reported based upon discussion and approval of the client:

a). when the acceptance criteria for the CCV are exceeded high (i.e., high bias) and the associated samples within the batch are non-detects, then those non-detects may be reported with a footnote or case narrative explaining the high bias. Otherwise the samples affected by the unacceptable CCV shall be re-analyzed after a new calibration curve has been established, evaluated and accepted; or

b). when the acceptance criteria for the CCV are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise the samples affected by the unacceptable CCV shall be re-analyzed after a new calibration curve has been established, evaluated and accepted.

Samples reported by the two conditions identified above will be appropriately flagged.
20.4.1.2 **Verification of Linear and Non-Linear Calibrations**

Calibration verification for calibrations involves the calculation of the percent drift or the percent difference of the instrument response between the initial calibration and each subsequent analysis of the verification standard. (These calculations are available in the laboratory method SOPs. Verification standards are evaluated based on the Percent Difference from the average CF or RF of the initial calibration or based on Percent Drift or Percent Recovery if a linear or quadratic curve is used.

Regardless of whether a linear or non-linear calibration model is used, if initial verification criterion is not met, then no sample analyses may take place until the calibration has been verified or a new initial calibration is performed that meets the specifications listed in the method SOPs. If the calibration cannot be verified after the analysis of a single verification standard, then adjust the instrument operating conditions and/or perform instrument maintenance, and analyze another aliquot of the verification standard. If the calibration cannot be verified with the second standard, then a new initial calibration is performed.

- When the acceptance criteria for the calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.

- When the acceptance criteria for the calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise, the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. Alternatively, a reporting limit standard may be analyzed to demonstrate that the laboratory can still support non-detects at their reporting limit.

20.5 **Tentatively Identified Compounds (TICs) – GC/MS Analysis**

For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

**Note:** If the TIC compound is not part of the client target analyte list but is calibrated by the laboratory and is both qualitatively and/or quantitatively identifiable, it should not be reported as a TIC. If the laboratory does not routinely analyze for this compound and may not have verified MDLs, the compound is reported as a “targeted TIC” as it is reported compared to a known standard and can be quantitatively (if verification is in control) and qualitatively measured. The result should be qualified if this is the case.

For example, the RCRA permit or waste delisting requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification.
20.6 **GC/MS Tuning**

Prior to any GCMS analytical sequence, including calibration, the instrument parameters for the tune and subsequent sample analyses within that sequence must be set.

Prior to tuning/auto-tuning the mass spectrometer, the parameters may be adjusted within the specifications set by the manufacturer or the analytical method. These generally don't need any adjustment but it may be required based on the current instrument performance. If the tune verification does not pass it may be necessary to clean the source or perform additional maintenance. Any maintenance is documented in the maintenance log.
<table>
<thead>
<tr>
<th>Instrument Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC Semivolatiles</td>
<td>14</td>
</tr>
<tr>
<td>GC Volatiles</td>
<td>4</td>
</tr>
<tr>
<td>GC/MS Semivolatiles</td>
<td>9</td>
</tr>
<tr>
<td>GCMS Volatiles</td>
<td>15</td>
</tr>
<tr>
<td>HPLC</td>
<td>4</td>
</tr>
<tr>
<td>HPLC/MS/MS</td>
<td>5</td>
</tr>
<tr>
<td>IC/MS/MS</td>
<td>2</td>
</tr>
<tr>
<td>ICP</td>
<td>2</td>
</tr>
<tr>
<td>ICP/MS</td>
<td>2</td>
</tr>
<tr>
<td>HPLC/ICP/MS</td>
<td>1</td>
</tr>
<tr>
<td>Mercury Analyzer</td>
<td>2</td>
</tr>
<tr>
<td>Graphite Furnace</td>
<td>1</td>
</tr>
<tr>
<td>Ion Chromatograph</td>
<td>7</td>
</tr>
<tr>
<td>TOC Analyzer</td>
<td>3</td>
</tr>
<tr>
<td>TOX Analyzer</td>
<td>2</td>
</tr>
<tr>
<td>Autoanalyzer</td>
<td>5</td>
</tr>
<tr>
<td>Autotitrator</td>
<td>2</td>
</tr>
<tr>
<td>pH Meter</td>
<td>4</td>
</tr>
<tr>
<td>Conductivity Meter</td>
<td>1</td>
</tr>
<tr>
<td>Dissolved Oxygen Meter</td>
<td>1</td>
</tr>
<tr>
<td>Turbidimeter</td>
<td>1</td>
</tr>
<tr>
<td>Flashpoint</td>
<td>1</td>
</tr>
<tr>
<td>Spectrophotometer</td>
<td>2</td>
</tr>
<tr>
<td>Balances</td>
<td>26</td>
</tr>
<tr>
<td>Refrigerators &amp; Freezers</td>
<td>54</td>
</tr>
<tr>
<td>Ovens</td>
<td>13</td>
</tr>
</tbody>
</table>

NOTE: A complete listing of all analytical and support equipment is available from the laboratory. The QA Department maintains a Master List of Equipment.
### Table 20-2. Example: Schedule of Routine Maintenance

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Procedure</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cetac Mercury Analyzers</strong></td>
<td>• Change Lamp</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Clean cell and GLS as needed</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Check pump tubing and pump flow</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check Waste Container</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Fill reductant bottle with 10% Stannous Chloride and check acid reagent</td>
<td>Daily</td>
</tr>
<tr>
<td><strong>GFAA</strong></td>
<td>• Check fluid level in rinse and waste containers</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check condition of autosampler tubing</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check the condition of graphite tube and replace as needed</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check coolant level in chiller and replace as needed</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check condition of Contact Rings and replace as needed</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean or replace air filters</td>
<td>As needed</td>
</tr>
<tr>
<td><strong>ICP</strong></td>
<td>• Check pump tubing</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check fluid level in waste container</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Clean or replace air filters</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check torch for residue</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check nebulizer flow</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean nebulizer and drain chamber</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Fill rinse solution/ IS solution</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Replace capillary tubing/sipper probe</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Change internal cooling fluid</td>
<td>Quarterly</td>
</tr>
<tr>
<td><strong>ICP MS</strong></td>
<td>• Change pump tubing</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check level of tuning solution</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check waste container</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Load printer with paper</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Check air filters</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Replace coolant on chiller</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Clean or change nebulizer</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Clean or replace torch</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace sample tubing</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Change oil in vacuum pumps</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Remove and clean cones</td>
<td>As needed</td>
</tr>
<tr>
<td><strong>UV-Vis Spectrophotometer</strong></td>
<td>• Clean ambient flow cell</td>
<td>As required</td>
</tr>
<tr>
<td></td>
<td>• Precision check/alignment of flow cell</td>
<td>As required</td>
</tr>
<tr>
<td></td>
<td>• Wavelength verification check</td>
<td>Semi-annually</td>
</tr>
<tr>
<td><strong>Colorimetric Analyzer</strong></td>
<td>• Clean detector</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean filters</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check tubing</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean sample probe shaft</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean pump, diluter, and XYZ sampler.</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>• Lubricate pump roller</td>
<td>Semi-annually</td>
</tr>
<tr>
<td>Instrument</td>
<td>Procedure</td>
<td>Frequency</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Ion Chromatograph</td>
<td>• Check plumbing for leaks</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check gases</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check pump pressure</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check eluent level</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check conductivity meter</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• De-gas pump head when flow is erratic</td>
<td>As needed</td>
</tr>
<tr>
<td>Total Organic Halide Analyzer</td>
<td>• Check electrodes/polish if needed</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Replace dehydrating fluid/electrolyte fluid</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean quartz boat</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Perform cell performance check</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• At the end of each day of use, wash out the absorption module, empty the electrolyte and fill chamber with DI water, empty dehydrator tube</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean or replace pyrolysis tube</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Clean titration cell</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace reference electrode fluid</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Change quartz wool</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace o-rings and seals</td>
<td>As needed</td>
</tr>
<tr>
<td>Hewlett Packard GC/MS</td>
<td>• Check Septa and clean injection port</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check carrier gas supply</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check tune parameters</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check oil levels in mechanical pumps and the diffusion pump if the vacuum is insufficient</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace electron multiplier</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Clean Source</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace filaments</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Change rough pump oil and exhaust filters</td>
<td>Annually</td>
</tr>
<tr>
<td></td>
<td>• Relubricate the turbomolecular pump-bearing wick</td>
<td>Annually</td>
</tr>
<tr>
<td>Gas Chromatograph</td>
<td>• Check carrier gas supply</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check temperatures of inlet, detectors, verify temperature program</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check septa clean injection port or replace injection port liner and cut column if needed</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Reactivate carrier gas drying agents</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace or repair flow controllers if constant flow cannot be maintained</td>
<td>As needed</td>
</tr>
<tr>
<td>Electron Capture Detector (ECD)</td>
<td>• Detector wipe test (Ni-63)</td>
<td>Semi-annually</td>
</tr>
<tr>
<td></td>
<td>• Detector cleaning</td>
<td>As needed</td>
</tr>
<tr>
<td>Flame Ionization Detector (FID)</td>
<td>• Detector cleaning</td>
<td>As needed</td>
</tr>
<tr>
<td>Nitrogen Phosphorus Detector (NPD)</td>
<td>• Replace bead</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace ceramic rings</td>
<td>As needed</td>
</tr>
<tr>
<td>Photoionization Detector (PID)</td>
<td>• Change O-rings</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Clean lamp window</td>
<td>As needed</td>
</tr>
<tr>
<td>Instrument</td>
<td>Procedure</td>
<td>Frequency</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>HPLC</td>
<td>• Check level of eluent vessels</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Change pump seals</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Change the column frit</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Change fuses in power supply</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Filter all samples</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Change autosampler rotor or oil autosampler slides</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Change or backflush columns</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace needle</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace needle seat assembly</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace Active Inlet Valve (AIV) cartridge</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace lamps</td>
<td>As needed</td>
</tr>
<tr>
<td>APCI/ESI LC/MS/MS</td>
<td>• Check solvent reservoirs</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Verify that pump is primed and operating pulse free</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Verify temperatures for capillary heater/vaporizer heater</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Verify pressure of manifold/fore-pump</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Verify that corona and multiplier are functional</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean Lenses</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Clean skimmer</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace column</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Oil autosampler</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Change autosampler filters</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace sample inlet tube</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace fused silica tubing at ESI interface</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace rough pump oil</td>
<td>Annually</td>
</tr>
<tr>
<td></td>
<td>• Replace turbo pump oil</td>
<td>Annually</td>
</tr>
<tr>
<td></td>
<td>• Vacuum system components including fans and fan covers</td>
<td>Annually</td>
</tr>
<tr>
<td>Balances</td>
<td>• Class “S” traceable weight check</td>
<td>Daily, when used</td>
</tr>
<tr>
<td></td>
<td>• Clean pan and check if level</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Field service</td>
<td>At least Annually</td>
</tr>
<tr>
<td>Sonicator</td>
<td>• Inspect probe for etching/pitting</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Tune sonicator assembly</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>• Disassemble and clean probe tips</td>
<td>As needed</td>
</tr>
<tr>
<td>Conductivity Meter</td>
<td>• Standardize with KCL</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Conductivity cell cleaning</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Check probes and cables</td>
<td>As needed</td>
</tr>
<tr>
<td>Flash Point Tester</td>
<td>• Check stirrer</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check tubing</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check gas supply</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Check thermometer against NIST thermometer</td>
<td>Quarterly by QA</td>
</tr>
<tr>
<td>Digestion Block</td>
<td>• Check with NIST thermometer</td>
<td>Annually</td>
</tr>
<tr>
<td>Turbidimeter</td>
<td>• Check light bulb</td>
<td>Daily, when used</td>
</tr>
<tr>
<td></td>
<td>• Inspect cells</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>• Clean housing</td>
<td>Monthly</td>
</tr>
<tr>
<td>Instrument</td>
<td>Procedure</td>
<td>Frequency</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Deionized/Distilled Water</td>
<td>• Conductivity check</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• System cleaning</td>
<td>As needed</td>
</tr>
<tr>
<td></td>
<td>• Replace cartridge and large mixed bed resins</td>
<td>As needed</td>
</tr>
<tr>
<td>Drying Ovens</td>
<td>• Temperature monitoring</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Temperature adjustments</td>
<td>As required</td>
</tr>
<tr>
<td>Refrigerators/Freezers</td>
<td>• Temperature monitoring</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Temperature adjustment</td>
<td>As required</td>
</tr>
<tr>
<td></td>
<td>• Defrosting/cleaning</td>
<td>As required</td>
</tr>
<tr>
<td>pH/Specific Ion Meter</td>
<td>• Calibration/check slope</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Clean electrode</td>
<td>As required</td>
</tr>
<tr>
<td>Dissolved Oxygen Meter</td>
<td>• Calibration/barometric pressure check</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Inspect probe for scratches or cracks.</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Change membrane</td>
<td>As required</td>
</tr>
<tr>
<td>BOD Incubator</td>
<td>• Temperature monitoring</td>
<td>Daily</td>
</tr>
<tr>
<td>Water baths</td>
<td>• Temperature monitoring</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>• Water replaced</td>
<td>Monthly or as needed</td>
</tr>
</tbody>
</table>
SECTION 21. MEASUREMENT TRACEABILITY

21.1 Overview

Traceability of measurements shall be assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration is not necessarily documented in a test method analysis or by analysis of a reference standard shall be subject to ongoing certifications of accuracy. At a minimum, these must include procedures for checking specifications of ancillary equipment: balances, thermometers, temperature, deionized (DI) and reverse osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. (Refer to Section 20.3). With the exception of Class A glassware and glass microliter syringes, daily accuracy and precision checks are performed for all mechanical volumetric devices. Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. Class A glassware and glass microliter syringes should be routinely inspected for chips, acid etching or deformity (e.g., bent needle). If the Class A glassware or syringe is suspect, the accuracy of the glassware will be assessed prior to use.

21.2 NIST-Traceable Weights and Thermometers

Reference standards of measurement shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

For NIST-traceable weights and thermometers, the laboratory requires that all calibrations be conducted by a calibration laboratory accredited by A2LA, NVLAP (National Voluntary Laboratory Accreditation Program), or another accreditation organization that is a signatory to a MRA (Mutual Recognition Arrangement) of one or more of the following cooperations – ILAC (International Laboratory Accreditation Cooperation) or APLAC (Asia-Pacific Laboratory Accreditation Cooperation). A calibration certificate and scope of accreditation is kept on file at the laboratory.

The calibration laboratory’s policy for achieving measurement traceability is defined and includes the subsequent elements of uncertainty.

The uncertainty calculations of the calibration laboratory are supported by uncertainty budgets and are represented by expanded uncertainties typically using a coverage factor of k=2 to approximate the 95% confidence level. This explanation accompanies the measurement result and the associated uncertainty.

The tolerance uncertainty ratio (TUR) is calculated using the expanded uncertainty of the measurement, not the collective uncertainty of the measurement standards. A statement to this effect accompanies the TUR along with the coverage factor and confidence level.

The calibration report or certificate submitted to TestAmerica Denver contains, in a well-designed format, a traceability statement, the conditions under which the calibrations were made in the context of any potential influence, a compliance statement with an identified metrological specification and the pertinent clauses, a clearly identified record of the quantities and functional test results before and after re-calibration, and no recommendation on the calibration interval. Opinions and interpretations of results are presented along with the basis upon which they were made and identified as such. The report may be submitted by facsimile
or other electronic means as long as the requirements of the International Standard are achieved. If significant amendments are made to a calibration certificate, a supplemental certificate for the serial-number-specified piece of equipment is so identified. When a new certificate is offered, it uniquely identifies and references the one it replaces. All calibration reports are filed in the QA Office.

The calibration laboratory supports in-house calibration systems: documented procedures for in-house calibrations, evidence by a report, certificate, or sticker, for an appropriate amount of time; training records of calibration personnel; certificates from accreditation services demonstrating traceability to national or international standards of measurement; procedures for evaluating measurement uncertainty; timely and documented recalibration of reference standards. When subcontracting to a calibration laboratory, TestAmerica Denver does not use a firm who subcontracts the work.

An external certified service engineer services laboratory balances on an annual basis. This service is documented on each balance with a signed and dated certification sticker. Balance calibrations are checked each day of use. All mercury thermometers are calibrated annually against a traceable reference thermometer. Temperature readings of ovens, refrigerators, and incubators are checked on each day of use.

21.3 Reference Standards / Materials

Reference standards/materials, where commercially available, are traceable to certified reference materials. Commercially prepared reference standards, to the extent available, are purchased from vendors that are accredited to ISO Guide 34 and ISO/IEC Guide 17025. All reference standards from commercial vendors shall be accompanied with a certificate that includes at least the following information:

- Manufacturer
- Analytes or parameters calibrated
- Identification or lot number
- Calibration method
- Concentration with associated uncertainties
- Purity

If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. The receipt of all reference standards must be documented. Reference standards are labeled with a unique Standard Identification Number and expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

All reference, primary and working standards/materials, whether commercially purchased or laboratory prepared, must be checked regularly to ensure that the variability of the standard or material from the ‘true’ value does not exceed method requirements. The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a vendor certified different lot is acceptable for use as a second source. For unique situations, such as Disodium Iminodiacetate (IDA) analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. The appropriate Quality Control (QC) criteria for specific
standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or LCS (where there is no sample preparation) is used as the second source confirmation. These checks are generally performed as an integral part of the analysis method (e.g., calibration checks, laboratory control samples).

All standards and materials must be stored and handled according to method or manufacturer’s requirements in order to prevent contamination or deterioration. Refer to the Corporate Environmental Health and Safety Manual or laboratory SOPs. For safety requirements, please refer to method SOPs and the laboratory Environmental Health and Safety Manual.

Standards and reference materials shall not be used after their expiration dates unless their reliability is verified by the laboratory and their use is approved by the Quality Assurance Manager. The procedures for re-verifying expired standards are documented in SOP DV-QA-0015, Verification and Storage of Chemical Standards and Reagents.

21.4 Documentation and Labeling of Standards, Reagents, and Reference Materials

Reagents must be at a minimum the purity required in the test method. The date of reagent receipt and the expiration date are documented. The lots for most of the common solvents and acids are tested for acceptability prior to company-wide purchase. (Refer to TestAmerica’s Corporate SOP (CA-Q-S-001), Solvent and Acid Lot Testing and Approval.)

All manufacturer or vendor supplied Certificate of Analysis or Purity must be retained, stored appropriately, and readily available for use and inspection. These records are maintained by the analytical groups and by QA on the laboratory network or TestAmerica Intranet Oasis. Certificates of analysis for standards are also attached to the standard record in the Reagent Module in the LIMS. Records must be kept of the date of receipt and date of expiration of standards, reagents and reference materials. In addition, records of preparation of laboratory standards, reagents, and reference materials must be retained, stored appropriately, and be readily available for use and inspection. For detailed information on documentation and labeling, please refer to SOP DV-QA-0015, Verification and Storage of Chemical Standards and Reagents.

Commercial materials purchased for preparation of calibration solutions, spike solutions, etc., are usually accompanied with an assay certificate or the purity is noted on the label. If the assay purity is 96% or better, the weight provided by the vendor may be used without correction. If the assay purity is less than 96% a correction will be made to concentrations applied to solutions prepared from the stock commercial material. Blended gas standard cylinders use a nominal concentration if the certified value is within +/-15%, otherwise the certified values are used for the canister concentration.

21.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into the laboratory’s LIMS system, and are assigned a unique identification number. The following information is typically recorded in the electronic database within the LIMS.

- Standard ID
- Description of Standard
- Department
- Preparer’s name
• Final volume and number of vials prepared
• Solvent type and lot number
• Preparation Date
• Expiration Date
• Standard source type (source or intermediate)
• Standard type (spike, surrogate, other)
• Parent standard ID (if applicable)
• Parent Standard Analyte Concentration (if applicable)
• Parent Standard Amount used (if applicable)
• Component Analytes
• Final concentration of each analyte
• Comment box (text field)

Records are maintained electronically for standard and reference material preparation. These records show the traceability to purchased stocks or neat compounds. These records also include method of preparation, date of preparation, expiration date and preparer’s name or initials. Preparation procedures are provided in the Method SOPs.

21.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

• Expiration Date (include prep date for reagents)
• Standard ID from LIMS
• Special Health/Safety warnings if applicable

Records must also be maintained of the date of receipt and date opened for commercially purchased items or date of preparation for laboratory prepared items. Special Health/Safety warnings must also be available to the analyst. This information is maintained in the LIMS and TestAmerica Intranet Oasis.

21.4.3 In addition, the following information may be helpful:

• Date opened (Required by DOE in QSM 5.1)
• Description of standard (if different from manufacturer’s label or if standard was prepared in the laboratory)
• Recommended Storage Conditions
• Concentration (if applicable)
• Initials of analyst preparing standard or opening container

All containers of prepared reagents must include an expiration date and an ID number to trace back to preparation.

Procedures for preparation of reagents can be found in the Method SOPs.
Standard ID numbers must be traceable through associated logbooks, worksheets and preparation/analytical batch records.

All reagents and standards must be stored in accordance to the following priority: 1) with the manufacturer’s recommendations; 2) with requirements in the specific analytical methods as specified in the laboratory SOP.

SECTION 22. SAMPLING

22.1 Overview

The laboratory does not provide sampling services. The laboratory’s responsibility in the sample collection process lies in supplying the sampler with the necessary coolers, reagent water, sample containers, preservatives, sample labels, custody seals, COC forms, and packing materials required to properly preserve, pack, and ship samples to the laboratory.

22.2 Sampling Containers

The laboratory offers clean sampling containers for use by clients. These containers are obtained from reputable container manufacturers and meet EPA specifications as required. Certificates of cleanliness for the bottles and preservatives are provided by the supplier and are maintained at the laboratory or are available to the laboratory on-line.

22.2.1 Preservatives

Upon request, preservatives are provided to the client in pre-cleaned sampling containers. In some cases containers may be purchased pre-preserved from the container supplier. Whether prepared by the laboratory or bought pre-preserved, the grades of the preservatives are at a minimum:

- Hydrochloric Acid – Reagent ACS (Certified VOA Free) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – Instra-Analyzed or equivalent
- Sodium Bisulfate – ACS Grade or equivalent
- Sodium Hydroxide – Instra-Analyzed or equivalent
- Sulfuric Acid – Instra-Analyzed or equivalent
- Sodium Thiosulfate – ACS Grade or equivalent

22.3 Definition of Holding Time

The date and time of sampling documented on the COC form establishes the day and time zero. As a general rule, when the maximum allowable holding time is expressed in “days” (e.g., 14 days, 28 days), the holding time is based on calendar day measured without regard to time zero. Holding times expressed in “hours” (e.g., 6 hours, 24 hours, etc.) are measured from date and time zero, the time sampled. Holding times for analysis include any necessary reanalysis.

There are some programs that determine holding time compliance based on the date and specific time of analysis compared to the time of sampling regardless of the length of the
holding time. This must be documented as part of the project records prior to acceptance of samples.

22.4 **Sampling Containers, Preservation Requirements, Holding Times**

The preservation and holding time criteria specified in the laboratory SOPs are derived from the source documents for the methods. If method required holding times or preservation requirements are not met, the reports will be qualified using a flag, footnote or case narrative. As soon as possible or “ASAP” is an EPA designation for tests for which rapid analysis is advised, but for which neither EPA nor the laboratory have a basis for a holding time.

22.5 **Sample Aliquots / Subsampling**

Taking a representative sub-sample from a container is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need consideration when sub-sampling for sample preparation. It is the laboratory’s responsibility to take a representative subsample or aliquot of the sample provided for analysis.

Analysts should handle each sample as if it is potentially dangerous. At a minimum, safety glasses, gloves, and lab coats must be worn when preparing aliquots for analysis.

Guidelines on taking sample aliquots and subsampling are located in SOP DV-QA-0023, *Subsampling*.

**SECTION 23. HANDLING OF SAMPLES**

Sample management procedures at the laboratory ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

23.1 **Chain of Custody (COC)**

The COC form is the written documented history of any sample and is initiated when bottles are sent to the field, or at the time of sampling. This form is completed by the sampling personnel and accompanies the samples to the laboratory where it is received and stored under the laboratory’s custody. The purpose of the COC form is to provide a legal written record of the handling of samples from the time of collection until they are received at the laboratory. It also serves as the primary written request for analyses from the client to the laboratory. The COC form acts as a purchase order for analytical services when no other contractual agreement is in effect. An example of a COC form may be found in Figure 23-1.

23.1.1 **Field Documentation**

The information the sampler needs to provide at the time of sampling on the container label is:

- Sample identification
- Date and time
- Preservative

During the sampling process, the COC form is completed and must be legible (see Figure 23-1). This form includes information such as:
- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling
- Sample collector’s name
- The matrix description
- The container description
- The total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)
- Any special instructions
- Purchase Order number or billing information (e.g., quote number) if available
- The date and time that each person received or relinquished the sample(s), including their signed name.

When the sampling personnel deliver the samples directly to TestAmerica personnel, the samples are stored in a cooler with ice, as applicable, and remain solely in the possession of the client’s field technician until the samples are delivered to the laboratory personnel. The sample collector must assure that each container is in his/her physical possession or in his/her view at all times, or stored in such a place and manner to preclude tampering. The field technician relinquishes the samples in writing on the COC form to the sample control personnel at the laboratory or to a TestAmerica courier. When sampling personnel deliver the samples through a common carrier (Fed-Ex, UPS), the COC relinquished date/time is completed by the field personnel and samples are released to the carrier. Samples are only considered to be received by lab when personnel at the fixed laboratory facility have physical contact with the samples.

**Note:** Independent couriers are not required to sign the COC form. The COC is usually kept in the sealed sample cooler. The receipt from independent couriers is maintained as part of the job record.

### 23.1.2 Legal / Evidentiary Chain-of-Custody

If samples are identified for legal/evidentiary purposes on the COC, Login will complete the custody seal, retain the shipping record with the COC, and initiate an internal COC for laboratory use by analysts and a sample disposal record.

### 23.2 Sample Receipt

Samples are received at the laboratory by designated sample receiving personnel and a unique laboratory project identification number is assigned. Each sample container shall be assigned a unique sample identification number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a durable sample identification label. Sample acceptance, receipt, tracking and
storage procedures are summarized in the following sections. Refer to SOP DV-QA-0003, *Sample Management and Chain of Custody* for detailed information on receipt of samples.

### 23.2.1 Laboratory Receipt

When samples arrive at the laboratory, sample receiving personnel inspect the coolers and samples. The integrity of each sample must be determined by comparing sample labels or tags with the COC and by visual checks of the container for possible damage. Any non-conformance, irregularity, or compromised sample receipt must be documented on a Condition Upon Receipt Anomaly Form (CUR) and brought to the immediate attention of the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the project record.

#### 23.2.1.1 Unique Sample Identification

All samples that are processed through the laboratory receive a unique sample identification to ensure that there can be no confusion regarding the identity of such samples at anytime. This system includes identification for all samples, subsamples and subsequent extracts and/or digestates.

The laboratory assigns a unique identification (e.g., Sample ID) code to each sample container received at the laboratory. This Primary ID is made up of the following information (consisting of four components):

```
Example: 280 - 19608 - A - 1
```

<table>
<thead>
<tr>
<th>Location ID</th>
<th>Login ID</th>
<th>Container Occurrence</th>
<th>Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>280</td>
<td>19608</td>
<td>A</td>
<td>1</td>
</tr>
</tbody>
</table>

The above example states that the laboratory is TestAmerica Denver (Location 280). Login ID is 19608 (unique to a particular client/job occurrence). The container code indicates it is the first container (“A”) of Sample #1.

If the primary container goes through a prep step that creates a “new” container, then the new container is considered secondary and gets another ID. An example of this being a client sample in a 1-Liter amber bottle is sent through a Liquid/Liquid Extraction and an extraction vial is created from this step. The vial would be a SECONDARY container. The secondary ID has 5 components.

```
Example: 280 - 19608 - A - 1 - A
```

Example: 280-19608-A-1-A, would indicate the PRIMARY container listed above went through a step that created the first occurrence of a SECONDARY container.

With this system, a client sample can literally be tracked throughout the laboratory in every step from receipt to disposal.
23.3 **Sample Acceptance Policy**

The laboratory has a written sample acceptance policy (Figure 23-2) that clearly outlines the circumstances under which samples shall be accepted or rejected. These include:

- a COC filled out completely;
- samples must be properly labeled;
- proper sample containers with adequate volume for the analysis (Sampling Guide) and necessary QC;
- samples must be preserved according to the requirements of the requested analytical method (Sampling Guide);
- sample holding times must be adhered to (Sampling Guide);
- all samples submitted for water/solid Volatile Organic analyses must have a Trip Blank submitted at the same time;
- the project manager will be notified if any sample is received in damaged condition.

Data from samples which do not meet these criteria are flagged and the nature of the variation from policy is defined.

23.3.1 After inspecting the samples, the sample receiving personnel sign and date the COC form, make any necessary notes of the samples' conditions and store them in appropriate refrigerators or storage locations.

23.3.2 Any deviations from these checks that question the suitability of the sample for analysis, or incomplete documentation as to the tests required will be resolved by consultation with the client. If the sample acceptance policy criteria are not met, the laboratory shall either:

- Retain all correspondence and/or records of communications with the client regarding the disposition of rejected samples, or
- Fully document any decision to proceed with sample analysis that does not meet sample acceptance criteria.

Note: North Carolina requires that they be notified when samples are processed that do not meet sample acceptance criteria.

The samples are logged into the LIMS according to DV-QA-0003, *Sample Management and Chain of Custody*. Deviations from the sample acceptance criteria are noted on the Condition Upon Receipt Form (CUR) by sample receiving staff. These deviations are resolved with the client by the PM or PMA.

23.4 **Sample Storage**

In order to avoid deterioration, contamination or damage to a sample during storage and handling, from the time of receipt until all analyses are complete, samples are stored in refrigerators, freezers or protected locations suitable for the sample matrix, except metals sample containers for only ICP or ICPMS analysis which may be stored unrefrigerated. In
In addition, samples to be analyzed for volatile organic parameters are stored in separate refrigerators designated for volatile organic parameters only. Samples are never to be stored with reagents, standards or materials that may create contamination.

To ensure the integrity of the samples during storage, refrigerator blanks are maintained in the volatile sample refrigerators and analyzed every two weeks.

Analysts and technicians retrieve the sample container(s) allocated to their analysis from the designated refrigerator, place them on carts, document the transfer of containers in LIMS, analyze the sample, and return the remaining sample or empty container to the refrigerator from which it originally came, documenting the return in LIMS. Empty containers are stored in the sample archive area until disposal. This transfer is documented in LIMS. All unused samples are kept in the refrigerators until the project is invoiced. At this time, the samples will be retained for an additional thirty days, typically in the sample archive area. Special arrangements may be made to store samples for longer periods of time. This extended holding period allows additional analyses to be performed on the archived sample and assists clients in dealing with legal matters or regulatory issues. Upon disposal, the drum number used for disposal is logged into LIMS.

Access to the laboratory is controlled such that sample storage need not be locked at all times unless a project specifically demands it. Samples are accessible to laboratory personnel only. Visitors to the laboratory are prohibited from entering the refrigerator and laboratory areas unless accompanied by an employee of TestAmerica.

23.5 **Hazardous Samples and Foreign Soils**

Any sample that is received from a foreign country or from a USDA quarantine area within the United States must be sent with a copy of the laboratory’s soil import permit and each cooler must have affixed a soil import permit label (Form 550) with the accompanying soil import permit number. See SOP DV-QA-0019, *Quarantine Soils Procedure*.

For any sample that is known to be hazardous at the time of receipt or, if after completion of analysis the result exceeds the acceptable regulatory levels, this is documented in a nonconformance memo. Analysts will notify the entire laboratory of any sample determined to be hazardous during handling or analysis by sending an email. All hazardous samples are either returned to the client or disposed of appropriately through a hazardous waste disposal firm that lab-packs all hazardous samples and removes them from the laboratory. Foreign soil samples are sent out for incineration by a USDA-approved waste disposal facility.

23.6 **Sample Shipping**

In the event that the laboratory needs to ship samples, the samples are placed in a cooler with enough ice to ensure the samples remain just above freezing and at or below 6°C during transit. The samples are carefully surrounded by packing material to avoid breakage (yet maintain appropriate temperature). A trip blank is enclosed for those samples requiring water/solid volatile organic analyses (see Note). The chain-of-custody form is signed by the sample control technician and attached to the shipping paperwork. Details of the procedure for shipping samples to another location are described in SOP DV-QA-0036, *Sub-out Work Sample Management and Chain of Custody*. Samples are generally shipped overnight express or hand-delivered by a TestAmerica courier to maintain sample integrity. All personnel involved with shipping and receiving samples must be trained to maintain the proper chain-of-custody...
documentation and to keep the samples intact and on ice. The Environmental, Health and Safety Manual contains additional shipping requirements.

**Note:** If a client does not request trip blank analysis on the COC or other paperwork, the laboratory will not analyze the trip blanks that were supplied. However, in the interest of good client service, the laboratory will advise the client at the time of sample receipt that it was noted that they did not request analysis of the trip blank; and that the laboratory is providing the notification to verify that they are not inadvertently omitting a key part of regulatory compliance testing.

### 23.7 Sample Disposal

Samples should be retained for a minimum of 30 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after project report is sent). The laboratory must follow the longer sample retention requirements where required by regulation or client agreement. Several possibilities for sample disposal exist: the sample may be consumed completely during analysis, the sample may be returned to the customer or location of sampling for disposal, or the sample may be disposed of in accordance with the laboratory’s waste disposal procedures (SOP: DV-HS-0005, Excess Sample Material Management). All procedures in the laboratory Environmental, Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than two months from receipt unless otherwise requested. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

If a sample is part of a known litigation, the affected legal authority, sample data user, and/or submitter of the sample must participate in the decision about the sample’s disposal. All documentation and correspondence concerning the disposal decision process must be kept on file. Pertinent information includes the date of disposal, nature of disposal (such as sample depletion, hazardous waste facility disposal, return to client), names of individuals who conducted the arrangements and physically completed the task. The laboratory will remove or deface sample labels prior to disposal unless this is accomplished through the disposal method (e.g., samples are incinerated). A Hazardous Waste Manifest will be prepared to document the disposal of each drum. Additional detail is in SOP DV-HS-0004, Hazardous Waste Manifesting.
Figure 23-1. Example: Chain of Custody (COC)

<table>
<thead>
<tr>
<th>Sample Identification</th>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Type</th>
<th>Matrix</th>
<th>Test No.</th>
<th>Project Manager</th>
<th>Regulatory Manager</th>
<th>Analyst/Technician</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Company Confidential and Proprietary
Figure 23-2. Example: Sample Acceptance Policy

All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria listed below will be noted on the laboratory report defining the nature and substance of the variation. In addition the client will be notified either by telephone, fax or e-mail as soon as possible after the receipt of the samples.

Per State and/or Federal Regulation, the client is responsible to ensure that samples are shipped in accordance with DOT/IATA requirements, and that radioactive materials may only be delivered to licensed facilities. Any samples containing (or suspected to contain) Source, Byproduct, or Special Nuclear Material as defined by 10 CFR should be delivered directly to facilities licensed to handle such radioactive material. Natural material or ores containing naturally occurring radionuclides may be delivered to any TestAmerica facility or courier as long as the activity concentration of the material does not exceed 270 pCi/g alpha or 2700 pCi/g beta (49 CFR Part 173).

1) Samples must arrive with labels intact with a Chain of Custody filled out completely. The following information must be recorded.

- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling
- The collector's name
- The matrix description
- The container description
- The total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)
- Any special instructions
- Purchase Order number or billing information (e.g., quote number) if available
- The date and time that each person received or relinquished the sample(s), including their signed name.
- The date and time of receipt must be recorded between the last person to relinquish the samples and the person who receives the samples in the lab, and they must be exactly the same.
- Information must be legible

2) Samples must be properly labeled.

- Use durable labels (labels provided by TestAmerica are preferred)
- Include a unique identification number
- Include sampling date and time and sampler ID
- Include preservative used.
- Use indelible ink
- Information must be legible

3) Proper sample containers with adequate volume for the analysis and necessary QC are required for each analysis requested. See Lab Sampling Guide.

4) Samples must be preserved according to the requirements of the requested analytical method (See Sampling Guide.

5) Most analytical methods require chilling samples to 4° C (other than water samples for metals analysis). For these methods, the criteria are met if the samples are chilled to below 6° C and above freezing (0° C). For methods with other temperature criteria (e.g., some bacteriological methods require < 10° C), the samples must arrive within ± 2° C of the required temperature or within the method specified range.
5i.) Samples that are delivered to the laboratory on the same day they are collected may not meet the requirements of Section 5. In these cases, the samples shall be considered acceptable if the samples were received on ice.

5ii.) If sample analysis is begun within fifteen (15) minutes of collection, thermal preservation is not required.

5iii.) Thermal preservation is not required in the field if the laboratory receives and refrigerates the sample within fifteen (15) minutes of collection.

- Chemical preservation (pH) will be verified prior to analysis and documented, either in sample control or by the analyst. The project manager will be notified immediately if there is a discrepancy. If analyses will still be performed, all affected results will be flagged to indicate improper preservation.

- For Volatile Organic analyses in drinking water (Methods 502.2 or 524.2) residual chlorine must be neutralized prior to preservation. If there is prior knowledge that the samples are not chlorinated, state it on the COC and use the VOA vials pre-preserved with HCl. The following are other options for a sampler and laboratory where the presence of chlorine is not known:
  1. Test for residual chlorine in the field prior to sampling.
     - If no chlorine is present, the samples are to be preserved using HCl as usual.
     - If chlorine is present, add either ascorbic acid or sodium thiosulfate prior to adding HCl.
  2. Use VOA vials pre-preserved with sodium thiosulfate or ascorbic acid and add HCl after filling the VOA vial with the sample.

- FOR WATER SAMPLES TESTED FOR CYANIDE (by Standard Methods or EPA 335)
  - In the Field: Samples are to be tested for Sulfide using lead acetate paper prior to the addition of Sodium Hydroxide (NaOH). If sulfide is present, the sample must be treated with Cadmium Chloride and filtered prior to the addition of NaOH.
  - If the sulfide test and treatment is not performed in the field, the lab will test the samples for sulfide using lead acetate paper at the time of receipt and if sulfide is present in the sample, the client will be notified and given the option of retaking the sample and treating in the field per the method requirements or the laboratory can analyze the samples as delivered and qualify the results in the final report.

- It is the responsibility of the client to notify the laboratory if thiosulfate, sulfite, or thiocyanate are known or suspected to be present in the sample. This notification may be on the chain of custody. The samples may need to be subcontracted to a laboratory that performs a UV digestion. If the lab does not perform the UV digestion on samples that contain these compounds, the results must be qualified in the final report.

- The laboratory must test the sample for oxidizing agents (e.g., chlorine) prior to analysis and treat according to the methods prior to distillation. (Ascorbic acid or sodium arsenite are the preferred choice.)

6) Sample Holding Times

- TestAmerica will make every effort to analyze samples within the regulatory holding time. Samples must be received in the laboratory with enough time to perform the sample analysis. Except for short holding time samples (< 48 hr HT) sample must be received with at least 48 hr (working days) remaining on the holding time for the laboratory to ensure analysis.

- Analyses that are designated as “field” analyses (Odor, pH, Dissolved Oxygen, Disinfectant Residual; a.k.a. Residual Chlorine, and Redox Potential) should be analyzed ASAP by the field sampler prior to delivering to the lab (within 15 minutes). However, if the analyses are to be performed in the laboratory, TestAmerica will make every effort to analyze the samples within 24 hours from receipt of the samples in the testing laboratory. Samples for “field” analyses received
after 4:00 pm on Friday or on the weekend will be analyzed no later than the next business day after receipt (Monday unless a holiday). Samples will remain refrigerated and sealed until the time of analysis. The actual times of all “field” sample analyses are noted on the “Short Hold Time Detail Report” in the final report. Samples analyzed in the laboratory will be qualified on the final report with an ‘H’ to indicate holding time exceedance.

7) All samples submitted for Volatile Organic analyses must have a Trip Blank submitted at the same time. TestAmerica will supply a blank with the bottle order.

8) The project manager will be notified if any sample is received in damaged condition. TestAmerica will request that a sample be resubmitted for analysis.

9) Recommendations for packing samples for shipment:
   - Pack samples in Ice rather than “Blue” ice packs.
   - Soil samples should be placed in plastic zip-lock bags. The containers often have dirt around the top and do not seal very well and are prone to intrusion from the water from melted ice.
   - Water samples would be best if wrapped with bubble-wrap or paper (newspaper, or paper towels work) and then placed in plastic zip-lock bags.
   - Fill extra cooler space with bubble wrap.
Figure 23-3. Example: Cooler Receipt Form

TestAmerica Denver
Sample Receiving Checklist
DV-QA-0003
Login #____________________ Date/Time Received:____________________

Company Name & Sampling Site:__________________________________________

Time Zone: ● EDT/EST ● CDT/CST ● MDT/MDT ● PDT/PST ● OTHER State:____________

Document any problems or discrepancies and the actions taken to resolve them on a Condition Upon Receipt Anomaly Report (CUR)

Temp____________ IRCR#_________ Temp____________ IRCR#_________ Temp____________ IRCR#_________ Temp____________ IRCR#_________

CF________ Initials_________ CF________ Initials_________ CF________ Initials_________ CF________ Initials_________

Date____________________ Date____________________ Date____________________ Date____________________

N/A Yes No Initials_________

☐ ☐ ☐ 1. Is radioactivity at or below background? BKG CPM:___________ CPM Reading:_________

☐ ☐ ☐ 2a. Is a custody seal present on the cooler?

☐ ☐ ☐ 2b. If yes, is the cooler’s custody seal intact?

☐ ☐ ☐ 2c. Do cooler or samples appear to have not been compromised or tampered with?

☐ ☐ ☐ 3a. Were samples received on ice?

☐ ☐ ☐ 3b. Is cooler temperature acceptable?

☐ ☐ ☐ 3c. Has temperature been recorded?

☐ ☐ ☐ 4. Is COC present; filled out in ink and legible; and filled out with all pertinent information?

☐ ☐ ☐ 5. Is the Field Sampler’s name present on the COC?

☐ ☐ ☐ 6a. Are there no discrepancies between the sample IDs and/or collection date and time on the containers and the COC?

☐ ☐ ☐ 6b. Are there no discrepancies between the container types and those listed on the COC?

☐ ☐ ☐ 7. Are samples received within Holding Time?

☐ ☐ ☐ 8. Do sample containers have legible labels?

☐ ☐ ☐ 9. Are all sample containers intact (not broken or leaking)?

☐ ☐ ☐ 10a. Are appropriate sample containers used?

☐ ☐ ☐ 10b. Are sample bottles completely filled? (Perchlorate bottles ≥ 1/3 head space)

☐ ☐ ☐ 10c. Is sufficient vol. for all requested analyses, incl. any requested MS/MSDs provided?

☐ ☐ ☐ 11. No splitting or composting of samples required?

☐ ☐ ☐ 12. Do all VOA sample vials have no headspace or bubbles >6 mm (1/4") in diameter?

☐ ☐ ☐ 13. Were VOA vials labeled as preserved? ☐ HCl ☐ 0-6°C ☐ Sodium Thiosulfate ☐ Ascorbic Acid ☐ Other

☐ ☐ ☐ 14. Are all samples single phase? (i.e., no multiphasic samples are present.)

Login Checks:

Initials_________

☐ ☐ ☐ 15. Was a Priority Form completed for any short holds or quick TATs?

☐ ☐ ☐ 16. Were any tests logged for subcontract?

☐ ☐ ☐ 17. Were special archiving instructions and login instructions indicated in the Project Notes?

Note Archive Requirements:

☐ ☐ ☐ 18. Were multiple Series logged for this job?

Labeling and Storage Checks:

Initials_________

pH Checks Required? ☐ Yes ☐ No ☐ Residual chlorine check required: ☐ Yes ☐ No ☐ Quarantined: ☐ Yes ☐ No

☑ ☐ ☐ 19. Was Sample Preservation verified and found to be correct? (excluding VOA, Oil & Grease, and TOC volumes)

☐ ☐ ☐ 20. Was Residual Chlorine checked and noted on the CUR if present?

☐ ☐ ☐ 21. If subcontract work was requested, was volume placed on sub shelf?

☐ ☐ ☐ 22. Were Terracore/Encores delivered to VOA lab?

☐ ☐ ☐ 23. Did the sample ID on TA label match the client’s sample ID on container?

☐ ☐ ☐ 24. Were stickers for special archiving instructions affixed to each box?

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Company Confidential and Proprietary
SECTION 24. ASSURING THE QUALITY OF TEST RESULTS

24.1 Overview

In order to assure clients of the validity of their data, the laboratory continuously evaluates the quality of the analytical process. The analytical process is controlled not only by instrument calibration as discussed in Section 20, but also by routine process quality control measurements (e.g., Blanks, Laboratory Control Samples (LCS), Matrix Spikes (MS), duplicates (DUP), surrogates, Internal Standards (IS)). These quality control checks are performed as required by the method or regulations to assess precision and accuracy. Quality control samples are to be treated in the exact same manner as the associated field samples being tested. In addition to the routine process quality control samples, Proficiency Testing (PT) Samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

24.2 Controls

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, drying and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control samples are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

24.3 Negative Controls

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method Blank (MB)</td>
<td>Used to assess preparation and analysis for possible contamination during the preparation and processing steps.</td>
</tr>
<tr>
<td></td>
<td>The specific frequency of use for method blanks during the analytical sequence is defined in the specific standard operating procedure for each analysis. Generally it is one for each batch of samples; not to exceed 20 environmental samples.</td>
</tr>
<tr>
<td></td>
<td>The method blank is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (e.g., Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples.</td>
</tr>
<tr>
<td></td>
<td>The method blank goes through all of the steps of the process (including, as necessary: filtration, clean-ups, etc.).</td>
</tr>
<tr>
<td></td>
<td>Reanalyze or qualify associated sample results when the concentration of a targeted analyte in the blank is at or above one-half the reporting limit as established by the method or by regulation, AND is greater than 1/10 of the amount measured in the sample. For some wet chemistry methods, the allowable blank may contain up to the reporting limit, as defined in the method SOP.</td>
</tr>
<tr>
<td>Calibration Blanks</td>
<td>Prepared and analyzed along with calibration standards where applicable. They are prepared using the same reagents that are used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.</td>
</tr>
<tr>
<td>Instrument Blanks</td>
<td>Blank reagents or reagent water that may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.</td>
</tr>
</tbody>
</table>
Table 24-1. Example – Negative Controls

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip Blank *</td>
<td>Required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses (or as specified in the client's project plan). Additionally, trip blanks may be prepared and analyzed for volatile analysis of air samples, when required by the client. A trip blank may be purchased (certified clean) or is prepared by the laboratory by filling a clean container with pure deionized free of any volatile compounds. Appropriate preservatives are also added to the container. The trip blank is sent with the bottle order and is intended to reflect the environment that the containers are subjected to throughout shipping and handling and help identify possible sources if contamination is found. The field sampler returns the trip blank in the cooler with the field samples.</td>
</tr>
<tr>
<td>Field Blanks *</td>
<td>Sometimes used for specific projects by the field samplers. A field blank prepared in the field by filling a clean container with pure reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)</td>
</tr>
<tr>
<td>Equipment Blanks *</td>
<td>Sometimes created in the field for specific projects. An equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (TNI)</td>
</tr>
<tr>
<td>Holding Blanks</td>
<td>Also referred to as refrigerator or freezer blanks, are used to monitor the sample storage units for volatile organic compounds during the storage of VOA samples in the laboratory.</td>
</tr>
</tbody>
</table>

* When known, these field QC samples should not be selected for matrix QC as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB."

Evaluation criteria and corrective action for these controls are defined in the specific standard operating procedure for each analysis.

24.4 Positive Controls

Control samples (e.g., QC indicators) are analyzed with each batch of samples to evaluate data based upon (1) Method Performance (Laboratory Control Sample (LCS) or Blank Spike (BS)), which entails both the preparation and measurement steps; and (2) Matrix Effects (Matrix Spike (MS) (Matrix spikes are not applicable to air) or Sample Duplicate (MD, DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch.

Note that frequency of control samples vary with specific regulatory, methodology and project specific criteria. Complete details on method control samples are as listed in each analytical SOP.

24.4.1 Method Performance Control - Laboratory Control Sample (LCS)

The LCS measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects in a laboratory batch.

The LCS is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (for example: reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The LCS is spiked with verified known amounts of analytes or is made of a material containing known and verified amounts of analytes, taken through all preparation and analysis steps along with the field samples. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), a calibration verification standard is reported as the LCS. In some instances where there is no practical clean solid matrix available, aqueous LCS’s may be
processed for solid matrices; final results may be calculated as mg/kg or μg/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the field samples.

Certified pre-made reference material purchased from a NIST/A2LA accredited vendor may also be used for the LCS when the material represents the sample matrix or the analyte is not easily spiked (e.g., solid matrix LCS for metals, TDS, etc.).

The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis. It is generally one for each batch of samples; not to exceed 20 environmental samples.

If the mandated or requested test method, or project requirements, do not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample (and Matrix Spike) where applicable (e.g., no spike of pH). However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, at a minimum, a representative number of the listed components (see below) shall be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components. The laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

- For methods that have 1-10 target analytes, spike all components.
- For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.
- For methods with more than 20 target analytes, spike at least 16 components.
- Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.
- Exception: Due to analyte incompatibility between the various PCB aroclors, Aroclors 1016 and 1260 are used for spiking as they cover the range of all of the aroclors. Specific aroclors may be used by request on a project specific basis.

### 24.5 Sample Matrix Controls

#### Table 24-2. Sample Matrix Control

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix Spikes (MS) Use</td>
<td>To assess the effect sample matrix of the spiked sample has on the precision and accuracy of the results generated by the method used;</td>
</tr>
<tr>
<td>Typical Frequency</td>
<td>At a minimum, with each matrix-specific batch of samples processed, an MS is carried through the complete analytical procedure. Unless specified by the client, samples used for spiking are randomly selected and rotated between different client projects. If the mandated or requested test method does not specify the spiking components, the laboratory shall spike the same set of compounds in both the Laboratory Control Sample and Matrix Spike. Refer to the method SOP for complete details.</td>
</tr>
<tr>
<td>Description</td>
<td>A sample fortified with a known amount of the test analyte(s).</td>
</tr>
<tr>
<td>Surrogate Use</td>
<td>Measures method performance to sample matrix (organics only).</td>
</tr>
</tbody>
</table>
Table 24-2. Sample Matrix Control

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Frequency</td>
<td>Are added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. The recovery of the surrogates is compared to the acceptance limits for the specific method. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers, to the client whose sample produced poor recovery.</td>
</tr>
<tr>
<td>Description</td>
<td>Similar to matrix spikes except the analytes are compounds with properties that mimic the analyte of interest and are unlikely to be found in environment samples.</td>
</tr>
<tr>
<td>Duplicates(^1)</td>
<td>As a measure of analytical precision, with each matrix-specific batch of samples processed, a matrix duplicate (MD or DUP) sample, matrix spike duplicate (MSD), or LCS duplicate (LCSD) is carried through the complete analytical procedure.</td>
</tr>
<tr>
<td>Description</td>
<td>Performed by analyzing two aliquots of the same field sample independently or an additional LCS.</td>
</tr>
<tr>
<td>Internal Standards</td>
<td>Use Spiked into all environmental and quality control samples (including the initial calibration standards) to monitor the qualitative aspect of organic and some inorganic analytical measurements.</td>
</tr>
<tr>
<td>Description</td>
<td>Used to correct for matrix effects and to help troubleshoot variability in analytical response and are assessed after data acquisition. Possible sources of poor internal standard response are sample matrix, poor analytical technique or instrument performance.</td>
</tr>
</tbody>
</table>

\(\text{Note: }^2\) See the specific analytical SOP for type and frequency of sample matrix control samples.

\(\text{Note: }^2\) LCSD’s are normally not performed except when regulatory agencies or client specifications require them. The recoveries for the spiked duplicate samples must meet the same laboratory established recovery limits as the accuracy QC samples. If an LCSD is analyzed both the LCS and LCSD must meet the same recovery criteria and be included in the final report. The precision measurement is reported as “Relative Percent Difference” (RPD). Poor precision between duplicates (except LCS/LCSD) may indicate non-homogeneous matrix or sampling.

24.6 Acceptance Criteria (Control Limits)

As mandated by the test method and regulation, each individual analyte in the LCS, MS, or Surrogate Spike is evaluated against the control limits published in the test method. Where there are no established acceptance criteria, the laboratory calculates in-house control limits with the use of control charts or, in some cases, utilizes client project specific control limits. When this occurs, the regulatory or project limits will supersede the laboratory’s in-house limits.

**Note:** For methods, analytes and matrices with very limited data (e.g., unusual matrices not analyzed often), interim limits are established using available data or by analogy to similar methods or matrices.

Once control limits have been established, they are verified, reviewed, and updated if necessary on an annual basis unless the method or program requires more frequent updating. Control limits are established per method (as opposed to per instrument) regardless of the number of instruments utilized.

Laboratory generated Percent Recovery acceptance (control) limits are generally established by taking $$\pm 3$$ standard deviations (99% confidence level) from the average recovery of a minimum of 20-30 data points (more points are preferred).

- Regardless of the calculated limit, the limit should be no tighter than the Calibration Verification (ICV/CCV). (Unless the analytical method specifies a tighter limit).
In-house limits cannot be any wider than those mandated in a regulated analytical method. Client or contract required control limits are evaluated against the laboratory’s statistically derived control limits to determine if the data quality objectives (DQOs) can be achieved. If laboratory control limits are not consistent with DQOs, then alternatives must be considered, such as method improvements or use of an alternate analytical method.

The lowest acceptable recovery limit will be 10% (the analyte must be detectable and identifiable). Exception: The lowest acceptable recovery limit for Benzidine will be 5% and the analyte must be detectable and identifiable.

The minimum RPD limit is 10%.

If either the high or low end of the control limit changes by < 5% from previous, the control chart is visually inspected and, using professional judgment, they may be left unchanged if there is no affect on laboratory ability to meet the existing limits.

24.6.1 The lab must be able to generate a current listing of their control limits and track when the updates are performed. In addition, the laboratory must be able to recreate historical control limits. Refer to SOP DV-QA-003P, Quality Control Program for a detailed description of the control charting procedure.

24.6.2 A LCS that is within the acceptance criteria establishes that the analytical system is in control and is used to validate the process. Samples that are analyzed with an LCS with recoveries outside of the acceptance limits may be determined as out of control and should be reanalyzed if possible. If reanalysis is not possible, then the results for all affected analytes for samples within the same batch must be qualified when reported. The internal corrective action process (see Section 12) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

- The analyte results are below the reporting limit and the LCS is above the upper control limit.
- The analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

For TNI and DoD/DOE work, there are an allowable number of Marginal Exceedances (ME):

<table>
<thead>
<tr>
<th>Range of Analytes</th>
<th>Maximum Marginal Exceedances</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;11 analytes</td>
<td>0</td>
</tr>
<tr>
<td>11-30 Analytes</td>
<td>1</td>
</tr>
<tr>
<td>31-50 Analytes</td>
<td>2</td>
</tr>
<tr>
<td>51-70 Analytes</td>
<td>3</td>
</tr>
<tr>
<td>71-90 Analytes</td>
<td>4</td>
</tr>
<tr>
<td>&gt;90 Analytes</td>
<td>5</td>
</tr>
</tbody>
</table>

Marginal exceedances are recovery exceedances between 3 SD and 4 SD from the mean recovery limit (TNI).

Marginal exceedances must be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systematic problem. For any systematic problem, the source of the error must be located and corrective action taken. The laboratory has a system to monitor marginal exceedances to ensure that they are random.

Though marginal exceedances may be allowed, the data must still be qualified to indicate it is outside of the normal limits. For any project that does not allow marginal exceedances this requirement must be communicated to the laboratory.
24.6.3 If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample is reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, or if requested by the client, unacceptable MS/MSDs are reprocessed and reanalyzed to prove matrix interference. A more detailed discussion of acceptance criteria and corrective action can be found in the lab’s method SOPs and in Section 12.

24.6.4 If a surrogate standard falls outside the acceptance limits, if there is not obvious chromatographic matrix interference, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets surrogate recovery criteria, the second run is reported (or both are reported if requested by the client). Under certain circumstances, where all of the samples are from the same location and share similar chromatography, the reanalysis may be performed on a single sample rather than all of the samples and if the surrogate meets the recovery criteria in the reanalysis, all of the affected samples would require reanalysis.

24.7 Additional Procedures to Assure Quality Control

The laboratory has written and approved method SOPs to assure the accuracy of the test method including calibration (see Section 20), use of certified reference materials (see Section 21) and use of PT samples (see Section 15).

A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 19.

- Use of formulae to reduce data is discussed in the method SOPs and in Section 20.
- Selection of appropriate reagents and standards is included in Section 9 and 21.
- A discussion on selectivity of the test is included in Section 5.
- Constant and consistent test conditions are discussed in Section 18.
- The laboratories sample acceptance policy is included in Section 23.

SECTION 25. REPORTING RESULTS

25.2 Overview

The results of each test are reported accurately, clearly, unambiguously, and objectively in accordance with State and Federal regulations as well as client requirements. Analytical results are issued in a format that is intended to satisfy customer and laboratory accreditation requirements as well as provide the end user with the information needed to properly evaluate the results. Where there is conflict between client requests and laboratory ethics or regulatory requirements, the laboratory’s ethical and legal requirements are paramount, and the laboratory will work with the client during project set up to develop an acceptable solution. Refer to Section 7.

A variety of report formats are available to meet specific needs.

In cases where a client asks for simplified reports, there must be a written request from the client. There still must be enough information that would show any analyses that were out of
conformance (QC out of limits) and there should be a reference to a full report that is made available to the client. Review of reported data is included in Section 19.

25.3 **Test Reports**

Analytical results are reported in a format that is satisfactory to the client and meets all requirements of applicable accrediting authorities and agencies. A variety of report formats are available to meet specific needs. The report, containing the laboratory name on the cover page, is reviewed, and signed by the appropriate project manager (or designee). At a minimum, the standard laboratory report shall contain the following information:

25.3.1 A report title (e.g., Analytical Report For Samples) with a “sample results” column header.

25.3.2 Each report cover page includes the laboratory name, address and telephone number.

25.3.3 A unique identification of the report (e.g., job number) and on each page an identification in order to ensure the page is recognized as part of the report and a clear identification of the end.

**Note:** Page numbers of the report are represented as page # of ##. Where the first number is the page number and the second is the total number of pages.

25.3.4 A copy of the chain of custody (COC) and any COCs involved with Subcontracting are included.

25.3.5 The name and address of client and a project name/number, if applicable.

25.3.6 Client project manager or other contact

25.3.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

25.3.8 Date of receipt of sample, date and time of collection, and date(s) of test preparation and performance, and time of preparation or analysis if the required holding time for either activity is less than or equal to 72 hours.

25.3.9 Date reported or date of revision, if applicable.

25.3.10 Method of analysis including method code (EPA, Standard Methods, etc.).

25.3.11 Reporting limit.

25.3.12 Method detection limits (if requested)

25.3.13 Definition of Data qualifiers and reporting acronyms (e.g., ND).

25.3.14 Sample results.

25.3.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits.
25.3.16 Condition of samples at receipt including temperature. This may be accomplished in a narrative or by attaching sample login sheets.

25.3.17 A statement expressing the validity of the results, that the source methodology was followed and all results were reviewed for error.

25.3.18 A statement to the effect that the results relate only to the items tested and the sample as received by the laboratory.

25.3.19 A statement that the report shall not be reproduced except in full, without prior express written approval by the laboratory.

25.3.20 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Authorized signatories are qualified Project Managers appointed by the Manager of Project Managers.

25.3.21 When TNI accreditation is required, the lab shall certify that the test results meet all requirements of TNI or provide reasons and/or justification if they do not.

25.3.22 Where applicable, a narrative to the report that explains the issue(s) and corrective action(s) taken in the event that a specific accreditation or certification requirement was not met.

25.3.23 When soil samples are analyzed, a specific identification as to whether soils are reported on a “wet weight” or “dry weight” basis.

25.3.24 Appropriate laboratory certification number for the state of origin of the sample, if applicable.

25.3.25 If only part of the report is provided to the client (client requests some results before all of it is complete), it must be clearly indicated on the report (e.g., partial report or preliminary report). A complete report must be sent once all of the work has been completed.

25.3.26 Any non-TestAmerica subcontracted analysis results are provided as a separate report on the official letterhead of the subcontractor. All TestAmerica subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

25.3.27 A Certification Summary Report, where required, will document that, unless otherwise noted, all analytes tested and reported by the laboratory were covered by the noted certifications.

Note: Refer to Corporate SOP CA-I-P-002, Electronic Reporting and Signature Policy, for details on internally applying electronic signatures of approval.

25.4 Reporting Level or Report Type

The laboratory offers four levels of quality control reporting. Each level, in addition to its own specific requirements, contains all the information provided in the preceding level. The packages provide the following information in addition to the information described above:

- Level I is a report with the elements described in Section 25.2 above, excluding 25.2.15 (QC Data)
Level II is a Level I report plus summary information, including results for the method blank, percent recovery for laboratory control samples and matrix spike samples, and the RPD values for all MSD and sample duplicate analyses.

Level III contains all the information supplied in Level II, but presented on the CLP-like summary forms, and relevant calibration information. A Level II report is not included, unless specifically requested. No raw data are provided.

Level IV is the same as Level III with the addition of all raw supporting data.

In addition to the various levels of QC packaging, the laboratory also provides reports in diskette deliverable form. Initial (preliminary) reports may be provided to clients by facsimile. Procedures used to ensure client confidentiality are outlined in Section 25.6.

25.4.1 **Electronic Data Deliverables (EDDs)**

EDDs are routinely offered as part of TestAmerica's services. The Denver laboratory offers a variety of EDD formats including Environmental Restoration Information Management System (ERPIMS), New Agency Standard (NAS), Format A, Excel, Dbase, GISKEY, SEDD2A, and Text Files.

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process. Once the facility has committed to providing data in a specific electronic format, the coding of the format may need to be performed. This coding is documented and validated. The validation of the code is retained by the IT staff coding the EDD.

EDDs shall be subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory can demonstrate that it can routinely generate that EDD without errors. Any revisions to the EDD format must be reviewed until it is demonstrated that it can routinely be generated without errors. If the EDD can be reproduced accurately and if all subsequent EDDs can be produced error-free, each EDD does not necessarily require a review.

25.5 **Supplemental Information for Test**

The lab identifies any unacceptable QC analyses or any other unusual circumstances or observations such as environmental conditions and any non-standard conditions that may have affected the quality of a result. This is typically in the form of a footnote or a qualifier and/or a narrative explaining the discrepancy in the front of the report.

Numeric results with values outside of the calibration range, either high or low are qualified as ‘estimated’.

Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications is required, including identification of test results derived from any sample that did not meet TNI sample acceptance requirements such as improper container, holding time, or temperature.

Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client’s instructions so require.
Opinions and Interpretations - The test report contains objective information, and generally does not contain subjective information such as opinions and interpretations. If such information is required by the client, the Laboratory Director will determine if a response can be prepared. If so, the Laboratory Director will designate the appropriate member of the management team to prepare a response. The response will be fully documented, and reviewed by the Laboratory Director, before release to the client. There may be additional fees charged to the client at this time, as this is a non-routine function of the laboratory.

Note: Review of data deliverable packages for submittal to regulatory authorities requires responses to non-conforming data concerning potential impact on data quality. This necessitates a limited scope of interpretation, and this work is performed by the QA Department. This is the only form of “interpretation” of data that is routinely performed by the laboratory.

When opinions or interpretations are included in the report, the laboratory provides an explanation as to the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly noted as such and where applicable, a comment should be added suggesting that the client verify the opinion or interpretation with their regulator.

25.6 Environmental Testing Obtained From Subcontractors

If the laboratory is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in the Corporate SOP on Subcontracting (SOP CW-L-S-004).

Data reported from analyses performed by a subcontractor laboratory are clearly identified as such on the analytical report provided to the client. Results from a subcontract laboratory outside of TestAmerica are reported to the client on the subcontract laboratory’s original report stationary and the report includes any accompanying documentation.

25.7 Client Confidentiality

In situations involving the transmission of environmental test results by telephone, facsimile or other electronic means, client confidentiality must be maintained.

TestAmerica will not intentionally divulge to any person (other than the Client or any other person designated by the Client in writing) any information regarding the services provided by TestAmerica or any information disclosed to TestAmerica by the Client. Furthermore, information known to be potentially endangering to national security or an entity’s proprietary rights will not be released.

Note: This shall not apply to the extent that the information is required to be disclosed by TestAmerica under the compulsion of legal process. TestAmerica will, to the extent feasible, provide reasonable notice to the client before disclosing the information.

Note: Authorized representatives of an accrediting authority are permitted to make copies of any analyses or records relevant to the accreditation process, and copies may be removed from the laboratory for purposes of assessment.

25.7.1 Report deliverable formats are discussed with each new client. If a client requests that reports be faxed or e-mailed, the reports are to meet all requirements of this document and include a cover letter.
25.8 Format of Reports

The format of reports is designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

25.9 Amendments to Test Reports

Corrections, additions, or deletions to reports are only made when justification arises through supplemental documentation. Justification is documented using the laboratory’s corrective action system (refer to Section 12).

The revised report is retained on the Archive data server, as is the original report. The revised report is stored in the Archive data server under the job number followed by “Rev#”. The revised report will have the word “revised” or “amended” next to the date rather than the word “reported”.

When the report is re-issued, a notation of “Revision #” is placed on the cover/signature page of the report. The revision history, revision number and date, is listed in the narrative with a brief explanation of reason for the re-issue. For Example: Revision 1: June 19, 2014 This revision was necessary to change the 8270 SVOC analyte bis(2-Chloroisopropyl)ether to 2,2′-oxybis(1-chloropropane) per client request. No changes to the data results were required. The Level IV report has been revised to reflect this change.

25.10 Policies on Client Requests for Amendments

25.10.1 Policy on Data Omissions or Reporting Limit Increases

Fundamentally, laboratory policy is simply to not omit previously reported results (including data qualifiers) or to not raise reporting limits and report sample results as ND. This policy has few exceptions. Exceptions are:

- Laboratory error.
- Sample identification is indeterminate (confusion between COC and sample labels).
- An incorrect analysis (not analyte) was requested (e.g., COC lists 8315 but client wanted 8310). A written request for the change is required.
- Incorrect limits reported based on regulatory requirements.
- The requested change has absolutely no possible impact on the interpretation of the analytical results and there is no possibility of the change being interpreted as misrepresentation by anyone inside or outside of TestAmerica.

25.10.2 Multiple Reports

TestAmerica does not issue multiple reports for the same work order where there is different information on each report (this does not refer to copies of the same report) unless required to meet regulatory needs and approved by QA.
Appendix 1. Laboratory Floor Plan

TestAmerica
Denver
Appendix 2. Glossary/Acronyms (EL-V1M2 Sec. 3.1)

Glossary:

Acceptance Criteria: Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst: The designated individual who performs the “hands-on” analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Analytical Uncertainty: A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis. (TNI)

Anomaly: A condition or event, other than a deficiency, that may affect the quality of the data, whether in the laboratory’s control or not.

Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of laboratory accreditation). (TNI)

Audit: A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives. (TNI)

Batch: Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one (1) to twenty (20) environmental samples of the same quality systems matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be twenty-four (24) hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed twenty (20) samples. (TNI)

Bias: The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample’s true value). (TNI)

Blank: A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Calibration: A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. (TNI)

1) In calibration of support equipment the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI).
2) In calibration according to methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.

**Calibration Curve:** The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (TNI)

**Calibration Standard:** A substance or reference material used to calibrate an instrument (QAMS)

**Certified Reference Material (CRM):** A reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute. (TNI)

**Chain of Custody (COC) Form:** Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; the collector; time of collection; preservation; and requested analyses. (TNI)

**Compromised Samples:** Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions, compromised samples are not analyzed. If emergency situation require analysis, the results must be appropriately qualified.

**Confidential Business Information (CBI):** Information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products. TNI and its representatives agree to safeguard identified CBI and to maintain all information identified as such in full confidentiality.

**Confirmation:** Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to Second Column Confirmation; Alternate wavelength; Derivatization; Mass spectral interpretation; Alternative detectors or Additional Cleanup procedures. (TNI)

**Conformance:** An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

**Correction:** Actions necessary to correct or repair analysis specific non-conformances. The acceptance criteria for method specific QC and protocols as well as the associated corrective actions. The analyst will most frequently be the one to identify the need for this action as a result of calibration checks and QC sample analysis. No significant action is taken to change behavior, process or procedure.

**Corrective Action:** The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

**Data Audit:** A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data re of acceptable quality (i.e., that they meet specified acceptance criteria).

**Data Reduction:** The process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors, and collation into a more useable form. (TNI)

**Deficiency:** An unauthorized deviation from acceptable procedures or practices, or a defect in an item, whether in the laboratory’s control or not. (ASQC)
Demonstration of Capability: A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. (TNI)

Document Control: The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity if performed. (ASQC)

Duplicate Analyses: The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA-QAD)

Equipment Blank: Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures.

External Standard Calibration: Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Field Blank: Blank prepared in the field by filing a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken (EPA OSWER)

Field of Accreditation: Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.

Holding Times: The maximum time that samples may be held prior to analyses and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (TNI)

Internal Standard Calibration: Calibrations for methods that utilize internal standards to compensate for changes in instrument conditions.

Instrument Blank: A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Instrument Detection Limit (IDL): The minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific instrument. The IDL is associated with the instrumental portion of a specific method only, and sample preparation steps are not considered in its derivation. The IDL is a statistical estimation at a specified confidence interval of the concentration at which the relative uncertainty is ± 100%. The IDL represents a range where qualitative detection occurs on a specific instrument. Quantitative results are not produced in this range.

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, taken through all preparation and analysis steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

An LCS shall be prepared at a minimum of 1 per batch of 20 or less samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to determine batch acceptance.
Least Squares Regression (1st Order Curve): The least squares regression is a mathematical calculation of a straight line over two axes. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The regression calculation will generate a correlation coefficient $(r)$ that is a measure of the "goodness of fit" of the regression line to the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, $r$ must be greater than or equal to 0.99 for organics and 0.995 for inorganics.

Limit(s) of Detection (LOD) [a.k.a., Method Detection Limit (MDL)]: A laboratory’s estimate of the minimum amount of an analyte in a given matrix that an analytical process can reliably detect in their facility. (TNI)

LOD Verification [a.k.a., MDL Verification]: A processed QC sample in the matrix of interest, spiked with the analyte at no more than 3X the LOD for single analyte tests and 4X the LOD for multiple analyte tests and processed through the entire analytical procedure.

Limit(s) of Quantitation (LOQ) [a.k.a., Reporting Limit]: The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. (TNI)

(QS) Matrix: The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

- **Aqueous:** Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater effluents, and TCLP or other extracts.

- **Drinking Water:** Any aqueous sample that has been designated as a potable or potential potable water source.

- **Saline/Estuarine:** Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

- **Non-Aqueous Liquid:** Any organic liquid with <15% settleable solids.

- **Biological Tissue:** Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

- **Solids:** Includes soils, sediments, sludges, and other matrices with >15% settleable solids.

- **Chemical Waste:** A product or by-product of an industrial process that results in a matrix not previously defined.

- **Air and Emissions:** Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or other device. (TNI)

Matrix Spike (spiked sample or fortified sample): A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): A replicate matrix spike prepared and analyzed to obtain a measure of the precision of the recovery for each analyte.

Method Blank: A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as
samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

**Method Detection Limit:** The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

**Negative Control:** Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.

**Non-conformance:** An indication, judgment, or state of not having met the requirements of the relevant specifications, contract, or regulation.

**Observation:** A record of phenomena that (1) may assist in evaluation of the sample data; (2) may be of importance to the project manager and/or the client, and yet not at the time of the observation have any known effect on quality.

**Performance Audit:** The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory.

**Positive Control:** Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.

**Precision:** The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (TNI)

**Preservation:** Any conditions under which a sample must be kept in order to maintain chemical and/or biological integrity prior to analysis. (TNI)

**Proficiency Testing:** A means of evaluating a laboratory’s performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (TNI)

**Proficiency Testing Program:** The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (TNI)

**Proficiency Test Sample (PT):** A sample, the composition of which is unknown to the laboratory and is provided to test whether the laboratory can produce analytical results within specified acceptance criteria. (TNI)

**Quality Assurance:** An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item or service is of the type of quality needed and expected by the client. (TNI)

**Quality Assurance [Project] Plan (QAPP):** A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EAP-QAD)

**Quality Control:** The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are
maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality. (TNI)

**Quality Control Sample:** A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control. (TNI)

**Quality Manual:** A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (TNI)

**Quality System:** A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC activities. (TNI)

**Raw Data:** The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records. (TNI)

**Record Retention:** The systematic collection, indexing and storing of documented information under secure conditions.

**Reference Material:** Material or substance one or more properties of which are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (TNI)

**Reference Standard:** Standard used for the calibration of working measurement standards in a given organization or a given location. (TNI)

**Sampling:** Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.

**Second Order Polynomial Curve (Quadratic):** The 2nd order curves are a mathematical calculation of a slightly curved line over two axis. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The 2nd order regression will generate a coefficient of determination (COD or r²) that is a measure of the "goodness of fit" of the quadratic curvature the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r² must be greater than or equal to 0.99.

**Selectivity:** The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system. (TNI)

**Sensitivity:** The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (TNI)

**Spike:** A known mass of target analyte added to a blank, sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

**Standard:** The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies. (TNI)
**Standard Operating Procedures (SOPs):** A written document which details the method for an operation, analysis, or action, with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks. (TNI)

**Storage Blank:** A blank matrix stored with field samples of a similar matrix (volatiles only) that measures storage contribution to any source of contamination.

**Surrogate:** A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with sample composition and shall be reported to the client whose sample produced poor recovery. (QAMS)

**Systems Audit (also Technical Systems Audit):** A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

**Technical Manager:** A member of the staff of an environmental laboratory who exercises actual day-to-day supervision of laboratory operations for the appropriate fields of accreditation and reporting of results.

**Technology:** A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.

**Traceability:** The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project. (TNI)

**Trip Blank:** A blank matrix placed in a sealed container at the laboratory that is shipped, held unopened in the field, and returned to the laboratory in the shipping container with the field samples.

**Uncertainty:** A parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measured value.
Acronyms:

CAR – Corrective Action Report
CCV – Continuing Calibration Verification
CF – Calibration Factor
CFR – Code of Federal Regulations
COC – Chain of Custody
DOC – Demonstration of Capability
DQO – Data Quality Objectives
DUP - Duplicate
EHS – Environment, Health and Safety
EPA – Environmental Protection Agency
GC - Gas Chromatography
GC/MS - Gas Chromatography/Mass Spectrometry
HPLC - High Performance Liquid Chromatography
ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy
ICP/MS – ICP/Mass Spectrometry
ICV – Initial Calibration Verification
IDL – Instrument Detection Limit
IH – Industrial Hygiene
IS – Internal Standard
LCS – Laboratory Control Sample
LCSD – Laboratory Control Sample Duplicate
LIMS – Laboratory Information Management System
LOD – Limit of Detection
LOQ – Limit of Quantitation
MDL – Method Detection Limit
MDLCK – MDL Check Standard
MDLV – MDL Verification Check Standard
MRL – Method Reporting Limit Check Standard
MS – Matrix Spike
MSD – Matrix Spike Duplicate
SDS - Safety Data Sheet
NELAP - National Environmental Laboratory Accreditation Program
PT – Performance Testing
TNI – The NELAC Institute
QA – Quality Assurance
QA/QC – Quality Assurance / Quality Control
QAPP – Quality Assurance Project Plan
RF – Response Factor
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
SD – Standard Deviation
SOP – Standard Operating Procedure
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound
Appendix 3. Laboratory Certifications, Accreditations, Validations

TestAmerica Denver maintains accreditations, certifications, and approvals with numerous state and national entities. Programs vary but may include on-site audits, reciprocal agreements with another entity, performance testing evaluations, review of the QA Manual, Standard Operating Procedures, Method Detection Limits, training records, etc. At the time of this QA Manual revision, the laboratory has accreditation/certification/licensing with the following organizations:

![Image of TestAmerica Certifications]

The certificates and accredited parameter lists are available for each State/Program at [www.testamericainc.com](http://www.testamericainc.com) under Analytical Services Search – Certifications.
ATTACHMENT 2

Summary of Analytes, Analytical Methods, Reporting Limits, and Method Detection Limits for Analytical Laboratory
## Summary of Analytes, Analytical Methods, Reporting Limits, and Method Detection Limits for Fixed-Based Laboratory Analysis Groups

<table>
<thead>
<tr>
<th>Analyte Description</th>
<th>CAS Number</th>
<th>RL</th>
<th>MDL</th>
<th>LOD Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>20.0</td>
<td>5.38</td>
<td>ug/kg</td>
</tr>
<tr>
<td>Benzene</td>
<td>71-43-2</td>
<td>5.00</td>
<td>0.470</td>
<td>ug/kg</td>
</tr>
<tr>
<td>Bromobenzene</td>
<td>108-86-1</td>
<td>5.00</td>
<td>0.490</td>
<td>ug/kg</td>
</tr>
<tr>
<td>Bromomethane</td>
<td>74-89-8</td>
<td>5.00</td>
<td>0.500</td>
<td>ug/kg</td>
</tr>
<tr>
<td>2-Butanone (MEK)</td>
<td>79-93-3</td>
<td>20.0</td>
<td>1.83</td>
<td>ug/kg</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>153-32-4</td>
<td>5.00</td>
<td>0.650</td>
<td>ug/kg</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>108-90-7</td>
<td>5.00</td>
<td>0.540</td>
<td>ug/kg</td>
</tr>
<tr>
<td>Chlorodibromomethane</td>
<td>124-44-1</td>
<td>5.00</td>
<td>0.550</td>
<td>ug/kg</td>
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<tr>
<td>Chloromethane</td>
<td>75-00-5</td>
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<td>ug/kg</td>
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<tr>
<td>Chloroform</td>
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<td>ug/kg</td>
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<tr>
<td>1-2-Dichloro-1,2-Dichloropropane</td>
<td>96-12-8</td>
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<td>0.900</td>
<td>ug/kg</td>
</tr>
<tr>
<td>1,2-Dichlorobenzene</td>
<td>95-50-1</td>
<td>5.00</td>
<td>0.520</td>
<td>ug/kg</td>
</tr>
<tr>
<td>1,2-Dichlorobenzene</td>
<td>95-50-1</td>
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<td>5.00</td>
<td>0.480</td>
<td>ug/kg</td>
</tr>
<tr>
<td>1,2-Dichlorobenzene</td>
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<td>0.780</td>
<td>ug/kg</td>
</tr>
<tr>
<td>Dibromomethane</td>
<td>106-93-4</td>
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<td>0.840</td>
<td>ug/kg</td>
</tr>
<tr>
<td>cis-1,2-Dichloroethylene</td>
<td>156-60-5</td>
<td>2.50</td>
<td>0.560</td>
<td>ug/kg</td>
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<tr>
<td>cis-1,3-Dichloropropene</td>
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<td>5.00</td>
<td>1.29</td>
<td>ug/kg</td>
</tr>
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<td>1,2-Dichloro-1,2-Dichloropropane</td>
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**Method Description:**
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- Water Metals (ICP/MS) 6020A 3020A
- Water Mercury (CVAAS) 7470A Prep
- Water (CVAA) 7470A 7470A

**RL - Reporting Limit**
**MDL - Method Detection Limit**
**LOD - Limit of Detection**

Note: RLs and MDLs are subject to change based on the most recent quarterly MDL study conducted at the laboratory. This RL/MDL list was compiled on October 4, 2017.
Appendix E

CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL PLAN

Ash Grove Cement Company
Chanute, Kansas

December 21, 2017
CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL PLAN
Ash Grove Cement Company, Chanute, Kansas

Prepared for:
Ash Grove Cement Company

Prepared by:
Arcadis U.S., Inc.
Rosehill Office Park 1
8725 Rosehill
Suite 350
Lenexa
Kansas 66215
Tel 913 492 0900
Fax 913 492 0902

Our Ref.:
KC001721.0001

Date:
December 21, 2017

Bretton Overholtzer
Principal Engineer

John Shonfelt
Senior Project Manager/Principal
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CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL PLAN
Ash Grove Cement Company, Chanute, Kansas

1 INTRODUCTION

This document provides the Construction Quality Assurance/Construction Quality Control (CQA/CQC) Plan for landfill cover upgrades and construction at the Ash Grove Cement Company facility in Chanute, Kansas (the Site).

1.1 Purpose and Scope

The purpose of this CQA/CQC Plan is to describe the observations and tests that will be used before, during, and upon completion of the landfill cover construction to ensure its completion in accordance with the approved plans and specifications.

This CQA/CQC Plan also describes the procedures to be used to ensure that construction documentation and certification is provided in a safe, accurate, and efficient manner according to United States Environmental Protection Agency (USEPA) and Ash Grove requirements. In addition, the Plan addresses specific QA/QC testing and documentation requirements for each of the various components of the landfill cover construction and soil excavation activities, complementing the specific requirements outlined in the Technical Specifications.

Additional related landfill cover construction information is provided in other components of the construction documents. In particular, the Corrective Measures Implementation Work Plan, Design Drawings, and Technical Specifications directly specify the construction materials and methods to be used by the Contractor for the landfill cover construction.

This CQA/CQC Plan is divided into the following sections:

• Section 1 – Introduction
• Section 2 – Soils Construction Quality Assurance
• Section 3 — Surveying
• Section 4 – Documentation
• Section 5 – References.

In addition, a Corrective Measures Implementation Report, as required by the Resource Conservation and Recovery Act (RCRA) Operating Permit (USEPA 2017) is discussed in Section 4.5.

1.2 Definitions Relating to Construction Quality Assurance

The various definitions related to CQA and CQC are provided below.

1.2.1 Construction Quality Assurance and Construction Quality Control

In the context of this document:

• CQA refers to means and actions employed by the Contractor to ensure conformity of the landfill cover preparation, production, and installation with this CQA/CQC Plan, the drawings, and the specifications. CQA is provided by a party independent from production and installation.
CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL PLAN
Ash Grove Cement Company, Chanute, Kansas

- CQC refers to those actions taken by Manufacturers, Fabricators, Installers, Contractors, or Owners to ensure that the materials and the workmanship meet the requirements of the plans and specifications. In the case of soils components, CQC is provided by the Contractor. In the case of the other non-soil components, CQC is provided by the Manufacturers and Installers of the various non-soil components.

1.3 Parties to Construction Quality Assurance
The Construction Contractor (Contractor) will be responsible for the quality of construction in the finished product, and also for compliance with the construction documents, drawings and specifications, and regulatory requirements. The Project Manager, assigned by Ash Grove, has ultimate responsibility for the oversight of construction and for conformance with the construction drawings, specifications, and quality assurance requirements. These positions, and additional roles that are part of the CQA team, are summarized in the following sections. For the Chanute Cement Plant project, several of the CQA positions may overlap or may be fulfilled by one individual.

1.3.1 Owner
The Owner owns, and/or is responsible for, the landfill areas addressed in the CMI. In this CQA/CQC Plan, the term “Owner” will refer specifically to Ash Grove.

1.3.2 Project Manager
The Project Manager is the official representative of the Owner. In this CQA/CQC Plan, the term “Project Manager” will apply equally to “Construction Project Coordinator” or “Owner's Representative” (i.e., the individual in charge of coordinating field activities on the Owner’s behalf).

1.3.3 Engineer
The Engineer is responsible for preparing the design, drawings, plans, Technical Specifications, and the CQA/CQC Plan for the project.

The Engineer will be a qualified engineer and maintain current registration from Kansas as a licensed Professional Engineer. The Engineer will have a history that demonstrates familiarity with landfill cover design and construction.

1.3.4 Contractor
The Contractor is responsible for the construction of the landfill covers and upgrades. The Contractor will have a demonstrated history of successful earthworks construction projects.

1.3.5 Soils Construction Quality Assurance Laboratory
The Soils CQA Laboratory is independent from the Owner, Project Manager, and Contractor and is responsible for conducting tests in the laboratory on samples of soil taken from the clay borrow pit and topsoil borrow area. The Soils CQA Laboratory will have experience in soils, meet all regulatory requirements, and be familiar with ASTM International (ASTM) and other applicable standards. The Soils
CQA Laboratory will be capable of providing test results in accordance with the requirements of the Technical Specifications.

1.3.6 Surveyor
The surveyor is responsible for preparing surveys of the constructed portions of the project to verify that the lines and grades meet the requirements of the Design Drawings and Technical Specifications.

The Certifying Surveyor will be a reputable, well-established firm that is familiar with the surveying customs and practices of the area and registered to practice land surveying in the State of Kansas. The Certifying Surveyor should demonstrate, by previous work, the ability to effectively communicate with the Contractor, and to provide high-quality record drawings in a timely manner.

1.4 Scope of Construction Quality Assurance
The scope of this CQA/CQC Plan includes the CQA of the landfill cover construction for Solid Waste Management Unit (SWMU) 17 South; maintenance/upgrades to existing covers at SWMUs 1, 16, 17 North, and 23; and establishment of vegetation on the newly constructed landfill covers and other disturbed areas.

Testing requirements, design guidelines, installation specifications, and requirements for the selection of soils for backfill are presented in the Removal Action Design and the Technical Specifications.

1.5 Project Meetings
To attain a high degree of quality during installation, clear and open channels of communication are essential. Anticipated meetings and items to be addressed at the meetings are identified in the following subsections.

1.5.1 Pre-Construction Meeting
A Pre-Construction Meeting will be held at the Site before the start of any construction work. At a minimum, the meeting will be attended by a representative of the Engineer, the Contractor, and the Project Manager.

Specific topics considered for the meeting include:

- Make any appropriate modifications to the CQA/CQC Plan.
- Review the responsibilities of each party.
- Review lines of authority and communication.
- Review methods for documenting and reporting, and for distributing documents and reports.
- Establish protocols for testing.
- Establish protocols for handling deficiencies, repairs, and retesting.
- Review the time schedule for all operations.
- Confirm soil borrow locations, excavation procedures, and erosion and sedimentation control requirements.
- Coordinate with any utilities work in the project area.
• Conduct a site walk to verify that preparations for construction are proceeding on schedule and to review material storage locations.
• Establish haul routes and soil stockpiling locations (if any).
• Review procedures for traffic control related to equipment routes used to support construction implementation activities

The meeting will be documented by a person designated at the beginning of the meeting, and minutes will be transmitted to all parties.

1.5.2 Progress Meetings
A weekly progress meeting or call will be attended by the Contractor, the Project Manager, and any other concerned parties. This meeting will discuss current progress, planned activities for the next week, and any new business or revisions to the work. The Contractor will log any problems, decisions, or questions arising at this meeting in their daily reports. Any matter requiring action that is raised in this meeting will be reported to the appropriate parties.

1.5.3 Problem or Work Deficiency Meeting
A special meeting will be held when and if a problem or deficiency is present or likely to occur. At a minimum, the meeting will be attended by the Contractor, the Project Manager, and the appropriate Contractor staff. If the problem requires a design modification, the Engineer should also be present. The purpose of the meeting is to define and resolve the problem or work deficiency as follows:
• Define and discuss the problem or deficiency.
• Review alternative solutions.
• Prepare and implement an action plan to resolve the problem or deficiency.

The meeting will be documented by a person designated at the meeting, and minutes will be transmitted to affected parties.

1.5.4 Health and Safety Audit Review Meeting
During construction, Ash Grove and the Contractor will conduct regular Health and Safety (H&S) audits to assess and document that the appropriate safety protocols are being implemented. Following each audit, or as needed, an H&S audit review meeting or call will be attended by the Contractor, the Project Manager, and any other concerned parties. The audit review meeting will discuss the results of the H&S observations, and plans for corrective action, if needed, will be developed and implemented by the appropriate parties.

1.6 Project Control Visits
Periodically, the Site will be visited by the Engineer. Where possible, this visit can be coordinated with a similar visit by the Owner and Project Manager.
2 SOIL CONSTRUCTION QUALITY ASSURANCE

2.1 Introduction

This section of the CQA/CQC Plan describes the specific CQA and CQC activities that will be provided for the soil components of the landfill cover construction. This section includes the following: (i) an identification of the individual soil components of the landfill cover; (ii) an identification of the parties involved in the CQA and CQC activities for the soil components; (iii) a description of the testing procedures to be provided for CQA and CQC of the individual soil components; and (iv) a description of the documentation procedures to be provided for the soil CQA and CQC activities.

2.1.1 Soil Components of the Chanute Cement Plant Project

The soil components of the Project are described in this section. The minimum required properties for each soil component are summarized in the Technical Specifications.

2.1.1 Subgrade

The subgrade is the uppermost in-situ soil layer remaining after soil excavation. The subgrade must be graded and prepared for placement of backfill soil.

2.1.3 General Soil Backfill

General soil backfill will be used for filling excavations not requiring low-permeability clay or topsoil. The general soil backfill will be representative of soils in the vicinity and will be reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, frozen materials, angular rocks, roots, weeds, and wood.

2.1.4 Clay Barrier

A clay fill material will be used to construct the landfill cover low-permeability barrier. Material property requirements for the low-permeability barrier are provided in Technical Specification Section 02201 and will be free of debris, toxic substances, hazardous materials, frozen materials, rocks greater than 4 inches in any dimension, and large roots or wood. The clay material selected for the low-permeability cover will be tested before installation to ensure that a minimum permeability of $5 \times 10^{-7}$ centimeters per second (cm/sec) can be achieved in the field. After placement, field tests will be performed to demonstrate that the $5 \times 10^{-7}$ cm/sec permeability has been achieved, as required by the Technical Specifications.

2.1.5 Topsoil

Topsoil will consist of natural, friable soil that is representative of soils in the vicinity that produce heavy growths of crops, grass, or other vegetation and is reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, or any material that might be harmful to plant growth or hinder grading, planting, or maintenance operations.
2.2 Pre-Qualification Testing and Acceptance

Each proposed source of project soil materials will undergo pre-qualification testing to confirm that it will meet the Technical Specifications.

The pre-qualification testing will be provided by the Contractor or the Owner using an independent geotechnical testing laboratory approved by the Project Manager. For each individual soil material type, the project Technical Specifications identify the specific tests and test methods to be used for the pre-qualification testing.

The results of the pre-qualification testing will be submitted to the Project Manager and the Contractor. The test results will be reviewed and acted upon (accepted or rejected) by the Contractor. As necessary, additional testing of the proposed material source may be requested at the discretion of the Contractor as part of their evaluation of the test data. Additional source testing may also be requested by the Contractor throughout construction in response to indications of potential material property changes.

2.3 Conformance Testing and Acceptance

Conformance testing will be done for all soil materials to confirm the ongoing consistency of the properties of the delivered soils with the Technical Specifications and the pre-qualification test results. Conformance soil sampling will be done by the Contractor and will be delivered to the other independent laboratory approved by the Project Manager for testing. The Technical Specifications identify the conformance tests, test methods, and testing frequencies for the various soil materials to be used for the project construction work.

The conformance test results will be evaluated by the Contractor for acceptance or rejection of the delivered soil. Additional testing may be conducted, as necessary, for sufficient evaluation of the proposed material. Additional conformance testing may also be conducted at increased frequencies at the discretion of the Contractor if ongoing visual observations indicate a potential concern with the soil material properties.

2.4 Construction Observation and Testing

The Contractor will conduct ongoing observation of the placement of the soil materials to ensure that the soil materials are placed in accordance with the Technical Specifications. The construction will be observed as described in this Plan, including documentation and record-keeping measures.

Construction observation will be the primary means used by the Contractor to confirm adequate placement of the general backfill material and the landfill cover topsoil. Construction testing will not routinely be provided for these materials, and will be conducted at the discretion of the Contractor in response to potential concerns arising from the observation program.

Periodic construction testing will be conducted by the Contractor to confirm that the landfill cover low-permeability clay barrier is placed in accordance with the Technical Specifications. The Technical Specifications identify the tests, test methods, and testing frequency that will be provided by the Contractor for construction testing.

The Contractor will use the results of the construction testing program for evaluation of acceptance or rejection of the placed soils. Additional construction testing will be provided at the discretion of the
Contractor, as necessary, for sufficient evaluation. All rejected soils will be removed and replaced by the Contractor, as described in Section 2.5 below.

### 2.5 Defects and Repairs

The project Technical Specifications prescribe detailed measures for the Earthwork Contractor to follow if defects or the need for repairs are identified for the placed soils. The Contractor will monitor (and test, as necessary) the backfill, compaction, and landfill cover construction. All CQA testing provisions applicable to the individual soil type will be provided for the repair work.

### 2.6 Layer Thickness Evaluation

The thickness of each soil layer will be evaluated by directly measuring the layer (using hand measurements or other means) and by checking survey results of the tops and bottoms of the layers as described in Section 3 – Surveying.
3 SURVEYING

3.1 Introduction
This plan for CQA surveying has been prepared as a guide to the surveyor for: (i) verifying that the constructed products meet the tolerances identified in the Technical Specifications and (ii) preparing as-built record drawings. Ongoing surveying will be conducted during construction of the landfill covers. The following sections describe the duties of the Surveyor and other surveying personnel.

3.2 Personnel
Surveying will be performed under the direct supervision of a qualified Land Surveyor registered in Kansas. Surveying personnel will be experienced in providing all typical surveying services and will provide detailed, accurate documentation.

3.3 Surveying Activities
The surveying activities that will be performed are presented below.

3.3.1 Survey Control
The Surveyor will locate three permanent benchmarks established at locations identified by the Contractor. Also, the Surveyor will establish any necessary new benchmarks using standard surveying practices. The Surveyor will confirm the vertical and horizontal controls for benchmarks using normal land surveying standards before the start of any certifying surveying work. The Contractor will verify that the coordinates and elevation of the benchmark have been checked.

3.3.2 Lines and Grades
The following surfaces will be surveyed as part of the Surveyor’s duties. The surfaces will be surveyed at intersecting points of a 100-foot-square grid (maximum) and at points of changes in slope or grade:

- Top of the SWMU 17 South subgrades before placement of the low-permeability clay barrier
- Top of the low-permeability clay barrier at SWMU 17 South before placement of the topsoil protective cover
- Top surface of the topsoil protective cover at SWMU 17 South.

Acceptable tolerance on survey coordinates will be as defined in the Technical Specifications.

3.3.3 Precision and Accuracy
The survey instruments used for this work will be sufficiently precise and accurate to meet the needs of the Project. Survey instruments will be capable of reading to a precision of 0.01 foot and with a setting accuracy of 10 seconds. Calibration certificates for all survey instruments will be submitted to the Contractor before starting surveying activities.
3.3.4  Frequency and Spacing
Surveying will be performed as soon as possible after completion of a particular part of the construction to facilitate progress and avoid delaying construction of the next feature. The Surveyor may also make spot checks during construction as necessary to assist the Contractor in complying with the required grades. However, surveying for the purpose of controlling the work is the responsibility of the Contractor.

3.3.5  Certifications
Survey results will be certified by the Land Surveyor or Professional Engineer and submitted to the Contractor for review.

3.4  Documentation
Original field survey notes will be retained by the Survey Crew Chief. A copy of these notes will be given to the appropriate Contractor at the end of each surveying task. The Surveyor should produce record plans for the Contractor as the job progresses. The results from the field survey will be documented on a set of record plans. At a minimum, these plans will show the final elevations of the surface listed above at a scale of 1 inch equals 50 feet, with contour intervals no greater than 1 foot.
4 DOCUMENTATION

4.1 Introduction
An effective CQA/CQC Plan depends largely on recognition of all construction activities that should be monitored and on assigning responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of CQA activities. The Contractor will document that all quality assurance requirements have been addressed and satisfied.

The Contractor will provide Ash Grove with signed descriptive remarks, data sheets, and logs to verify that all monitoring activities have been carried out. The Contractor will maintain at the Site a complete file of Construction Drawings, the CQA/CQC Plan, the Technical Specifications, test procedures, daily field report and testing logs, and other pertinent forms and documents.

4.2 Daily Recordkeeping
Daily records will be completed in the field documenting construction activities such as cover maintenance, backfill/soil import, and landfill cover construction.

4.2.1 Project Administration Records
Most project administration records will be completed daily by the Contractor field staff and submitted weekly to the Engineer and Ash Grove. These forms are briefly described below.

4.2.1.1 Daily Field Report
The Daily Field Report will be prepared by the Contractor field staff and submitted weekly to the Engineer. At a minimum, the Daily Field Report will include the following information:

- The date, project name, location, and other identification
- A narrative of the events and activities, including meetings and observations that occurred during a given day
- The names of parties to any discussions
- The relevant subject matter or issues
- The activities planned and performed
- The constraints or suggestions
- The schedule.

4.2.1.2 Personnel Daily Log
The Personnel Daily Log will be prepared at the beginning of the Project and updated each day by the Contractor. This log will list all Contractors and Contractor’s personnel involved with the Project and is a record of attendance for each day of the Project. This log will be available for review at the Site and may be issued as part of the Construction Completion Report.
4.2.1.3 Contractor Personnel Log

The Contractor Personnel Log will be prepared at the beginning of the Project and updated as required by the Contractor. This log will provide a summary of the Earthwork Contractors and Geosynthetics Installer involved in the Project (on site and off site), describes their position, and lists the time periods of involvement with site work. This log will be available for review at the Site and may be issued as part of the certification report.

4.2.1.4 Weekly Field Report

Weekly, the Contractor will summarize in a Weekly Field Report the activities recorded on the Daily Field Reports. This report will be submitted each week to the Engineer and Ash Grove, and will include, at a minimum, the following information:

- The date, project name, location, and other information
- A summary of work activities during reporting period
- A summary of construction situations, deficiencies, and/or defects occurring during the reporting period
- A summary of test results, failures, and retests.

4.2.2 Soils CQA Records

Records kept for soils-related activities (e.g., clay backfill and topsoil cover) will be completed by the Contractor. The information will be recorded as testing is done in the field or as results are received from the laboratory. The records will be available for review on site, and copies will be issued as part of the Construction Certification Report. The relevant forms are briefly described below.

**Field/Laboratory Compaction Test Log (ASTM D 698 Method A, B, C, D, and ASTM D 1557 Method A, B, C)**

The results of field and laboratory compaction tests will be recorded on the Field and Laboratory Compaction Test Log. Separate forms will be used for each test method.

**Summary of Sieve Analysis Test Data**

This form will provide a summary of sieve analysis test results for soils.

**Summary of Field Density Test**

This form will provide a summary of field nuclear density test results and sand cone test results for soils.

4.3 Photographic Documentation

Photographic documentation will serve as a pictorial record of work progress, problems, and mitigation activities. These photographs will be available for review at any time by the Engineer. Some of the photographs will be reproduced as part of the certification report. The remaining photographs will be stored as part of the project records.
4.4 Design and/or Specifications Changes

Design and/or specification changes may be required during construction. In such cases, the Contractor will notify Ash Grove and the Engineer. Ash Grove will notify USEPA as necessary. Design and/or specification changes will be made only with the written agreement of the Engineer and Ash Grove, and will take the form of an addendum, clarification, or modification to the Technical Specifications.

4.5 Signatures and Removal Action Report

At the completion of the work, the Contractor will submit a Construction Completion Report to Ash Grove. This report will certify that the work has been performed in compliance with the Construction Drawings, the CQA Plan, the Project Specifications, and any revisions to these documents, except as properly authorized and implemented, and that the document provides the necessary information to support the certification. This Construction Completion Report will also be submitted to USEPA as the Corrective Measures Implementation Report, as required by the RCRA Operating Permit (USEPA 2017).

At a minimum, this report will include: (a) summaries of all construction activities; (b) observation logs; (c) a discussion of any changes from design and material specifications; (d) Record Drawings; and (e) a summary statement sealed and signed by a Professional Engineer registered in the Kansas (i.e., the Engineer-of-Record).

The Record Drawings will include scale drawings depicting the location of the construction and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses. The Contractor will prepare these documents and include them as part of the Construction Completion Report.

4.6 File Storage

All original handwritten data sheets, especially those containing signatures, should be stored by Ash Grove in a suitable repository on site, or using an off-site professional storage services (i.e., Iron Mountain) through the life of the Ash Grove Plant. Other reports may be stored by any standard method that will allow for easy access.
5 REFERENCES

Appendix F:

Site Specific Health and Safety Plan
Revision 14d

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Ash Grove Cement Company</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chanute, Kansas</td>
</tr>
</tbody>
</table>

| Project Number:        | KC001721.0001             |
| Client Name:           | Ash Grove Cement Company  |
| Date:                  | 12/21/2017                |
| HASP Expires:          | 12/21/2018                |
| Revision:              | 0                         |

Approvals:

HASP Developer:  Brooke Glasrud
Project Manager: John Shonfelt
HASP Reviewer:  Tina Lloyd
Emergency Information

Site Address: Ash Grove Cement Company
1801 North Santa Fe
Chanute, Kansas 66720

Emergency Phone Numbers:

<table>
<thead>
<tr>
<th>Emergency (fire, police, ambulance)</th>
<th>911</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency (facility specific, if applicable):</td>
<td></td>
</tr>
<tr>
<td>Poison Control</td>
<td>800-222-1222</td>
</tr>
<tr>
<td>KS One-Call</td>
<td>811 or 800-344-7233</td>
</tr>
<tr>
<td>Emergency Other (specify)</td>
<td></td>
</tr>
<tr>
<td>Client Contact</td>
<td>Drew Hoisington</td>
</tr>
<tr>
<td></td>
<td>620-431-4500</td>
</tr>
</tbody>
</table>

WorkCare (non-life-threatening injury/illness) 1-888-449-7787

<table>
<thead>
<tr>
<th>Project H&amp;S</th>
<th>Tina Lloyd</th>
</tr>
</thead>
<tbody>
<tr>
<td>913-998-6916 / 913-205-5417</td>
<td></td>
</tr>
<tr>
<td>Task Manager</td>
<td>Tina Lloyd</td>
</tr>
<tr>
<td>913-998-6916 / 913-205-5417</td>
<td></td>
</tr>
<tr>
<td>Project Manager</td>
<td>John Shonfelt</td>
</tr>
<tr>
<td>913-998-6911 / 913-522-7842</td>
<td></td>
</tr>
<tr>
<td>Corporate H&amp;S Specialist</td>
<td>Alec MacAdam</td>
</tr>
<tr>
<td>720-454-0948</td>
<td></td>
</tr>
<tr>
<td>Corporate H&amp;S Director</td>
<td>Denis Balcer</td>
</tr>
<tr>
<td>614-778-9171</td>
<td></td>
</tr>
</tbody>
</table>

Hospital Name and Address: Neosho Memorial Regional Medical Center
629 South Plummer Ave
Chanute, KS 66720

Hospital Phone Number: 620-431-4000

Incident Notification Process

1 Dial 911/Facility Emergency Number/WorkCare as applicable
2 Contact PM/Supervisor John Shonfelt
3 Contact Corporate H&S Denis Balcer
4 Contact Client Drew Hoisington

Complete below, as applicable, or clear cell contents:

Location of Assembly Area(s): To be determined

Nearest AED location: To be determined

Nearest Storm Shelter: To be determined
Route to the Hospital

**Ash Grove Cement Co**
1801 N Santa Fe Ave, Chanute, KS 66720

1. Head east
2. Turn right toward 225th Rd/W Ash Grove Rd
3. Turn right onto 225th Rd/W Ash Grove Rd
4. Turn left onto Douglas Rd/N Plummer Ave

**Neosho Memorial Regional Medical Center**
629 S Plummer Ave, Chanute, KS 66720
General Information

**Site Type (select all applicable where work will be conducted):**

- [ ] Active
- [ ] Railroad
- [ ] Bridge
- [ ] Remote Area
- [ ] Buildings
- [ ] Residential
- [ ] Commercial
- [ ] Retail
- [ ] Construction
- [ ] Roadway (public, including right-of-way)
- [ ] Military Installation
- [ ] Water Treatment Plant
- [ ] Inactive Industrial
- [ ] Unknown
- [ ] Active Industrial
- [ ] Security Risk Site/Location
- [ ] Landfill
- [ ] Utility
- [ ] Other (specify): Traffic on haul roads
- [ ] Marine
- [ ] Parking Lot/Private Roadway

When moving between project work locations on the Haul Road (near SWMUs 16 and 17), Arcadis driver should yield to any oncoming Dump Truck or Mining Truck traffic. Hazard Lights should be on when traveling the Haul Road as a precaution and to notify surrounding traffic of truck location.

**Surrounding Area and Topography (select one):**

- [ ] Surrounding area and topography are presented in the project work plan
- [ ] Surrounding area and topography *(briefly describe)*:

  The Ash Grove cement plant is located adjacent to the northern limit of Chanute, KS and sites on approximately 3,600 acres and consists of various quarry operations and cement manufacturing areas.

**Simultaneous Operations (SimOps)**

- [ ] Not applicable
- [ ] SimOps will exist on this project

  Onsite activities including various quarry and cement manufacturing, including onsite vehicle and personnel traffic.

**Site Background (select one):**

- [ ] Site background is presented in the project work plan
- [ ] Site background *(briefly describe)*:

  The plant mines the majority of raw materials necessary for cement production and manufactures portland cement by processing a mixture of raw materials in cement kilns to form cement clinker which is ground into portland cement. Arcadis' responsibilities onsite include landfill design, landfill maintenance, groundwater sampling, and risk assessment site evaluations.
**Project Tasks**

The following tasks are identified for this project:

<table>
<thead>
<tr>
<th>Select applicable tasks from the drop down menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sampling - Well sampling using peristaltic pumps</td>
</tr>
<tr>
<td>2 Sampling - Soil sampling using direct push technology</td>
</tr>
<tr>
<td>3 Sampling - Surface water sampling using manual methods</td>
</tr>
<tr>
<td>4 Sampling - Sediment sampling using manual methods</td>
</tr>
<tr>
<td>5 Oversight - Oversight of contractors</td>
</tr>
<tr>
<td>6 Select</td>
</tr>
<tr>
<td>7 Select</td>
</tr>
<tr>
<td>8 Select</td>
</tr>
<tr>
<td>9 Select</td>
</tr>
<tr>
<td>10 Select</td>
</tr>
</tbody>
</table>

- ☐ Subcontractor H&S information is attached
- ☐ Utility clearance required.
- ☐ Journey Management Plan attached
- ☐ State specific H&S required:

- ☑ The following H&S Standards are attached:
  - **Utility Clearance HS Standard**

- ☑ Required Checklists/Work Forms
  - Tailgate Safety Briefing Form
  - Vehicle Inspection Checklist

- ☑ Required Permits
  - Not Applicable

---

**Roles and Responsibilities**

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 John Shonfelt</td>
<td>Project Manager</td>
</tr>
<tr>
<td>2 Tina Lloyd</td>
<td>Task Manager</td>
</tr>
<tr>
<td>3 Rich Parshall</td>
<td>Field Technical Lead</td>
</tr>
<tr>
<td>4 Rich Parshall</td>
<td>Site Safety Officer</td>
</tr>
<tr>
<td>5 Bret Overholtzer</td>
<td>Project Engineer</td>
</tr>
<tr>
<td>6 Royce Face</td>
<td>Project Engineer</td>
</tr>
<tr>
<td>7 Allen Long</td>
<td>Project Engineer</td>
</tr>
<tr>
<td>8 Manu Ajmani</td>
<td>Field Engineer</td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
Training

All Arcadis employees are required to have the following training to be on site:

- H&S Program Orientation
- HAZCOM GHS/EAP
- Defensive Driving - Smith On-Line
- Hazwoper 40 Hour
- Hazwoper 8-Hour Annual Refresher
- None
- None
- None
- None
- None
- None
- None
- None
- Client specific:

Other:

Selected Arcadis employees are required to have the following additional training:

- First Aid/CPR
- DOT HazMat #1
- MSHA - Part 48 Initial New Miner
- MSHA - Part 48 Refresher
- None
- None
- None
- None
- None
- None
- None
- None
- None
- None
- None
- None
- None
- None
- Site Specific Hazard Awareness Training

Names or Numbers from above

Field Lead, Project & Field Engineers

Field Staff

Hazard Analysis

The task hazard analysis uses a hazard ranking process utilizing the chart below. The ranking will automatically populate. However, the ranking may be adjusted manually, if required.

<table>
<thead>
<tr>
<th>Risk Assessment Matrix</th>
<th>Likelihood Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequences Ratings</td>
<td>A</td>
</tr>
<tr>
<td>People</td>
<td>0</td>
</tr>
<tr>
<td>Property</td>
<td>Almost Impossible</td>
</tr>
<tr>
<td>1-Slight or No Health Effect Slight or No Damage</td>
<td>0-Low</td>
</tr>
<tr>
<td>2-Minor Health Effect Minor Damage</td>
<td>0-Low</td>
</tr>
<tr>
<td>3-Major Health Effect Local Damage</td>
<td>0-Low</td>
</tr>
<tr>
<td>4-Fatalities Major Damage</td>
<td>0-Low</td>
</tr>
<tr>
<td>Likelihood Ratings</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>1-Low</td>
</tr>
<tr>
<td></td>
<td>Possible but Unlikely</td>
</tr>
<tr>
<td>1-Slight or No Health Effect Slight or No Damage</td>
<td>1-Low</td>
</tr>
<tr>
<td>2-Minor Health Effect Minor Damage</td>
<td>1-Low</td>
</tr>
<tr>
<td>3-Major Health Effect Local Damage</td>
<td>1-Low</td>
</tr>
<tr>
<td>4-Fatalities Major Damage</td>
<td>1-Low</td>
</tr>
<tr>
<td></td>
<td>2-Low</td>
</tr>
<tr>
<td></td>
<td>Likely to Happen</td>
</tr>
<tr>
<td>1-Slight or No Health Effect Slight or No Damage</td>
<td>2-Low</td>
</tr>
<tr>
<td>2-Minor Health Effect Minor Damage</td>
<td>2-Low</td>
</tr>
<tr>
<td>3-Major Health Effect Local Damage</td>
<td>2-Low</td>
</tr>
<tr>
<td>4-Fatalities Major Damage</td>
<td>2-Low</td>
</tr>
<tr>
<td></td>
<td>3-Low</td>
</tr>
<tr>
<td></td>
<td>Almost Certain to Happen</td>
</tr>
<tr>
<td>1-Slight or No Health Effect Slight or No Damage</td>
<td>3-Low</td>
</tr>
<tr>
<td>2-Minor Health Effect Minor Damage</td>
<td>3-Low</td>
</tr>
<tr>
<td>3-Major Health Effect Local Damage</td>
<td>3-Low</td>
</tr>
<tr>
<td>4-Fatalities Major Damage</td>
<td>3-Low</td>
</tr>
<tr>
<td></td>
<td>4-Medium</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td>1-Slight or No Health Effect Slight or No Damage</td>
<td>4-Medium</td>
</tr>
<tr>
<td>2-Minor Health Effect Minor Damage</td>
<td>4-Medium</td>
</tr>
<tr>
<td>3-Major Health Effect Local Damage</td>
<td>4-Medium</td>
</tr>
<tr>
<td>4-Fatalities Major Damage</td>
<td>4-Medium</td>
</tr>
<tr>
<td></td>
<td>6-Medium</td>
</tr>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td>1-Slight or No Health Effect Slight or No Damage</td>
<td>6-Medium</td>
</tr>
<tr>
<td>2-Minor Health Effect Minor Damage</td>
<td>6-Medium</td>
</tr>
<tr>
<td>3-Major Health Effect Local Damage</td>
<td>6-Medium</td>
</tr>
<tr>
<td>4-Fatalities Major Damage</td>
<td>6-Medium</td>
</tr>
<tr>
<td></td>
<td>9-High</td>
</tr>
<tr>
<td></td>
<td>Almost Certain to Happen</td>
</tr>
<tr>
<td>1-Slight or No Health Effect Slight or No Damage</td>
<td>9-High</td>
</tr>
<tr>
<td>2-Minor Health Effect Minor Damage</td>
<td>9-High</td>
</tr>
<tr>
<td>3-Major Health Effect Local Damage</td>
<td>9-High</td>
</tr>
<tr>
<td>4-Fatalities Major Damage</td>
<td>9-High</td>
</tr>
<tr>
<td></td>
<td>12-High</td>
</tr>
<tr>
<td></td>
<td>Very High</td>
</tr>
<tr>
<td>1-Slight or No Health Effect Slight or No Damage</td>
<td>12-High</td>
</tr>
<tr>
<td>2-Minor Health Effect Minor Damage</td>
<td>12-High</td>
</tr>
<tr>
<td>3-Major Health Effect Local Damage</td>
<td>12-High</td>
</tr>
<tr>
<td>4-Fatalities Major Damage</td>
<td>12-High</td>
</tr>
<tr>
<td>Task 1: Sampling - Wells sampling using peristaltic pumps</td>
<td>Hazard Types (unmitigated ranking H-High, M-Medium, L-Low)</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Suggested FHSHB Ref: III F</td>
<td>Biological: H, Chemical: M, Driving: L, Electrical: L</td>
</tr>
</tbody>
</table>

### Hazard Analysis

#### Hazard #1
*Chemical - liquids, skin or eye irritation/damage/allergy*

**Suggested FHSHB Ref:** III C, F, G, K, S, AG

<table>
<thead>
<tr>
<th>Overall Unmitigated Risk: MEDIUM</th>
<th>Mitigated Risk: LOW</th>
</tr>
</thead>
</table>

**Controls that should be Considered:**
- Primary: TRACK, HASP, JSAs, PPE (see HASP "PPE" section)
- See HASP "Monitoring" section
- Secondary: Job Briefing/Site Awareness, Hazcom Training, SDS (see also HASP Hazcom/GHS section)
- Client Training/Briefing, Specialized Equipment (specify below)

**Enter Required Controls:** PPE

#### Hazard #2
*Electrical - Housekeeping - Injury or property damage due to frayed wiring, improperly mounted wiring, missing or damaged warning labels, etc.*

**Suggested FHSHB Ref:** III AB, AG

<table>
<thead>
<tr>
<th>Overall Unmitigated Risk: MEDIUM</th>
<th>Mitigated Risk: LOW</th>
</tr>
</thead>
</table>

**Controls that should be Considered:**
- Primary: TRACK, JSAs, Housekeeping, Inspections, HASP
- Secondary: Electrical (NFPA 70E) Training
- Engineering Controls (specify below)
- Admin. Controls (specify below)

**Enter Required Controls:** PPE

#### Hazard #3
*Motion - Musculoskeletal - Injury from lifting, twisting, stooping, or awkward body positions*

**Suggested FHSHB Ref:** III AF

<table>
<thead>
<tr>
<th>Overall Unmitigated Risk: Not Ranked</th>
<th>Mitigated Risk: Not Ranked</th>
</tr>
</thead>
</table>

**Controls that should be Considered:**
- Primary: TRACK, JSAs, PPE (see HASP "PPE" section)
- See HASP "Monitoring" section
- Secondary: Job Briefing/Site Awareness, Hazcom Training, SDS (see also HASP Hazcom/GHS section)
- Client Training/Briefing, Specialized Equipment (specify below)

**Enter Required Controls:** Use legs to lift and transport purge water

#### Hazard #4
*None*

<table>
<thead>
<tr>
<th>Overall Unmitigated Risk: Not Ranked</th>
<th>Mitigated Risk: Not Ranked</th>
</tr>
</thead>
</table>

**Controls that should be Considered:**
- Primary: Secondary

**Enter Required Controls:**

#### Hazard #5
*None*

<table>
<thead>
<tr>
<th>Overall Unmitigated Risk: Not Ranked</th>
<th>Mitigated Risk: Not Ranked</th>
</tr>
</thead>
</table>

**Controls that should be Considered:**
- Primary: Secondary

**Enter Required Controls:**

#### Hazard #6
*None*

<table>
<thead>
<tr>
<th>Overall Unmitigated Risk: Not Ranked</th>
<th>Mitigated Risk: Not Ranked</th>
</tr>
</thead>
</table>

**Controls that should be Considered:**
- Primary: Secondary

**Enter Required Controls:**

*If you need to list more hazards for this task, unhide "Extended Hazard Analysis".*
### Task 2: Sampling - Soil sampling using direct push technology

#### Hazard Analysis

<table>
<thead>
<tr>
<th>Hazard Types (unmitigated ranking H-High, M-Medium, L-Low)</th>
<th>Suggested FHSHB Ref:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological: L</td>
<td>Chemical: L</td>
</tr>
<tr>
<td>Environmental: L</td>
<td>Gravity: M</td>
</tr>
<tr>
<td>Personal Safety: L</td>
<td>Pressure: L</td>
</tr>
</tbody>
</table>

#### Hazard #1

**Chemical - solids/particulates, skin or eye irritation/damage/allergy**

- **Suggested FHSHB Ref:** III C, F, G, K, S, AG
- **Overall Unmitigated Risk:** MEDIUM
- **Mitigated Risk:** LOW if utilizing:
- **Controls that should be Considered:**
  - Primary: TRACK, HASP, JSAs, PPE (see HASP "PPE" section)
  - Secondary: Job Briefing/Site Awareness, Hazcom Training, SDS (see also HASP Hazcom/GHS section), Client Training/Briefing
  - Specialized Equipment (specify below)
  - WorkCare
- **Enter Required Controls:** PPE. Sample the lowest volume required by the laboratory to limit soil exposure

#### Hazard #2

**Environmental - Utilities - Injury or property damage from utility strike/damage**

- **Suggested FHSHB Ref:** III AN
- **Overall Unmitigated Risk:** HIGH
- **Mitigated Risk:** MEDIUM if utilizing:
- **Controls that should be Considered:**
  - Primary: TRACK, Inspections, H&S Standards, Specialized Checklist/Forms, Specialized Equipment (specify below)
  - Secondary: Field H&S Handbook (see ref. above), Admin. Controls (specify below)
  - PPE (see HASP "PPE" section)
- **Enter Required Controls:** Follow the Utility Clearance HS Standard and checklist

#### Hazard #3

**Motion - Cuts and scrapes - Injury from moving object impacting skin or eye**

- **Suggested FHSHB Ref:** III S
- **Overall Unmitigated Risk:** MEDIUM
- **Mitigated Risk:** LOW if utilizing:
- **Controls that should be Considered:**
  - Primary: TRACK, JSAs, Site Awareness, Engineering Controls (specify below)
  - Secondary: Field H&S Handbook (see ref. above), Job Briefing/Site Awareness, H&S Standards, WorkCare, First Aid/CPR Training (designated person)
- **Enter Required Controls:** let driller cut open acetate liners for soil sampling

#### Hazard #4

- **Suggested FHSHB Ref:** None
- **Overall Unmitigated Risk:** Not Ranked
- **Mitigated Risk:** Not Ranked if utilizing:
- **Controls that should be Considered:**
- **Enter Required Controls:**

#### Hazard #5

- **Suggested FHSHB Ref:** None
- **Overall Unmitigated Risk:** Not Ranked
- **Mitigated Risk:** Not Ranked if utilizing:
- **Controls that should be Considered:**
- **Enter Required Controls:**

#### Hazard #6

- **Suggested FHSHB Ref:** None
- **Overall Unmitigated Risk:** Not Ranked
- **Mitigated Risk:** Not Ranked if utilizing:
- **Controls that should be Considered:**
- **Enter Required Controls:**

*If you need to list more hazards for this task, unhide "Extended Hazard Analysis".*
## Task 3: Sampling - Surface water sampling using manual methods

<table>
<thead>
<tr>
<th>Hazard Types (unmitigated ranking H-High, M-Medium, L-Low)</th>
<th>Suggested FHSHB Ref:</th>
<th>III F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Chemical</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Driving</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Gravity</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Motion</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Personal Safety</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Radiation</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Sound</td>
<td>L</td>
<td></td>
</tr>
</tbody>
</table>

### Hazard #1

**Biological** - skin or eye injury from exposure to mammal, reptile, amphibian, fish, bird or invertebrate bites

Suggested FHSHB Ref: III N

- **Overall Unmitigated Risk:** MEDIUM
- **Mitigated Risk:** LOW if utilizing:

*Controls that should be Considered:*
- Primary: TRACK JSAs
- Secondary: Field H&S Handbook (see ref. above)
- PPE (see HASP "PPE" section)
- WorkCare

*Enter Required Controls:* Wear pants and sleeves to limit exposure to biological hazards

### Hazard #2

**Motion** - Musculoskeletal - Injury from lifting, twisting, stooping, or awkward body positions

Suggested FHSHB Ref: III AF

- **Overall Unmitigated Risk:** MEDIUM
- **Mitigated Risk:** LOW if utilizing:

*Controls that should be Considered:*
- Primary: TRACK JSAs
- Secondary: Field H&S Handbook (see ref. above)
- PPE (see HASP "PPE" section)
- Engineering Controls (specify below)

*Enter Required Controls:* Use legs and do not lift more than you can carry. Take multiple trips

### Hazard #3

**Chemical** - solids/particulates - injury or illness from skin absorption

Suggested FHSHB Ref: III C, F, G, K, S, AG

- **Overall Unmitigated Risk:** MEDIUM
- **Mitigated Risk:** LOW if utilizing:

*Controls that should be Considered:*
- Primary: TRACK JSAs
- Secondary: Field H&S Handbook (see ref. above)
- PPE (see HASP "PPE" section)
- See HASP "Monitoring" section
- Hazcom Training
- SDS (see also HASP Hazcom/GHS section)
- Client Training/Briefing
- Specialized Equipment (specify below)

*Enter Required Controls:* Wear PPE and collect a limited sample volume

### Hazard #4

None

- **Overall Unmitigated Risk:** Not Ranked
- **Mitigated Risk:** Not Ranked if utilizing:

*Enter Required Controls:*

### Hazard #5

None

- **Overall Unmitigated Risk:** Not Ranked
- **Mitigated Risk:** Not Ranked if utilizing:

*Enter Required Controls:*

### Hazard #6

None

- **Overall Unmitigated Risk:** Not Ranked
- **Mitigated Risk:** Not Ranked if utilizing:

*Enter Required Controls:*

---

*If you need to list more hazards for this task, unhide "Extended Hazard Analysis".*
## Hazard Analysis

### Task 4: Sampling - Sediment sampling using manual methods

<table>
<thead>
<tr>
<th>Hazard Types (unmitigated ranking H-High, M-Medium, L-Low)</th>
<th>Suggested FHSHB Ref:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>III F</td>
</tr>
<tr>
<td>Chemical</td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
</tr>
<tr>
<td>Personal Safety</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard #1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biological</strong> - skin or eye injury from exposure to mammal, reptile, amphibian, fish, bird or invertebrate bites</td>
</tr>
<tr>
<td>Suggested FHSHB Ref: III N</td>
</tr>
<tr>
<td>Overall Unmitigated Risk: MEDIUM</td>
</tr>
<tr>
<td>Controls that should be Considered: Primary: TRACK JSAs, Engineering Controls (specify below)</td>
</tr>
<tr>
<td>Mitigated Risk: LOW if utilizing:</td>
</tr>
<tr>
<td>Enter Required Controls: Wear pants and sleeves to limit exposure to biological hazards</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard #2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chemical</strong> - liquids - injury or illness from skin absorption</td>
</tr>
<tr>
<td>Suggested FHSHB Ref: III C, F, G, K, S, AG</td>
</tr>
<tr>
<td>Overall Unmitigated Risk: MEDIUM</td>
</tr>
<tr>
<td>Controls that should be Considered: Primary: TRACK, HASP JSAs, PPE (see HASP &quot;PPE&quot; section)</td>
</tr>
<tr>
<td>Mitigated Risk: LOW if utilizing:</td>
</tr>
<tr>
<td>Enter Required Controls: wear proper PPE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motion</strong> - Musculoskeletal - Injury from lifting, twisting, stooping, or awkward body positions</td>
</tr>
<tr>
<td>Suggested FHSHB Ref: III AF</td>
</tr>
<tr>
<td>Overall Unmitigated Risk: MEDIUM</td>
</tr>
<tr>
<td>Controls that should be Considered: Primary: TRACK JSAs, PPE (see HASP &quot;PPE&quot; section), Admin. Controls (specify below)</td>
</tr>
<tr>
<td>Mitigated Risk: LOW if utilizing:</td>
</tr>
<tr>
<td>Enter Required Controls: approach sampling area with caution and proceed if footings is stable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard #4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>None</strong></td>
</tr>
<tr>
<td>Suggested FHSHB Ref: None</td>
</tr>
<tr>
<td>Overall Unmitigated Risk: Not Ranked</td>
</tr>
<tr>
<td>Controls that should be Considered: Primary: Secondary:</td>
</tr>
<tr>
<td>Mitigated Risk: Not Ranked if utilizing:</td>
</tr>
<tr>
<td>Enter Required Controls:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard #5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>None</strong></td>
</tr>
<tr>
<td>Suggested FHSHB Ref: None</td>
</tr>
<tr>
<td>Overall Unmitigated Risk: Not Ranked</td>
</tr>
<tr>
<td>Controls that should be Considered: Primary: Secondary:</td>
</tr>
<tr>
<td>Mitigated Risk: Not Ranked if utilizing:</td>
</tr>
<tr>
<td>Enter Required Controls:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard #6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>None</strong></td>
</tr>
<tr>
<td>Suggested FHSHB Ref: None</td>
</tr>
<tr>
<td>Overall Unmitigated Risk: Not Ranked</td>
</tr>
<tr>
<td>Controls that should be Considered: Primary: Secondary:</td>
</tr>
<tr>
<td>Mitigated Risk: Not Ranked if utilizing:</td>
</tr>
<tr>
<td>Enter Required Controls:</td>
</tr>
</tbody>
</table>

If you need to list more hazards for this task, unhide “Extended Hazard Analysis”.

## Task 5: Oversight - Oversight of contractors

### Hazard Types (unmitigated ranking H-High, M-Medium, L-Low)

<table>
<thead>
<tr>
<th>Biological</th>
<th>Chemical</th>
<th>Driving</th>
<th>Electrical</th>
<th>Suggested FHSHB Ref:</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>II M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental</th>
<th>Gravity</th>
<th>Mechanical</th>
<th>Radiation</th>
<th>Sound</th>
<th>Suggested FHSHB Ref:</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>II M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Personal Safety</th>
<th>Pressure</th>
<th>Radiation</th>
<th>Sound</th>
<th>Suggested FHSHB Ref:</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>II M</td>
</tr>
</tbody>
</table>

### Hazard #1

**Biological** - bites or stings from exposure to insects or arachnids

<table>
<thead>
<tr>
<th>Suggested FHSHB Ref:</th>
<th>III N</th>
</tr>
</thead>
</table>

**Overall Unmitigated Risk:** MEDIUM

**Mitigated Risk:** LOW if utilizing:

**Controls that should be considered:**
- Primary: TRACK JSAs, Engineering Controls (specify below)
- Secondary: Field H&S Handbook (see ref. above), PPE (see HASP "PPE" section), WorkCare First Aid/CPR Training (designated person)

**Enter Required Controls:**
- Wear pants and use bug spray to keep insects away. Inspect within the treatment building for insects or arachnids before placing your hand on surfaces

### Hazard #2

**Driving** - Driver - Injury, death or property damage due to driver distraction, fatigue, etc.

<table>
<thead>
<tr>
<th>Suggested FHSHB Ref:</th>
<th>III V, AO</th>
</tr>
</thead>
</table>

**Overall Unmitigated Risk:** HIGH

**Mitigated Risk:** LOW if utilizing:

**Controls that should be considered:**
- Primary: TRACK JSAs, Smith System (on line)
- Secondary: Operator Competency per Standard

**Enter Required Controls:**
- Managing work time (working hours and daylight) to keep driving conditions safe

### Hazard #3

**Motion** - Musculoskeletal - Injury from lifting, twisting, stooping, or awkward body positions

<table>
<thead>
<tr>
<th>Suggested FHSHB Ref:</th>
<th>III AF</th>
</tr>
</thead>
</table>

**Overall Unmitigated Risk:** MEDIUM

**Mitigated Risk:** LOW if utilizing:

**Controls that should be considered:**
- Primary: TRACK JSAs, PPE (see HASP "PPE" section)
- Secondary: Field H&S Handbook (see ref. above), PPE (specify below), Administrative Controls (specify below), Housekeeping, Medical Surveillance, WorkCare First Aid/CPR Training (designated person)

**Enter Required Controls:**
- Stay mobile and alert while providing oversight of contractors

### Hazard #4

**None**

<table>
<thead>
<tr>
<th>Suggested FHSHB Ref:</th>
<th>None</th>
</tr>
</thead>
</table>

**Overall Unmitigated Risk:** Not Ranked

**Mitigated Risk:** Not Ranked if utilizing:

**Controls that should be considered:**
- Primary: 
- Secondary: 

**Enter Required Controls:**
- Lift using legs. Do not carry more than you can. Take multiple trips

### Hazard #5

**None**

<table>
<thead>
<tr>
<th>Suggested FHSHB Ref:</th>
<th>None</th>
</tr>
</thead>
</table>

**Overall Unmitigated Risk:** Not Ranked

**Mitigated Risk:** Not Ranked if utilizing:

**Controls that should be considered:**
- Primary: 
- Secondary: 

**Enter Required Controls:**

### Hazard #6

**None**

<table>
<thead>
<tr>
<th>Suggested FHSHB Ref:</th>
<th>None</th>
</tr>
</thead>
</table>

**Overall Unmitigated Risk:** Not Ranked

**Mitigated Risk:** Not Ranked if utilizing:

**Controls that should be considered:**
- Primary: 
- Secondary: 

**Enter Required Controls:**

If you need to list more hazards for this task, unhide "Extended Hazard Analysis".
**Hazard Communication (HazCom)/Global Harmonization System (GHS)**

☐ HAZCOM/GHS for this project is managed by the client or general contractor

*List the chemicals anticipated to be used by Arcadis on this project per HazCom/GHS requirements. (Modify quantities as needed)*

<table>
<thead>
<tr>
<th>Preservatives</th>
<th>Qty</th>
<th>Decontamination</th>
<th>Qty</th>
<th>Calibration</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applicable</td>
<td></td>
<td>Not applicable</td>
<td></td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>&lt;500 ml</td>
<td>Alconox</td>
<td>≤ 5 lbs</td>
<td>Isobutylene/air</td>
<td>1 cyl</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>&lt;500 ml</td>
<td>Liquinox</td>
<td>≤ 1 gal</td>
<td>Methane/air</td>
<td>1 cyl</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>&lt;500 ml</td>
<td>Methanol</td>
<td>≤ 1 gal</td>
<td>Pentane/air</td>
<td>1 cyl</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>&lt;500 ml</td>
<td>Hexane</td>
<td>≤ 1 gal</td>
<td>Hydrogen/air</td>
<td>1 cyl</td>
</tr>
<tr>
<td>Zinc acetate</td>
<td>&lt;500 ml</td>
<td>Isopropyl alcohol</td>
<td>≤ 4 gal</td>
<td>Propane/air</td>
<td>1 cyl</td>
</tr>
<tr>
<td>Ascorbic acid</td>
<td>&lt;500 ml</td>
<td>Nitric acid</td>
<td>≤ 1 L</td>
<td>Hydrogen sulfide/air</td>
<td>1 cyl</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>&lt;500 ml</td>
<td>Other:</td>
<td></td>
<td>Carbon monoxide/air</td>
<td>1 cyl</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>&lt; 4 gal.</td>
<td>Other:</td>
<td></td>
<td>pH standards (4,7,10)</td>
<td>≤ 1 gal</td>
</tr>
<tr>
<td>Formalin (&lt;10%)</td>
<td>&lt; 4 gal.</td>
<td>Other:</td>
<td></td>
<td>Conductivity standards</td>
<td>≤ 1 gal</td>
</tr>
<tr>
<td>Methanol</td>
<td>&lt;500 ml</td>
<td>Other:</td>
<td></td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Sodium bisulfate</td>
<td>&lt;500 ml</td>
<td>Other:</td>
<td></td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fuels</th>
<th>Qty.</th>
<th>Kits</th>
<th>Qty.</th>
<th>DOT(1):</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applicable</td>
<td></td>
<td>Not applicable</td>
<td></td>
<td>MOT eligible soils</td>
<td></td>
</tr>
<tr>
<td>Gasoline</td>
<td>≤ 5 gal</td>
<td>Hach (specify):</td>
<td></td>
<td>MOT eligible water</td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td>≤ 5 gal</td>
<td>DTECH (specify):</td>
<td></td>
<td>MOT eligible solids</td>
<td></td>
</tr>
<tr>
<td>Kerosene</td>
<td>≤ 5 gal</td>
<td>Other:</td>
<td></td>
<td>MOT eligible liquids</td>
<td></td>
</tr>
<tr>
<td>Propane</td>
<td>1 cyl</td>
<td>Other:</td>
<td></td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td>Other:</td>
<td></td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

(1) Attach applicable Materials of Trade (MOT) generic shipping determination. SDS not generally applicable to this category.

*Safety Data Sheets (SDSs) must be available to field staff. Indicate below how SDS information will be provided:*

☐ Not applicable
☐ Printed copy in company vehicle  ☑ Contractor SDSs are not applicable
☐ Printed copy in the project trailer/office ☐ Contractor SDSs are attached
☐ Printed copy attached          ☐ Contractor SDSs will be on site and located:
☐ Electronic copy on field computer

☐ Bulk quantities of the following materials will be stored:

Contact the project H&S contact for information in determining code and regulatory requirements associated with **bulk storage** of materials.
**Monitoring**

- Chemical air monitoring is not required for this project or is the responsibility of the contractor.

*For projects requiring air monitoring, list the relevant constituents representing a hazard to site workers.*

### Monitoring Equipment and General Protocols

- Monitoring is required for any task or activity where employees have potential exposure to vapors or particulates above the TWA. Action levels below are appropriate for most situations. Contact the project H&S contact for all stop work situations. Select monitoring frequency and instruments to be used.

#### Monitoring Frequency:

- Indicator Tube/Chip Frequency: **Indicator tube/chip monitoring not required**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Action Levels</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photoionization Detector</td>
<td>&lt; 0.000</td>
<td>Continue work</td>
</tr>
<tr>
<td>Lamp (eV):</td>
<td>0.000</td>
<td>Sustained &gt;5 min. continuous monitor, review eng. controls and PPE, proceed with caution</td>
</tr>
<tr>
<td></td>
<td>&gt; 0.000</td>
<td>Sustained &gt;5 min. stop work, contact SSO</td>
</tr>
<tr>
<td>Flame Ionization Detector (FID)</td>
<td>&lt; 0.000</td>
<td>Continue work</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>Sustained &gt;5 min. continuous monitor, review eng. controls and PPE, use caution</td>
</tr>
<tr>
<td></td>
<td>&gt; 0.000</td>
<td>Sustained &gt;5 min. stop work, contact SSO</td>
</tr>
<tr>
<td>LEL/O2 Meter</td>
<td>0-5% LEL</td>
<td>Continue work</td>
</tr>
<tr>
<td></td>
<td>&gt;5-10% LEL</td>
<td>Continuous monitor, review eng. controls, proceed with caution</td>
</tr>
<tr>
<td></td>
<td>&gt;10% LEL</td>
<td>Stop work, evacuate, contact SSO</td>
</tr>
<tr>
<td></td>
<td>19.5%-23.5% O2</td>
<td>Normal, continue work</td>
</tr>
<tr>
<td></td>
<td>&lt;19.5% O2</td>
<td>O2 deficient, stop work, evacuate, cont.</td>
</tr>
<tr>
<td></td>
<td>&gt;23.5% O2</td>
<td>O2 enriched, stop work, evacuate, contact</td>
</tr>
<tr>
<td>Indicator: □ tube □ chip</td>
<td>sPEL/TLV</td>
<td>Continue work</td>
</tr>
<tr>
<td></td>
<td>&gt;PEL/TLV</td>
<td>Stop work, review eng. controls and PPE, contact SSO</td>
</tr>
<tr>
<td>Compound(s):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particulate Monitor</td>
<td>&lt; 1.5</td>
<td>Continue work</td>
</tr>
<tr>
<td>(mists, aerosols, dusts in mg/m³)</td>
<td>3.000</td>
<td>Use engineering controls, monitor continuous</td>
</tr>
<tr>
<td></td>
<td>&gt; 3.000</td>
<td>Stop work, review controls, contact SSO</td>
</tr>
<tr>
<td>Other:</td>
<td>Specify:</td>
<td>Specify</td>
</tr>
</tbody>
</table>

* Arcadis administrative TWAs ensure mixture component TWAs are not exceeded that would require additional monitoring or medical surveillance.
Personal Protective Equipment (PPE)

See JSA or Permit for the task being performed for required PPE. If work is not conducted under a JSA or Permit, refer to the governing document for PPE requirements. At a minimum, the following checked PPE is required for all tasks during field work (outside of field office trailers and vehicles) not covered by a JSA or Permit on this project:

Minimum PPE required to be worn by all staff on project:

- [ ] Hard hat
- [ ] Safety glasses
- [ ] Snake chaps/guards
- [ ] Briar chaps
- [ ] Coveralls:
- [ ] Safety glasses
- [ ] Chainsaw chaps
- [ ] Chainsaw chaps
- [ ] Chem. resistant gloves:
- [ ] Face shield
- [ ] Sturdy boot
- [ ] Gloves other:
- [ ] Hearing protection
- [ ] Steel or comp. toe boot
- [ ] Chemical boot:
- [ ] Rain suit
- [ ] Metatarsal boot
- [ ] Boot other:
- [ ] Apron:
- [ ] Other:
- [ ] Traffic vest, shirt or coat: Class II
- [ ] Life vest:

Specify Type:

- [ ] Chem. resistant gloves:
- [ ] Gloves other:
- [ ] Safety glasses
- [ ] Safety glasses
- [ ] Chainsaw chaps
- [ ] Safety glasses
- [ ] Chainsaw chaps
- [ ] Chem. resistant gloves:
- [ ] Face shield
- [ ] Sturdy boot
- [ ] Gloves other:
- [ ] Hearing protection
- [ ] Steel or comp. toe boot
- [ ] Chemical boot:
- [ ] Rain suit
- [ ] Metatarsal boot
- [ ] Boot other:
- [ ] Apron:
- [ ] Other:
- [ ] Traffic vest, shirt or coat: Class II
- [ ] Life vest:

Task specific PPE: Hearing protection required around heavy equipment

Comments:

Wear waders, if water is present and they are deemed necessary for sediment or surface water sampling

Hard Hard not required during Sediment and Surface Water Sampling

Medical Surveillance (check all that apply)

- [ ] Medical Surveillance is not required for this project.
- [ ] HAZWOPER medical surveillance applies to all Arcadis site workers on the project.
- [ ] HAZWOPER medical surveillance applies to all subcontractors on the project.
- [ ] HAZWOPER medical surveillance applies to all site workers on the project except:

- [ ] Other medical surveillance required (describe type and who is required to participate):

- [ ] Client drug and/or alcohol testing required. □ □ DOT drug and/or alcohol testing required.

Hazardous Materials Shipping and Transportation (check all that apply)

- [ ] Not applicable, no materials requiring a Shipping Determination (SD) will be transported or shipped
- [ ] A SD has been reviewed and provided to field staff
- [ ] A SD is attached
- [ ] All HazMat will be transported under Materials of Trade by Arcadis (see generic MOT SD Form)
- [ ] Other (specify):

Traffic Safety Plan (TSP) (check all that apply)

- [ ] Not applicable for this project
- [ ] All or portions of the work conducted under a Right-of-Way (ROW) TSP
- [ ] All or portions of the work conducted under a Non-ROW TSP
- [ ] TSP provided to field staff
- [ ] TSP attached
- [ ] Other (specify):

Arcadis Commercial Motor Vehicles (CMVs)

This section is applicable to Arcadis operated vehicles only (select one)

- [ ] This project will not utilize CMV drivers
- [ ] This project will utilize CMV drivers

This project will NOT utilize vehicles (alone or in combination with a trailer) with a gross vehicle weight rating (GVWR) of 10,001 pounds or more. GVWR Truck + GVWR Trailer = <10,001 pounds
Site Control (check all that apply)

☐ Not applicable for this project.
☐ Site control protocols are addressed in JSA or other supporting document (attach)
☐ Maintain an exclusion zone of _________ ft. around the active work area
☐ Site control is integrated into the TSP for the project
☐ Level C site control - refer to Level C Supplement attached
☐ Other (specify):

When moving between project work locations on the Haul Road (near SWMU 16 and 17), Arcadis driver should yield to any oncoming Dump Truck or Mining Truck traffic. Hazard Lights should be on when traveling the Haul Road as a precaution and to notify surrounding traffic of truck location.

Decontamination (check all that apply)

☐ Not applicable for this project.
☐ Decontamination protocols are addressed in JSA or other governing document (attach)
☐ Wash hands and face prior to consuming food, drink or tobacco.
☐ Remove gloves and coveralls and contain, wash hands and face prior to consuming food, drink or tobacco. Ensure footwear is clean of site contaminants
☐ Respiratory protection- refer to the Level C supplement attached.
☐ Other (specify):

Sanitation (check all that apply)

☐ Mobile operation with access to off-site restrooms and potable water
☐ Restroom facilities on site provided by client or other contractor
☐ Project to provide portable toilets (1 per 20 workers)
☐ Potable water available on site
☐ Project to provide potable water (assume 1 gal./person/day)
☐ Project requires running water (hot and cold, or tepid) with soap and paper towels

Safety Briefings (check all that apply)

☐ Safety briefing required daily
☐ Safety briefing required twice a day
☐ Safety briefings required at the following frequency:
☐ Subcontractors to participate in Arcadis safety briefings
☐ Arcadis to participate in client/contractor safety briefings
☐ Other (specify):

Safety Equipment and Supplies

Safety equipment/supply requirements are addressed in the JSA or Permit for the task being performed. If work is not performed under a JSA or Permit, the following safety equipment is required to be present on site in good condition (Check all that apply):

☐ First aid kit
☐ Bloodborne pathogens kit
☐ Fire extinguisher
☐ Eyewash (ANSI compliant)
☐ Eyewash (bottle)
☐ Drinking water
☐ Other:
☐ Mobile Phone
☐ Insect repellent
☐ Sunscreen
☐ Air horn
☐ Traffic cones
☐ 2-way radios
☐ Heat stress monitor

Remove gloves and coveralls and contain, wash hands and face prior to consuming food, drink or tobacco. Ensure footwear is clean of site contaminants.
International Travel

- This project does not involve international travel
- This project involves international travel

Behavior Based Safety Program (check all that apply) - Frequency specified by the Project Manager

- TIP required at the following frequency on this project:
  Select One: _______ mhrs _______ time(s) _______ Define: ____________

- H&S Field Assessment required at the following frequency on this project:
  Select One: _______ mhrs _______ time(s) _______ Define: ____________

- Other (specify):

Signatures

I have read, understand and agree to abide by the requirements presented in this health and safety plan. I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

<table>
<thead>
<tr>
<th>Printed Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Add additional sheets if necessary

You have an absolute right to STOP WORK if unsafe conditions exist!
Attachments
Attachment 1

Forms
# Task Improvement Process

## General
- **Observed Company:**
- **Observation Type:**
- **TIP Form:** H&S Field Multi-Task (General)
- **Task Observed:**
- **Observee Name:**
- **Observer Name:**
- **Observation Date:**
- **Project Number:** KC001721.0001
- **Project Name:** Ash Grove Cement Company Chanute, Kansas
- **Supervisor:**
- **Equipment On Site:**
- **Pertinent Information:**

## Observation

<table>
<thead>
<tr>
<th>Task</th>
<th>Correct</th>
<th>Questionable</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPE worn according to HASP/JLA specifications and inspected before use?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STOP work authority used where appropriate?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Body Use/Positioning</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper lifting/pushing / pulling techniques used (no awkward positions/posture; no twisting or excessive reaching; no straining; no excessive weight; load under control/stable, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body parts away from pinch points (clear or protected from being caught between objects/equipment or from contacting sharp objects/edges, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body parts not in the Line of Fire (protected from being struck by traffic, equipment, falling/flying objects, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Work Procedures/Environment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct type and number of barricades/warning devices/cones?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td>Communication with others when necessary (hand signals, flags, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right tools and equipment selected for the job and inspected before use?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools and equipment used properly?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housekeeping performed (work areas and pathways clear of hazards, uneven surfaces addressed, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slip/tip/fall hazards addressed (path selected and cleared, eyes on path, speed footing, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper energy control (electrical systems grounded, lock out/tag out performed, isolated, cords/fixtures in good condition, GFCI inspected and utilized when appropriate and used properly, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protected from overhead/underground utilities (proper clearance, properly marked, spotters as necessary, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe work on/near water (appropriate flotation device, appropriate boat for body of water and operation of boat, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical/Radiation protection (decontamination zones set up properly, air monitoring, completed, and logged, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall from elevated height prevention (maintains 3-points of contact, appropriate ladder, mounting/dismounting vehicle/equipment, fall arrest system, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any additional safety issues identified:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tip Summary** Enter details of the TIP and follow up discussion provide details on how any questionable items were resolved.

Discussion following the TIP led by: ________________________________

Date of follow-up discussion: _________________________________
Positive Comments:

Discussion Summary Completed:  
- Supervisor Led  
- Peer to Peer  
- Arcadis Employee to Subcontractor

Summary of Questionable Items

Action Items (Optional) Assign appropriate action items based on the observations made. You can add more than one action item if needed.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Action Item</th>
<th>Responsible Person</th>
<th>Due Date</th>
<th>Comp. Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Standard Review  
Reviews to be performed after entry of this TIP into 4-Sight.

Quality Review  
Quality Reviews to be performed after entry of this TIP into 4-Sight.

Field Validation and Verification  
Use the 4-Sight generated copy of this TIP to perform field V&V activities.
# TAILGATE HEALTH & SAFETY MEETING FORM

**Project Name:** Ash Grove Cement Company  
**Project Location:** Chanute, Kansas

<table>
<thead>
<tr>
<th>Date:</th>
<th>Time:</th>
<th>Conducted by:</th>
<th>Signature/Title:</th>
</tr>
</thead>
</table>

**Issues or concerns from previous day’s activities:**

**Task anticipated to be performed today:**

**The following was used to communicate H&S information in this briefing (check all that apply):**

- [ ] HASP *(including THA)*
- [ ] JSAs *(specify JSA #s)*:
- [ ] Permits *(specify type or #)*:
- [ ] Traffic Safety Plan
- [ ] FHSHB *(specify sections)*:
- [ ] H&S Standard *(specify number)*:
- [ ] H&S checklist *(specify type)*:
- [ ] Activity specific hazard analysis:

**Activity:**

- [ ] Biological
- [ ] Chemical
- [ ] Driving
- [ ] Electrical
- [ ] Environmental
- [ ] Gravity
- [ ] Mechanical
- [ ] Motion
- [ ] Personal Safety
- [ ] Pressure
- [ ] Radiation
- [ ] Sound

**Controls required to be used:**

<table>
<thead>
<tr>
<th>PPE Required <em>(If not using JSA or Permit with PPE requirements)</em>:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] Hard hat</td>
</tr>
<tr>
<td>[ ] Safety glasses</td>
</tr>
<tr>
<td>[ ] Face shield</td>
</tr>
<tr>
<td>[ ] Safety goggles</td>
</tr>
<tr>
<td>[ ] Steel/composite toe boots</td>
</tr>
<tr>
<td>[ ] Traffic vest <em>(specify II or III)</em>:</td>
</tr>
<tr>
<td>[ ] Life Vest <em>(specify type)</em>:</td>
</tr>
<tr>
<td>[ ] Protective Suit <em>(specify type)</em>:</td>
</tr>
<tr>
<td>[ ] Protective gloves <em>(specify type)</em>:</td>
</tr>
<tr>
<td>[ ] Other <em>(specify)</em>:</td>
</tr>
</tbody>
</table>

**Signature and Certification:** I have read and understand the project specific HASP for this project.

<table>
<thead>
<tr>
<th>Printed Name/Signature/Company</th>
<th>Sign In Time</th>
<th>Sign Out Time</th>
</tr>
</thead>
</table>

I will **STOP** the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will **be alert** to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB**, I will perform **TRACK**, and then amend the hazard assessments or the HASP as needed.

I will **not assist** a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done **TRACK** and I have thoroughly controlled the hazard.

All site staff should **arrive early** for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call **WorkCare** at 1.888.449-7787 and then notify the field supervisor.

Utility strike, motor vehicle accident or 3rd party property damage - field supervisor will immediately notify the Project or Task Manager.
What You Need to Know

Emergency Phone: 911  WorkCare Phone: 1-888-449-7787
Your nearest hospital: Neosho Memorial Regional Medical Center 629 South Plummer Ave Chanute, KS 667

H&S Specialist for this project: Alec MacAdam  Cell Phone: 720-454-0948
Project Site Safety Officer: 0
Nearest assembly area(s): To be determined
Nearest storm shelter(s): To be determined
Simultaneous operations (SimOps): SimOps is not applicable to this project.

Site Security: A Site Security Plan does not apply to this project.
Utility Clearance: Review of utility clearance checklist and daily site walkover for utility identification is required.
State Specific Requirements: You must follow Heat Injury and Illness Prevention Plan developed for this project.
You are required to have current training in the following:
H&S Program Orientation, HAZCOM GHS/EAP, Defensive Driving - Smith On-Line, Hazwoper 40 Hour, Hazwoper 8-Hour Annual Refresher,

SDSs for this project are located: Printed copy attached
Primary chemical constituents of concern for this project:
Refer to the applicable HASP extended air monitoring worksheet for the activity to be performed for constituent information.

PID action levels for this project:

<table>
<thead>
<tr>
<th>Level</th>
<th>Action</th>
</tr>
</thead>
</table>
| < 0.0 | Continue work
| 0.0 | Sustained >5 min. continuous monitor, review eng. controls and PPE, proceed with caution
| > 0.0 | Sustained >5 min. stop work, contact SSO

* Arcadis administrative TWAs ensure mixture component TWAs are not exceeded that would require additional monitoring or medical surveillance.

For work not conducted under a JSA or permit, you must wear the following PPE:
Hard hat, Safety glasses, Steel or comp. toe boot, Traffic vest, shirt or coat: Class II, Chemical boot: 0,

Wear waders, if water is present and they are deemed necessary for sediment or surface water sampling
Hard Hard not required during Sediment and Surface Water Sampling

You are required to be current on your medical surveillance.

You are not authorized to work until you have reviewed and agree with shipping determinations that are applicable to your project.
TSPs are not required for your work.

The following safety equipment and supplies are required to be on site for this project:
First aid kit, Fire extinguisher, Eyewash (ANSI compliant), Eyewash (bottle), Drinking water, Insect repellent, Sunscreen, Other: , Mobile Phone, 0, 0

Site Control: Site control is not required for this project.
Decontamination: Decontamination protocols are addressed in JSA or other governing document (attach)
Sanitation: Mobile operation with access to off-site restrooms and portable water
Project to provide portable water (assume 1 gal./person/day)
Safety Briefings: Safety briefing required daily
This project has the following TIP goals:
THIS FORM MUST BE COMPLETED IN ENTIRETY PRIOR TO BEGINNING ANY INTRUSIVE WORK

Project: Ash Grove Cement Company Chanute, Kansas
Project Number: KC001721.0001
Form Completion Date: _______ Form Expiration Date: (15 business days post form completion date)

Pre-Field Work
Required: One Call or "811" notified 48-72 hours in advance of work? #: _______
Ticket Expiration Date: ____________________ (Review State Requirements)
Utility companies notified during the One Call process: □ See attached ticket
□ None
List any other utilities requiring notification: □ None

Private Locator Contacted: □ Yes □ No
Plan private utility clearance subcontractor assignments, areas, required clearance equipment, depth of clearance needed, types of utilities. When possible re-clear 811 markings to confirm utility locations.

Client provided utility maps or "as built" drawings showing utilities? □ Yes □ No

Field Work - This must be completed on site, by staff who have a minimum of one year of field experience in identifying utilities. Review Check list with PM or designee prior to beginning intrusive work.

List Soil Boring / Well IDs or Excavation Locations applicable to this clearance checklist:

3 Reliable Lines of Evidence Required Prior to Starting any Subsurface Intrusive Work
□ One Call/"811" (Reliable as a line of evidence when working in public right of way or easement)
Utility Markings Present: □ Paint □ Pin flags/stakes □ Other □ None
□ Client Provided Maps/Drawings OR □ Maps/Drawings requested but not provided
□ Client Clearance Name(s)/Affiliation(s)
□ Interview(s): Name(s)/Affiliation(s)

Did person(s) interviewed indicate depths of any utilities in the subsurface? □ Yes, depths provided: □ No, did not know or refused to answer
Additional Comments:

□ Site Inspection (Complete Page 2 & Photo Document Marked Utilities & Utility Structures)
□ Public Records / Maps / Asbuilt
□ Private Locator: (Name and Company)
□ Ground Penetrating Radar (GPR)
□ Radiofrequency (RFLoc)
□ Electromagnetic (EM)
□ Metal Detector

Soft Dig Methods:
□ Termination Depth ______ ft. bgs
□ Potholing / Vacuum Extraction
□ Air-Knife □ Hydro-Knife
□ Probing
□ Hand Auguring
□ Other:
□ Marine Locator: (Name and Company)

Tips for Successful Utility Location:
1. Don't forget to look up
2. Be on site with Private Utility Locators
3. Ask Private Locators to "confirm" other's markings
4. Select alternate/backup locations during clearance process
5. Mark out all known utilities. Leave nothing to question
6. No hammering - no pickaxes - no digging bars - no shortcutting
7. No excessive turning or downward force of hand augers/shovels
8. Utilities may run in or directly under asphalt/concrete

During the site inspection look for the following: ("YES" requires additional investigation and the utility must be marked properly prior to beginning subsurface intrusive work):
<table>
<thead>
<tr>
<th>Site Inspection</th>
<th>Utility Color Codes</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Natural gas line present (evidence of a gas meter)?</td>
<td>Yellow</td>
<td>□ Yes</td>
</tr>
<tr>
<td>i) Feeder Lines to buildings or homes?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>b) Evidence of electric lines:</td>
<td>Red</td>
<td>□ Yes</td>
</tr>
<tr>
<td>i) Conduits to ground from electric meter or along wall?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>ii) Conduits from power poles running into ground?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iii) Light poles, electric devices with no overhead lines?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iii) Overhead electric lines present? (See Section I)</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>c) Evidence of sewer drains:</td>
<td>Green</td>
<td>□ Yes</td>
</tr>
<tr>
<td>i) Restrooms or kitchen on site?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>ii) Sewer cleanouts present?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iii) Combined sewer/storm lines or multiple sewer lines?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>d) Evidence of water lines:</td>
<td>Blue</td>
<td>□ Yes</td>
</tr>
<tr>
<td>i) Water meter on site or multiple water lines?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>ii) Fire hydrants in vicinity of work?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iii) Irrigation systems? (Sprinkler heads, valve boxes, controls in building)</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>e) Evidence of storm drains:</td>
<td>Green</td>
<td>□ Yes</td>
</tr>
<tr>
<td>i) Open curbside or slotted grate storm drains</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>ii) Gutter down spouts going into ground</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>f) Evidence of telecommunication lines:</td>
<td>Orange</td>
<td>□ Yes</td>
</tr>
<tr>
<td>i) Fiber optic warning signs in areas?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iv) Aboveground cable boxes or housings or wires in work area?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>g) Underground storage tanks:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Tank pit present, tank vent present?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>ii) Product lines running to dispensers/buildings?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>h) Do utilities enter or exit existing structures/buildings?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>i) Proposed excavation marked in white?</td>
<td>White</td>
<td>□ Yes</td>
</tr>
<tr>
<td>j) Unclassed utilities / anomalies marked in pink?</td>
<td>Pink</td>
<td>□ Yes</td>
</tr>
<tr>
<td>k) Overhead Utilities/Communication Lines - Look Up:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Overhead electrical conduit, pipe chases, cable trays, product lines?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>ii) Overhead fire sprinkler system?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>l) Overhead Power lines in or near the work area:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) &lt; 50 kV within 10 ft. of work area?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>ii) &gt;50 - 200 kV within 15 ft. of work area?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iii) &lt;200-350 kV within 20 ft. of work area?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iv) &gt;350-500 kV within 25 ft. of work area?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>v) &gt;500-750 kV within 35 ft. of work area?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>vi) &gt;750-1000 kV within 45 ft. of work area?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>m) Other:</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>i) Evidence of linear asphalt or concrete repair?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>ii) Evidence of linear ground subsidence or change in vegetation?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iii) Unmarked manholes or valve covers in work area?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>iv) Warning signs (&quot;Call Before you Dig&quot;, etc.) on or adjacent to site?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>v) Utility color markings not illustrated in this checklist?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>n) Has the Utilities &amp; Structures Checklist been reviewed by the PM or Designee PM or Designee Name:</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
</tbody>
</table>

Name and Signature of person completing the checklist: _________________________________

Date: __________________________________________________________________________

Do not perform **mechanized** intrusive work within 30 inches of a utility marking without receiving pre-approval by Corporate H&S.
# Arcadis Weekly Vehicle Inspection Form

**Vehicle # / License Plate #**

**Lease Plan # / Last 6 of Vin #**

<table>
<thead>
<tr>
<th></th>
<th>OK</th>
<th>Needs</th>
<th>Repair Date</th>
<th>OK</th>
<th>Needs</th>
<th>Repair Date</th>
<th>OK</th>
<th>Needs</th>
<th>Repair Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inspection Date</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Odometer reading</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Driver / Inspector Name</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Check the appropriate box and enter repair date for identified repairs.*

**Interior**
- Horn operational
- Door Latches operational
- Seat Belts in good repair
- Seats and Seating Controls
- Steering Wheel - No Excessive Play
- Interior Lights and Light Controls
- Instrument Panel/Gauges
- Wiper Controls operational
- Heat/Dewfrost/AC Conditioning working
- Rear View Mirror present
- Backup Camera/Sensors working
- Jack and Lug Wrench present

**Exterior**
- Lights and Signals operational
- Tires properly inflated/good tread depth
- Spare Tire properly inflated
- Doors operational
- Windows Not Cracked/Damaged
- Side View Mirrors
- Body Panels and Bumpers

**Engine & Brakes**
- Engine Start & Running Smoothly
- Fluid Levels, No Noticable Leaks
- Belts tight, no cracks
- Brakes operational, no squeaking

**Emergency Equipment**
- First Aid Kit, Inspected weekly
- Fire Extinguisher properly secured
- Fire Extinguisher inspected weekly
- Orange/Yellow emergency warning light
- Roadside Assistance Information
- Roadside Assistance Information
- Recommended spotter cones available

**Cargo**
- Cargo Secure and Properly Distributed
- Securing Devices in Good Condition

**Registration**
- License Plate / Tags
- Registration and Insurance
- City/State Inspection Decal
- Lease Plan Information / Fuel Card

---

1. Note all damages to the vehicle on the back of this page.
2. Emergency Equipment required per Motor Vehicle Standard ARC HSGE024
Note All Vehicle Damage Below

All Vehicle Damage must be reported to Sue Berndt (Corporate Legal), Andrew McDonald (Corporate H&S), and Roger Elliot (Corporate Fleet Manager)

Codes:
- B - Bent
- BR - Broken
- B/H - Bulge
- C - Chafed
- CH - Chipped
- CPM - Covered with Protective Material
- Unable to Determine Defects IF ANY
- CSA - Chafed and Scratched All Over
- CR - Cracked
- D - Dented
- DM - Dust and Mud Covered
- UN - Unable to Determine Other
- Defects IF ANY
- G - gouged or Cut
- GC - Glass Cracked
- HS - Hairline Scratch
- M - Missing
- P - Punctured
- R - Rusty
- S - Scratched
- SM - Smashed
- ST - Stained/or Soiled
- T - Torn

Cars
Cats
Rear

Trucks
Trucks
Rear

Vans/Buses
Vans/Buses
Rear

Note:
- Indicate on Diagram
- Give Dimensions
- Circle Where Applicable

Notes:

Tread guide: If a tread gauge is not available, coins may be used to determine remaining tread. 2/32" is the minimum by law in most states (top of Lincoln’s head on penny), 4/32" is minimum recommended for wet surfaces (top of Washington’s head on quarter), 6/32" is minimum recommended for snowy surfaces (top of Lincoln Memorial on penny). Vehicle tires should be replaced if the tread depth is less than 6/32".

Reference JSA 10907 For Weekly Vehicle Inspection
Arcadis Lone Worker or Remote Location Communication Plan
(For international travel/work, use the Travel Security Plan template in lieu of this template)

Project Name: Ash Grove Cement Company Chanute, Kansas
Project Number: KC001721.0001
Date: 12/21/2017
Revision: 

General Information (select all that apply):
- [x] Worker will be alone
- [x] Buddy system will be used
- [ ] Area is within cell phone service range
- [ ] Cell phone service is limited or out of range
- [ ] Worker will be performing high risk activity
- [ ] Work will be performed outside normal operating hours (nights or weekends)
- [ ] Wilderness work
- [ ] Site is not accessible to standard emergency services
- [ ] Other unique site conditions that may hinder employee’s ability to get help, if required.

Explain:

Communication Plan

<table>
<thead>
<tr>
<th>Frequency of Communication:</th>
<th>4 HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned Start Time:</td>
<td>7:00:00 AM</td>
</tr>
<tr>
<td>Planned End Time:</td>
<td>7:00:00 PM</td>
</tr>
</tbody>
</table>

Contact Information:
- Field Worker Name: Rich Parshall
- Field Worker Phone Number: 816-536-9858
- Vehicle Make/Model/License Plate: White Arcadis Field Truck
- Office Contact Name: Tina Lloyd
- Office Contact Phone Number: 913-998-6916 or 913-205-5417

Method of Communication:
- [x] Cell Phone (including text notification)
- [ ] GPS
- [ ] Landline
- [ ] Transponder
- [ ] 2-way Radio
- [ ] Other: 

Contingency Plan (if the Field Worker cannot be reached, describe actions the Office Contact will take)
Contact Drew Hoisington at Ash Grove 620-431-4500
## Notification Log

<table>
<thead>
<tr>
<th>Time</th>
<th>Field Worker Notification</th>
<th>Office Receipt of Notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00:00 AM</td>
<td>__________________________</td>
<td>______________________________</td>
</tr>
<tr>
<td>11:00:00 AM</td>
<td>__________________________</td>
<td>______________________________</td>
</tr>
<tr>
<td>3:00:00 PM</td>
<td>__________________________</td>
<td>______________________________</td>
</tr>
<tr>
<td>7:00:00 PM</td>
<td>__________________________</td>
<td>______________________________</td>
</tr>
</tbody>
</table>
Attachment 2

JSAs
## Job Steps

<table>
<thead>
<tr>
<th>Job Step No.</th>
<th>Job Step Description</th>
<th>Potential Hazard</th>
<th>Critical Action</th>
<th>H&amp;S Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-Trip Inspection</td>
<td>Failing to perform pre-trip inspections may cause mechanical failure, accident or injury.</td>
<td>Perform walk around of vehicle with particular attention to tire inflation and condition. Check lights, wipers, seatbelts for proper operating condition. Properly adjust seat and mirrors prior to vehicle operation. Use or review vehicle inspection checklist as required under the MVSP.</td>
<td>ARC HoGE024 Motor Vehicle Safety Standard (MVSP)</td>
</tr>
<tr>
<td>2</td>
<td>Driving a motor vehicle on public streets</td>
<td>Failing to observe traffic flow ahead increases risk of hard braking resulting in potential impact of vehicle ahead, being struck by another vehicle from behind and decreases decision making time.</td>
<td>Use Smith System Key #1, &quot;Aim High in Steering&quot;. <strong>Look ahead (15 seconds if possible) to observe traffic flow and traffic signals.</strong> Adjust speed accordingly to keep vehicle moving and avoid frequent braking. Select lane of least traffic and adjust speed based on observed signal timing when possible. Avoid following directly behind large vehicles that obscure view ahead.</td>
<td>Smith System &quot;5-Keys&quot; is a registered trademark of Smith System Driver Improvement Institute, Inc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scraps, cuts, burns to hand if inspecting engine fluids and/or tires. Eye splash hazard if inspecting engine fluids. Pinch or crush hazards when opening or closing hood, trunk or tailgate.</td>
<td>Wear protective gloves and safety glasses as described below when checking under hood or tires. Use TRACK and keep hands clear when opening/closing hood, trunk, or tailgate to avoid crush or pinch hazard.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improperly secured cargo may dislodge creating injury, property damage or road hazard.</td>
<td>Ensure all cargo is properly secured to prevent movement while the vehicle is in operation. This includes cargo in the cab of the vehicle.</td>
<td></td>
</tr>
</tbody>
</table>
3 Failing to keep your eyes moving increases risk of not seeing relevant vehicles, pedestrians and objects in your vicinity that may impair your ability to make timely and appropriate driving decisions and also increases risk of accident.

Use Smith System Key #3, "Keep Your Eyes Moving". **Move your eyes every 2 seconds and avoid staring while evaluating relevant objects.** Scan major and minor intersections prior to entering them. Check mirrors.

4 Failing to maintain space around and in front of your vehicle increases risk of striking another vehicle or being struck by another vehicle. Insufficient space shortens time for effective driving decision making resulting in increased accident risk.

Use Smith System #4, "Leave Yourself an Out". **Use 4 second rule when following a vehicle.** Avoid driving in vehicle clusters by adjusting speed and using lanes that permit maximum space and visibility. When stopped, keep one car length space in front of vehicle ahead or white line.

5 Failing to communicate with other drivers and pedestrians increases risk of striking vehicles, pedestrians, or being struck by other vehicles, especially from the rear.

Use Smith System Key #5, "Make Sure They See You". **Brake early and gradually when stopping to reduce potential of being rear ended.** Keep foot on brake while stopped. Use turn signals and horn effectively. Establish eye contact with other drivers and pedestrians to extent practical. Use vehicle positioning that promotes being seen.

6 Distractions within the vehicle takes focus off driving, increases risk of accident decreases time for making effective driving decisions.

Cell phone use (any type or configuration) is prohibited while the vehicle is in motion. Familiarize yourself with vehicle layout and controls (radio, temperature controls, etc.) prior to operating unfamiliar vehicles. Set controls prior to operating vehicle. Use GPS in unfamiliar areas to avoid use of paper maps/directions while driving. Set GPS prior to vehicle operation. Pull over and stop to modify GPS functions. Avoid consuming food or drink while driving.

3 Parking

1 Parking vehicle in areas of clustered parked vehicles or near facility entrance may impair visibility to oncoming traffic in lot and increase exposure to pedestrian traffic.

Use pull through parking or back into parking space when permitted or practical. When practical and safe to do so, park away from other vehicles and avoid parking near the facility entrance or loading docks. If available, use a spotter to aid in backing activity. Back no further than necessary and back slowly. Get out and look (GOAL) if uncertain of immediate surroundings. Tap horn prior to backing.

<table>
<thead>
<tr>
<th>PPE</th>
<th>Personal Protective Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>Eye Protection</td>
<td>safety glasses</td>
</tr>
<tr>
<td>Hand Protection</td>
<td>work gloves (specify type)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Communication Devices</td>
</tr>
<tr>
<td>other</td>
</tr>
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<td>Miscellaneous</td>
</tr>
<tr>
<td>first aid kit</td>
</tr>
<tr>
<td>Employee: Santaniello, Julie A.</td>
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<tr>
<td>Employee: Santaniello, Julie A.</td>
</tr>
<tr>
<td>Employee: Lujan, Teresa M.</td>
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**Job Safety Analysis**

### General

<table>
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<tr>
<td>49</td>
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<table>
<thead>
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<th>Task Description</th>
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<tr>
<td>Environment-Soil sampling - manual</td>
<td>Hand augering</td>
<td>2/6/2009</td>
<td>02/06/2009</td>
</tr>
</tbody>
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| Template | Auto Closed | |
|----------|-------------| |
| TRUE     | FALSE       | |

### Client / Project

- **Client**: Ash Grove Cement Company
- **Project Number**: KC001721.0001
- **Project Name**: CMI
- **Project Manager**: Shonfelt, John

### User Roles

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<td>12/19/2011</td>
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<td>2/8/2009</td>
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### Job Steps

<table>
<thead>
<tr>
<th>Job Step No.</th>
<th>Job Step Description</th>
<th>Potential Hazard</th>
<th>Critical Action</th>
<th>H&amp;S Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sampling set-up</td>
<td>Underground utilities could be encountered during hand augering</td>
<td>Follow the Utility Clearance HS Standard</td>
<td>Utility Clearance HS Standard ARCHSF019</td>
</tr>
<tr>
<td>2</td>
<td>Installation of hand auger boring</td>
<td>Muscle strains from pulling/pushing could occur when installing the boring, and when removing the auger from the hole</td>
<td>Stretch out arms/back/shoulder muscles prior to beginning. Using firm grip on handle, slowly turn auger and progress downward in 6” increments. Slowly pull auger from hole- use legs to pull auger out of hole. If water is encountered, a suction will be created when trying to remove the auger. Ask for assistance from another worker if you can't remove safely on your own.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Collect Sample Soil Sample</td>
<td>Staff can come into contact with impacted soils</td>
<td>Take rest breaks as needed or switch out task with another employee.</td>
<td>Wear chemical protective gloves as outlined in the HASP, and wear safety glasses.</td>
</tr>
<tr>
<td>Step</td>
<td>Task</td>
<td>Review Comments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sharp edges and broken glassware can cause lacerations</td>
<td>Discard any broken sample containers or glass. Do not overtighten sample containers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Containerizing and moving soil cuttings can cause muscle strains</td>
<td>Dispose of left over soil cuttings in a drum or bucket and dispose properly. Only fill buckets half full due to weight and strength of bucket. Wear leather work gloves and use good lifting techniques when handling buckets.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Decon Hand Auger</td>
<td>1 Exposure to COCs while deconing equipment. Wear chemical protective gloves as outlined in the HASP, and wear safety glasses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Cleaning solutions can splash while deconing equipment. Use PPE as outlined in the HASP, and try to minimize splashing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 The end of the hand auger has sharp edges, and lacerations can occur. Use brush to scrub off soils and not hands. Do not reach into the nose (the end with teeth) of the auger with hand.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fill in Sample Location</td>
<td>1 Open boreholes are a trip hazard. Fill in hole with sand or bentonite. Pack down chips as best as possible. Add a bit of DI Water to make chips swell and fill hole completely.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Muscle strain can occur from lifting bags of sand and/or bentonite. Use proper lifting techniques as detailed in the Field H&amp;S handbook.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PPE: Personal Protective Equipment

<table>
<thead>
<tr>
<th>Type</th>
<th>Personal Protective Equipment</th>
<th>Description</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Protection</td>
<td>safety glasses</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Foot Protection</td>
<td>steel-toe boots</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Hand Protection</td>
<td>chemical resistant gloves (specify type)</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>work gloves (specify type)</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Head Protection</td>
<td>hard hat</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Hearing Protection</td>
<td>ear plugs</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Miscellaneous PPE</td>
<td>traffic vest--Class II or III</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Respiratory Protection</td>
<td>dust mask</td>
<td></td>
<td>Recommended</td>
</tr>
</tbody>
</table>

### Supplies

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply</th>
<th>Description</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decontamination</td>
<td>Decon supplies (specify type)</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>first aid kit</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Personal</td>
<td>eye wash (specify type)</td>
<td>bottle</td>
<td>Required</td>
</tr>
<tr>
<td>Traffic Control</td>
<td>traffic cones</td>
<td></td>
<td>Required</td>
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### Review Comments

- **Employee:** Coppola, Mija A  
  **Role:** HASP Reviewer  
  **Review Type:** Approve  
  **Completed Date:** 2/6/2009
  
- **Employee:** Vollertsen, Patricia A  
  **Role:** Quality Reviewer  
  **Review Type:** NA  
  **Completed Date:** 3/3/2009

Looks really good and these are so easy to read. Some comments Step 1, hazard 2: Consider including page number from handbook Step 2, hazard 2: Consider using “hand/muscle fatigue rather than “strain”. Step 3, critical action 1: Is Tyvek ever required for really wet soils? Step 3, hara 3 and step 5: Hazard 1: Consider muscle “fatigue” rather than strain Step 5, hazard 1: Do you ever have to move to the next spot before filling in hole? If so, may want to add in the CA--if you have to walk away before filling, mark hole to alert others. Step 6 - as this is a JLA for hand augering, would you maybe just reference the “well installation JLA” rather than adding the step here? If that doesn’t make sense, need to look at hazard 5 as it notes that debris can get in eyes, but the CA talks about a dust mask - may want to reword that debris in eyes, nose and mouth can occur when working with soil, grout, and bentonite and for CA include reference to eye protection.
# Job Safety Analysis

## General

<table>
<thead>
<tr>
<th>JSA ID</th>
<th>Status</th>
<th>Created Date</th>
<th>Completed Date</th>
<th>H&amp;S Reference</th>
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<table>
<thead>
<tr>
<th>Job Name</th>
<th>Task Description</th>
<th>Potential Hazard</th>
<th>Critical Action</th>
<th>H&amp;S Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment-Surface water sampling in drainage ditch</td>
<td>Surface water sampling</td>
<td>Slips/trips/falls on wet surfaces and tripping over equipment or supplies.</td>
<td>Wear shoes with anti-slip soles, plan route and do not hurry through task. Do not carry sample coolers or other objects that obscure vision. Avoid heavily muddied areas. Make multiple trips if necessary. Coolers with samples will get heavier as job progresses. Use smaller coolers to keep loads light.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cuts to hands from broken glass</td>
<td>Wear protective gloves when placing or removing bottle lid. Select gloves with good gripping capability on wet glass. Do not overtighten lids when securing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Awkward twisting or body positions, muscle strain.</td>
<td>Avoid extended periods of squatting and avoid bending at the waist. Do not over reach when direct filling containers. Plan sampling activity to account for current and water depth if wading to collect samples.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Falling into water can cause injury/drowning</td>
<td>Wear PFD if falling into water deeper than waist high is a hazard, or if working proximal to turbulent / fast moving water. TRACK water conditions every day as rain/snow thaw can cause water conditions to worsen. Person walking through water should minimize what they are carrying so they can maintain balance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water entering boots can increase the chance for blisters and other skin issues with feet/ankles.</td>
<td>Wear rubber outer boots when appropriate. Waders should be worn when wading into deeper water.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cuts to hands from ropes and cables during sample collection from deep water.</td>
<td>Wear protective gloves. Ensure rope has a thickness appropriate to prevent cuts to hands - 3/8 inch rope suggested minimum thickness. Be aware that water will create drag on sampling device during removal and do not hurry through task.</td>
<td></td>
</tr>
</tbody>
</table>

## User Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Employee</th>
<th>Due Date</th>
<th>Completed Date</th>
<th>Supervisor</th>
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<tr>
<td>Developer</td>
<td>Coppola, Mija A</td>
<td>3/29/2012</td>
<td>5/13/2009</td>
<td>Ebert, Joachim</td>
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## Job Steps

<table>
<thead>
<tr>
<th>Job Step No.</th>
<th>Job Step Description</th>
<th>Potential Hazard</th>
<th>Critical Action</th>
<th>H&amp;S Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Surface water sampling from drainage ditch</td>
<td>Slips/trips/falls on wet surfaces and tripping over equipment or supplies.</td>
<td>Wear shoes with anti-slip soles, plan route and do not hurry through task. Do not carry sample coolers or other objects that obscure vision. Avoid heavily muddied areas. Make multiple trips if necessary. Coolers with samples will get heavier as job progresses. Use smaller coolers to keep loads light.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cuts to hands from broken glass</td>
<td></td>
<td>Wear protective gloves when placing or removing bottle lid. Select gloves with good gripping capability on wet glass. Do not overtighten lids when securing.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Awkward twisting or body positions, muscle strain.</td>
<td></td>
<td>Avoid extended periods of squatting and avoid bending at the waist. Do not over reach when direct filling containers. Plan sampling activity to account for current and water depth if wading to collect samples.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Falling into water can cause injury/drowning</td>
<td></td>
<td>Wear PFD if falling into water deeper than waist high is a hazard, or if working proximal to turbulent / fast moving water. TRACK water conditions every day as rain/snow thaw can cause water conditions to worsen. Person walking through water should minimize what they are carrying so they can maintain balance.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Water entering boots can increase the chance for blisters and other skin issues with feet/ankles.</td>
<td></td>
<td>Wear rubber outer boots when appropriate. Waders should be worn when wading into deeper water.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Cuts to hands from ropes and cables during sample collection from deep water.</td>
<td></td>
<td>Wear protective gloves. Ensure rope has a thickness appropriate to prevent cuts to hands - 3/8 inch rope suggested minimum thickness. Be aware that water will create drag on sampling device during removal and do not hurry through task.</td>
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## PPE

### Personal Protective Equipment

<table>
<thead>
<tr>
<th>Type</th>
<th>Personal Protective Equipment</th>
<th>Description</th>
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<tr>
<td>Eye Protection</td>
<td>safety glasses</td>
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<tr>
<td>Foot Protection</td>
<td>boots</td>
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<tr>
<td></td>
<td>rubber boots</td>
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<tr>
<td>Hand Protection</td>
<td>chemical resistant gloves (specify type)</td>
<td>nitrile</td>
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## Supplies

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<tr>
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<td>Decontamination</td>
<td>Decon supplies (specify type)</td>
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<tr>
<td>Miscellaneous</td>
<td>first aid kit</td>
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<td>Personal</td>
<td>eye wash (specify type)</td>
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<td>Reviewer</td>
<td>Comments</td>
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<td>5/29/2009</td>
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**insect repellant**

**Recommended**

**sunscreen**

**Recommended**
## Job Safety Analysis

### General

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<th>Status</th>
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### Client / Project

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<tr>
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<td>KC001721.0001</td>
<td>CMI</td>
<td>Shonfelt, John</td>
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### User Roles

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<th>Role</th>
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<td>2/6/2009</td>
<td>2/6/2009</td>
<td>Ebert, Joachim</td>
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### Job Steps

<table>
<thead>
<tr>
<th>Job Step No.</th>
<th>Job Step Description</th>
<th>Potential Hazard</th>
<th>Critical Action</th>
<th>H&amp;S Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stage at pre-determined sampling location and set up work zone and sampling equipment</td>
<td>1. Personnel could be hit by vehicular traffic</td>
<td>Set up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Sampling equipment, tools and monitoring well covers can cause tripping hazard</td>
<td>Keep equipment picked up and use TRACK to assess changes.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Open wells to equilibrate and gauge wells</td>
<td>1. When squatting, personnel can be difficult to see by vehicular traffic.</td>
<td>Wear class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Pinchpoints on well vault can pinch or lacerate fingers</td>
<td>Use correct tools to open well vault/cap. Wear leather gloves when removing well vault lids, and chemical protective gloves while gauging. Wear proper PPE including safety boots, knee pads and safety glasses.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Begin Purging Well and Collecting Parameter Measurements</td>
<td>3. Lifting sampling equipment can cause muscle strain</td>
<td>Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Pressure can build up inside well causing cap to release under pressure</td>
<td>Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Begin Purging Well and Collecting Parameter Measurements</td>
<td>1. Electrical shock can occur when connecting/disconnecting pump from the battery.</td>
<td>Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Purge water can spill or leak from equipment</td>
<td>Stop purging activities immediately, stop leakage and block any drainage grate with absorbent pads. Call PM to notify them of any reportable spill.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Water spilling on the ground can cause muddy/slippery conditions</td>
<td>Be careful walking in work area when using plastic around well to protect from spillage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Lacerations can occur when cutting materials such as plastic tubing</td>
<td>When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, leather type.</td>
<td></td>
</tr>
</tbody>
</table>
5 Purge water can splash into eyes. Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses.

4 Collect Groundwater Sample

1 Working with bailer rope can cause rope burns on hands. Slowly raise and lower the rope or string for the bailer. Wear appropriate gloves for the task.

2 Sample containers could break or leak preservative. Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves.

6 Staging of Well Purge water

1 Muscle strains can occur when moving purge water or drums. If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less.

### PPE

<table>
<thead>
<tr>
<th>Type</th>
<th>Personal Protective Equipment</th>
<th>Description</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermal Protection</td>
<td>long sleeve shirt/pants</td>
<td></td>
<td>Recommended</td>
</tr>
<tr>
<td>Eye Protection</td>
<td>safety glasses</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Foot Protection</td>
<td>steel-toe boots</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Hand Protection</td>
<td>chemical resistant gloves (specify type)</td>
<td>Nitrile</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>work gloves (specify type)</td>
<td>leather</td>
<td>Required</td>
</tr>
<tr>
<td>Head Protection</td>
<td>hard hat</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Hearing Protection</td>
<td>ear plugs</td>
<td></td>
<td>Recommended</td>
</tr>
<tr>
<td>Miscellaneous PPE</td>
<td>other</td>
<td>Knee pads</td>
<td>Required</td>
</tr>
</tbody>
</table>

### Supplies

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply</th>
<th>Description</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Devices</td>
<td>mobile phone</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Decontamination</td>
<td>Decon supplies (specify type)</td>
<td>alconox, DI water, spray bottle</td>
<td>Required</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>first aid kit</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>flashlight</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Personal</td>
<td>eye wash (specify type)</td>
<td>bottle</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>insect repellant</td>
<td></td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>sunscreen</td>
<td></td>
<td>Recommended</td>
</tr>
<tr>
<td>Traffic Control</td>
<td>barricades</td>
<td></td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>traffic cones</td>
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</tr>
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### Review Comments

<table>
<thead>
<tr>
<th>Reviewer</th>
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<tbody>
<tr>
<td>Employee:</td>
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<tr>
<td>Role:</td>
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<tr>
<td>Review Type:</td>
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<tr>
<td>Completed Date</td>
<td>2/6/2009</td>
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### Job Safety Analysis

#### General

<table>
<thead>
<tr>
<th>JSA ID</th>
<th>Status</th>
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<tbody>
<tr>
<td>166</td>
<td>(3) Completed</td>
<td>5/1/2009</td>
<td>05/13/2009</td>
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</table>

- **Job Name**: Environment-Sample cooler handling
- **Task Description**: Sample cooler handling
- **Template**: TRUE
- **Auto Closed**: FALSE

#### Client / Project

- **Client**: Ash Grove Cement Company
- **Project Number**: KC001721.0001
- **Project Name**: CMI
- **Project Manager**: Shonfelt, John

#### User Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Employee</th>
<th>Due Date</th>
<th>Completed Date</th>
<th>Supervisor</th>
<th>Active</th>
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<tbody>
<tr>
<td>Developer</td>
<td>Coppola, Mija A</td>
<td>12/19/2011</td>
<td>5/11/2009</td>
<td>Ebert, Joachim</td>
<td>☐</td>
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</tbody>
</table>

#### Job Steps

<table>
<thead>
<tr>
<th>Job Step No.</th>
<th>Job Step Description</th>
<th>Potential Hazard</th>
<th>Critical Action</th>
<th>H&amp;S Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Transfer field samples to sample packing area</td>
<td>Lifting heavy coolers may result in muscle strain especially to lower back.</td>
<td>Use proper lifting techniques and keep back straight. Use buddy system for large coolers, Use mechanical aids like hand trucks if readily available to move coolers. Do not over fill coolers with full sample containers for temporary movement to the sample prep area. Ensure an adequate supply of sample coolers are in field.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sample cooler selection</td>
<td>Hazards to hands from broken glass caused by over tightening lids or improper placement in cooler</td>
<td>Inspect all bottles and bottle caps for cracks/leaks before and after filling container. Do not over tighten sample lids. Clean up any broken bottles immediately, avoid contact with sample preservatives. Wear leather gloves when handling broken glass.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Exposure to chemicals (acid preservatives or site contaminants) on the exterior of sample bottles after filling.</td>
<td>Wear protective gloves for acid preservatives and safety glasses with side shields during all sample container handling activities (before and after filling). Once filled follow project specific HASP PPE requirements for skin and eye protection.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Samples containing hazardous materials may violate DOT/IATA HazMat shipping regulations</td>
<td>All persons filling a sample bottle or preparing a cooler for shipment must have complete ARCADIS DOT HazMat shipping training. Compare the samples collected to the materials described in the Shipping Determination for the Project and ensure consistent. Re-perform all Shipping determinations if free product is collected and not anticipated during planning.</td>
<td></td>
</tr>
</tbody>
</table>

2. Sample cooler selection

<table>
<thead>
<tr>
<th>Job Step No.</th>
<th>Job Step Description</th>
<th>Potential Hazard</th>
<th>Critical Action</th>
<th>H&amp;S Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sample coolers with defective handles, lid hinges, lid hasps cracked or otherwise damaged may result in injury (cuts to hands, crushing of feet if handle breaks etc)</td>
<td></td>
<td>Only use coolers that are new or in like new condition, No rope handled coolers unless part of the manufacturer's handle design.</td>
<td>ARCADIS Shipping Guide US-001</td>
</tr>
<tr>
<td>2</td>
<td>Selection of excessively large coolers introduces lifting hazards once the cooler is filled.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select coolers and instruct lab to only provide coolers of a size appropriate for the material being shipped. For ordinary sample shipping sample coolers should be 48 quart capacity or smaller to reduce lifting hazards.
### Pack Samples

1. **Pinch points and abrasions to hands from cooler lid closing unexpectedly**
   - Beware that lid could slam shut; block/brace if needed; be wary of packing in strong winds. New coolers may be more prone to self closing, tilt cooler back slightly to facilitate keeping lid open.

2. **Awkward body positions and contact stress to legs and knees when preparing coolers on irregular or hard ground surfaces.**
   - Plan cooler prep activities. Situate cooler where neutral body positions can be maintained if practical, like truck tailgate. Avoid cooler prep on rough gravel surfaces unless knees and legs protected during kneeling.

3. **Frostbite or potential for oxygen deficiency when packing with dry ice. Contact cold stress to fingers handling blue ice or wet ice**
   - Dry ice temperature is -109.30F. Wear thermal protective gloves. DO NOT TOUCH with bare skin! Dry ice sublimates at room temp and could create oxygen deficiency in closed environment. Maintain adequate ventilation! Do not keep dry ice in cab of truck. Wear gloves when handling blue ice or gaging wet ice. Dry Ice is DOT regulated for air shipping, follow procedures in Shipping Determination.

### Sealing, labeling and Marking Cooler

1. **Cuts to hands and forearms from strapping tape placement or removing old tape and labels**
   - Do not use a fixed, open-blade knife to remove old tags/labels, USE SCISSORS or other safety style cutting device. Only use devices designed for cutting. Do not hurry through task.

2. **Lifting and awkward body position hazards from taping heavy coolers, dropping coolers on feet during taping.**
   - Do not hurry through the taping tasks, ensure samples in cooler are evenly distributed in cooler to reduce potential for overhanging cooler falling off edge of tailgate/table when taping.

3. **Improper labeling and marking may result in violation of DOT/IATA HazMat shipping regulations delaying shipment or resulting in regulatory penalty**
   - Do not deviate from ARCADIS Shipping Guide or Shipping Determination marking or labeling requirements.

### Offering sample cooler to a carrier or lab courier for shipment.

1. **Lifting heavy coolers may result in muscle strain especially to lower back.**
   - See lifting hazard controls above.

2. **Carrier refusal to accept cooler may cause shipping delay and/or result in violation of DOT HazMat shipping regulations.**
   - Promptly report all rejected and refused shipments to the ARCADIS DOT Program Manager. Do Not re-offer shipment if carrier requires additional labels markings or paperwork inconsistent with your training or Shipping Determination without contacting the ARCADIS DOT Compliance Manager.

### PPE

<table>
<thead>
<tr>
<th>Type</th>
<th>Personal Protective Equipment</th>
<th>Description</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Protection</td>
<td>safety glasses</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Hand Protection</td>
<td>chemical resistant gloves (specify type)</td>
<td>nitrile</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>work gloves (specify type)</td>
<td>leather</td>
<td>Required</td>
</tr>
</tbody>
</table>

### Supplies

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply</th>
<th>Description</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous</td>
<td>Other</td>
<td>Scissors</td>
<td>Required</td>
</tr>
<tr>
<td>Employee: Moyers, Samuel H</td>
<td>Role: HASP Reviewer</td>
<td>Review Type: Revise</td>
<td>Completed Date: 5/11/2009</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------</td>
<td>---------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Employee: Moyers, Samuel H</td>
<td>Role: HASP Reviewer</td>
<td>Review Type: Approve</td>
<td>Completed Date: 5/13/2009</td>
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### General

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<th>4079</th>
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<tr>
<td>Job Name</td>
<td>General Industry-Site inspection/walkover -</td>
<td>Created Date</td>
<td>12/9/2010</td>
</tr>
<tr>
<td>Task Description</td>
<td>Site Inspection</td>
<td>Completed Date</td>
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<tr>
<td>Template</td>
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<td>Auto Closed</td>
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### Client / Project

<table>
<thead>
<tr>
<th>Client</th>
<th>Ash Grove Cement Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Number</td>
<td>KC001721.0001</td>
</tr>
<tr>
<td>Project Name</td>
<td>CMI</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Shonfelt, John</td>
</tr>
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</table>

### User Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Employee</th>
<th>Due Date</th>
<th>Completed Date</th>
<th>Supervisor</th>
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<tbody>
<tr>
<td>Developer</td>
<td>Coppola, Mija A</td>
<td>1/26/2012</td>
<td>12/10/2010</td>
<td>Ebert, Joachim</td>
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<tr>
<td>HASP Reviewer</td>
<td>Tremblay, Tony</td>
<td>12/24/2010</td>
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<td>Quality Reviewer</td>
<td>Brien, Jason D</td>
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<td>VanDewalker, Heather M</td>
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</table>

### Job Steps

<table>
<thead>
<tr>
<th>Job Step No.</th>
<th>Job Step Description</th>
<th>Potential Hazard</th>
<th>Critical Action</th>
<th>H&amp;S Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Undeveloped Site Walk(Winter Conditions)</td>
<td>1 Slippery/icy conditions</td>
<td>Use caution and proper footwear with traction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Eye/face injury</td>
<td>Use caution when walking through trees and brush. Wear proper eye protection to avoid eye injury</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Hypothermia/frostbite</td>
<td>Assess weather conditions and wear proper clothing to avoid hypothermia/frostbite and freezing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Falling ice/snow</td>
<td>Assess the site for falling ice/snow from trees/powerlines. Use caution when walking around trees and powerlines. Wear hard hat</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 Stray animals</td>
<td>Make lots of noise while walking through the site. Carry repellent in the event of encountering stray animals. If a dangerous or aggravated animal is spotted, leave the area, return to your vehicle and contact animal control.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 Vehicular traffic</td>
<td>Assess the site and the surrounding area for vehicular traffic. Use caution when walking near busy roadways. Wear type II or III traffic vest.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Undeveloped Site Walk (Summer Conditions)</td>
<td>1 Slips/trips/falls</td>
<td>Use caution when walking on un-even surfaces. Use proper footwear with traction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Eye injury</td>
<td>Use caution when walking through areas of trees and brush. Wear proper eye protection to avoid eye injury from tree limbs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Dehydration</td>
<td>Drink plenty of water and avoid long periods of direct sun exposure</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Sunburn</td>
<td>Wear sunscreen. Avoid long periods of direct sun exposure. Work in the shade if possible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 Vehicular traffic</td>
<td>Assess the site and the surrounding area for vehicular traffic. Use caution when walking near busy roadways. Wear type II or III traffic vest.</td>
<td></td>
</tr>
</tbody>
</table>
6 Stray animals, ticks, bugs

Make lots of noise when traveling through the site and carry repellent spray. If a dangerous or aggravated animal is spotted, leave the area and return to your vehicle and contact animal control. Wear long pants/long sleeve shirt and use insect repellent as necessary.

<table>
<thead>
<tr>
<th>PPE</th>
<th>Personal Protective Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>Dermal Protection</td>
<td>long sleeve shirt/pants</td>
</tr>
<tr>
<td>Foot Protection</td>
<td>steel-toe boots</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Communication Devices</td>
</tr>
<tr>
<td>Miscellaneous</td>
</tr>
<tr>
<td>Personal</td>
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<table>
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<td>Reviewer</td>
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<td></td>
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<tr>
<td>Reviewer</td>
</tr>
<tr>
<td>Reviewer</td>
</tr>
</tbody>
</table>
Attachment 3

SDSs
Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015
Revision: 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier
Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture: Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer Supplier
Alconox, Inc. Not Applicable
30 Glenn Street
White Plains, NY 10603
1-914-948-4040

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:
Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

⚠️

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.
Additional information: None.

Hazard description

Hazard Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization: None

3.2 Description: None

3.3 Hazardous components (percentages by weight)

<table>
<thead>
<tr>
<th>Identification</th>
<th>Chemical Name</th>
<th>Classification</th>
<th>Wt. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS number:</td>
<td>Sodium tripolyphosphate</td>
<td>Skin Irrit. 2; H315</td>
<td>12-28</td>
</tr>
<tr>
<td>7758-29-4</td>
<td></td>
<td>Eye Irrit. 2; H319</td>
<td></td>
</tr>
<tr>
<td>CAS number:</td>
<td>Sodium Alkylbenzene Sulfonate</td>
<td>Acute Tox. 4; H303</td>
<td>8-22</td>
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<tr>
<td>68081-81-2</td>
<td></td>
<td>Skin Irrit. 2; H315</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Eye Irrit. 2; H319</td>
<td></td>
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<tr>
<td>CAS number:</td>
<td>Tetrasodium Pyrophosphate</td>
<td>Skin Irrit. 2; H315</td>
<td>2-16</td>
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<tr>
<td>7722-88-5</td>
<td></td>
<td>Eye Irrit. 2; H319</td>
<td></td>
</tr>
</tbody>
</table>

3.4 Additional information: None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

- Maintain an unobstructed airway.
- Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

- Wash affected area with soap and water.
- Seek medical attention if symptoms develop or persist.

After eye contact:

- Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
- Remove contact lens(es) if able to do so during rinsing.
- Seek medical attention if irritation persists or if concerned.

After swallowing:

- Rinse mouth thoroughly.
- Seek medical attention if irritation, discomfort, or vomiting persists.
Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed
None

4.3 Indication of any immediate medical attention and special treatment needed:
No additional information.

5 Firefighting measures

5.1 Extinguishing media
Suitable extinguishing agents:
Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents: None

5.2 Special hazards arising from the substance or mixture:
Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters
Protective equipment:
Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information:
Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:
Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions:
Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up:
Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections: None

7 Handling and storage

7.1 Precautions for safe handling:
Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities:
Store in a cool, well-ventilated area.

7.3 Specific end use(s):
No additional information.
8 Exposure controls/personal protection

8.1 Control parameters:
7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:
Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:
Not needed under normal conditions.

Protection of skin:
Select glove material impermeable and resistant to the substance.

Eye protection:
Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:
Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance (physical state, color)</td>
<td>White and cream colored flakes - powder</td>
</tr>
<tr>
<td>Explosion limit lower:</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>Explosion limit upper:</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>Odor:</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>Vapor pressure at 20°C:</td>
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</tr>
<tr>
<td>Odor threshold:</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>Vapor density:</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>pH-value:</td>
<td>9.5 (aqueous solution)</td>
</tr>
<tr>
<td>Relative density:</td>
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</tr>
<tr>
<td>Melting/Freezing point:</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>Solubilities:</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>Boiling point/Boliling range:</td>
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</tr>
<tr>
<td>Partition coefficient (n-octanol/water):</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>Flash point (closed cup):</td>
<td>Not determined or not available.</td>
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<tr>
<td>Auto/Self-ignition temperature:</td>
<td>Not determined or not available.</td>
</tr>
<tr>
<td>Evaporation rate:</td>
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</tr>
<tr>
<td>Decomposition temperature:</td>
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</tr>
</tbody>
</table>
Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015

Revision: 12.10.2015

Trade Name: Alconox

<table>
<thead>
<tr>
<th>Flammability (solid, gaseous):</th>
<th>Not determined or not available.</th>
<th>Viscosity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density at 20°C:</td>
<td>Not determined or not available.</td>
<td></td>
</tr>
</tbody>
</table>

10 Stability and reactivity

10.1 Reactivity: None

10.2 Chemical stability: None

10.3 Possibility hazardous reactions: None

10.4 Conditions to avoid: None

10.5 Incompatible materials: None

10.6 Hazardous decomposition products: None

11 Toxicological information

11.1 Information on toxicological effects:

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product.

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation.

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes.

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information
Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015
Revision: 12.10.2015

Trade Name: Alconox

12.1 Toxicity:
- Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
- Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
- Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
- Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
- Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:
- PBT: No additional information.
- vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:
- It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number:
- ADR, ADN, DOT, IMDG, IATA
  None

14.2 UN Proper shipping name:
- ADR, ADN, DOT, IMDG, IATA
  None

14.3 Transport hazard classes:
- ADR, ADN, DOT, IMDG, IATA
  Class: None
  Label: None
  LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:
- RQ (if applicable): None
- Proper shipping Name: None
- Hazard Class: None
- Packing Group: None
- Marine Pollutant (if applicable): No additional information.

Non Bulk:
- RQ (if applicable): None
- Proper shipping Name: None
- Hazard Class: None
- Packing Group: None
- Marine Pollutant (if applicable): No additional information.
Trade Name: Alconox

14.4 Packing group:
ADR, ADN, DOT, IMDG, IATA

14.5 Environmental hazards:
None

14.6 Special precautions for user:
Danger code (Kemler):
None
EMS number:
None
Segregation groups:
None

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

14.8 Transport/Additional information:
Transport category:
None
Tunnel restriction code:
None
UN "Model Regulation":
None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA
Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable
Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):
Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):
Chemicals known to cause cancer: None of the ingredients are listed.
Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.
Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.
Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian
Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.
Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3
Effective date: 12.08.2015
Revision: 12.10.2015

Trade Name: Alconox

Germany MAK: Not classified.

Asia Pacific

Australia
Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China
Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan
Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea
Existing Chemicals List (ECL): All ingredients are listed.

New Zealand
New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines
Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan
Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases
Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0
Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015
Revision: 12.10.2015

<table>
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<tr>
<th>Trade Name:</th>
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<tbody>
<tr>
<td>HMIS:</td>
<td>1-0-0</td>
</tr>
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</table>
MATERIAL SAFETY DATA SHEET

Buffer solution pH 4 (phthalate), traceable to NIST, colored red

Section 1 - Chemical Product and Company Identification

MSDS Name: Buffer solution pH 4 (phthalate), traceable to NIST, colored red
Catalog Numbers: 38384-0000, 38384-0010
Synonyms: 

Company Identification: Acros Organics BVBA
Janssen Pharmaceuticalalaan 3a
2440 Geel, Belgium

Company Identification: (USA)
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

For information in the US, call: 800-ACROS-01
For information in Europe, call: +32 14 57 52 11
Emergency Number, Europe: +32 14 57 52 99
Emergency Number US: 201-796-7100
CHEMTREC Phone Number, US: 800-424-9300
CHEMTREC Phone Number, Europe: 703-527-3887

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>%</th>
<th>EINECS#</th>
<th>Hazard Symbols</th>
<th>Risk Phrases</th>
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<tbody>
<tr>
<td>877-24-7</td>
<td>Potassium hydrogen phthalate</td>
<td>1.02%</td>
<td>212-889-4</td>
<td></td>
<td></td>
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<tr>
<td>3244-88-0</td>
<td>Fuchsin acid</td>
<td>0.0005%</td>
<td>221-816-5</td>
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<td></td>
</tr>
<tr>
<td>7487-94-7</td>
<td>Mercuric chloride</td>
<td>0.001%</td>
<td>231-299-8</td>
<td>T+ N</td>
<td>28 34 48/24/25 50/53</td>
</tr>
<tr>
<td>7732-18-5</td>
<td>Water</td>
<td>Balance</td>
<td>231-791-2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hazard Symbols: None listed
Risk Phrases: None listed

Text for R-phrases: see Section 16

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Not available

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation. May be harmful if absorbed through the skin.
Ingestion: May cause irritation of the digestive tract. May be harmful if swallowed.
Inhalation: May cause respiratory tract irritation. May be harmful if inhaled.
### Section 4 - First Aid Measures

**Eyes:** Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

**Skin:** Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

**Ingestion:** Get medical aid. Wash mouth out with water.

**Inhalation:** Remove from exposure and move to fresh air immediately.

**Notes to Physician:** Treat symptomatically and supportively.

### Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.

**Extinguishing Media:** Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.

### Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:** Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container.

### Section 7 - Handling and Storage

**Handling:** Avoid breathing dust, vapor, mist, or gas. Avoid contact with skin and eyes.

**Storage:** Store in a cool, dry place. Store in a tightly closed container.

### Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Use adequate ventilation to keep airborne concentrations low.

**Exposure Limits**

CAS# 877-24-7:

CAS# 3244-88-0:

CAS# 7487-94-7:

- Belgium - TWA: (mercury inorganic compounds): 0.025 mg/m3 VLE (as Hg)
- France - VME: (mercury inorganic compounds): 0.1 mg/m3 VME (as Hg)
- Germany: (mercury inorganic compounds): 0.1 mg/m3 VME (as Hg) Germany: (mercury inorganic compounds): skin notation
- Malaysia: (mercury inorganic compounds): 0.025 mg/m3 TWA (as Hg)
- Netherlands: (mercury inorganic compounds): 0.15 mg/m3 STEL Netherlands: (mercury inorganic compounds): 0.05 mg/m3 MAC
- Russia: (mercury inorganic compounds): 0.005 mg/m3 TWA (aerosol, as Hg)
- Spain: (mercury inorganic compounds): 0.025 mg/m3 VLA-ED (as Hg)

CAS# 7732-18-5:
Personal Protective Equipment

**Eyes:** Wear chemical splash goggles.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

---

### Section 9 - Physical and Chemical Properties

- **Physical State:** Liquid
- **Color:** Clear red
- **Odor:** Odorless
- **pH:** 4
- **Vapor Pressure:** Not available
- **Viscosity:** Not available
- **Boiling Point:** Not available
- **Freezing/Melting Point:** Not available
- **Autoignition Temperature:** Not available
- **Flash Point:** Not available
- **Explosion Limits: Lower:** Not available
- **Explosion Limits: Upper:** Not available
- **Decomposition Temperature:** Not available
- **Solubility in Water:** Miscible
- **Specific Gravity/Density:** 1.000
- **Molecular Formula:**
- **Molecular Weight:**

---

### Section 10 - Stability and Reactivity

- **Chemical Stability:** Stable.
- **Conditions to Avoid:** Not available
- **Incompatibilities with Other Materials:** Not available
- **Hazardous Decomposition Products:** Not available
- **Hazardous Polymerization:** Has not been reported.

---

### Section 11 - Toxicological Information

- **RTECS#:**
  - CAS# 877-24-7: CZ4326000
  - CAS# 3244-88-0: DD4737000
  - CAS# 7487-94-7: OV9100000
  - CAS# 7732-18-5: ZC0110000

- **LD50/LC50:**

  **RTECS:**
  - **CAS# 877-24-7:** Dermal, guinea pig: LD50 = >1 gm/kg;
    Oral, rat: LD50 = >3200 mg/kg;
  - **CAS# 3244-88-0:**
  - **CAS# 7487-94-7:** Draize test, rabbit, eye: 50 ug/24H Severe;
    Draize test, rabbit, skin: 500 mg/24H Severe;
    Oral, mouse: LD50 = 6 mg/kg;
    Oral, rat: LD50 = 1 mg/kg;
    Skin, rat: LD50 = 41 mg/kg;
RTECS:
CAS# 7732-18-5: Oral, rat: LD50 = >90 mL/kg;

Carcinogenicity: Potassium hydrogen phthalate - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.
Fuchsin acid - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.
Mercuric chloride - IARC: Group 3 (not classifiable)
Water - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.

Other: The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

Section 12 - Ecological Information
Not available

Section 13 - Disposal Considerations
Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

<table>
<thead>
<tr>
<th>Shipping Name:</th>
<th>IATA</th>
<th>IMO</th>
<th>RID/ADR</th>
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<tbody>
<tr>
<td>Hazard Class:</td>
<td>Not regulated as a hazardous material</td>
<td>Not regulated as a hazardous material</td>
<td>Not regulated as a hazardous material</td>
</tr>
<tr>
<td>UN Number:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packing Group:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section 15 - Regulatory Information

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: Not available
Risk Phrases:
Safety Phrases:
S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)
CAS# 877-24-7: Not available
CAS# 3244-88-0: Not available
CAS# 7487-94-7: 3
CAS# 7732-18-5: Not available

Canada
CAS# 877-24-7 is listed on Canada's DSL List
CAS# 3244-88-0 is listed on Canada's DSL List
CAS# 7487-94-7 is listed on Canada's DSL List
CAS# 7732-18-5 is listed on Canada's DSL List

US Federal
TSCA
CAS# 877-24-7 is listed on the TSCA Inventory.
CAS# 3244-88-0 is listed on the TSCA Inventory.
CAS# 7487-94-7 is listed on the TSCA Inventory.
CAS# 7732-18-5 is listed on the TSCA Inventory.
Text for R-phrases from Section 2

R 28 Very toxic if swallowed.
R 34 Causes burns.
R 48/24/25 Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**MSDS Creation Date:** 11/08/2004

**Revision #0 Date** Original.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantibility or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.

---------------------------------------------------------------------------------------------------------------------------------------------
MATERIAL SAFETY DATA SHEET
Buffer Solution pH 7.0

Section 1 - Chemical Product and Company Identification

MSDS Name: Buffer Solution pH 7.0
Catalog Numbers: J/2855/08, J/2855/15, J/2855/17, J/2855/21, J/2855/24
Synonyms: None
Company Identification: Fisher Scientific UK
Bishop Meadow Road, Loughborough
Leics. LE11 5RG
For information in Europe, call: (01509) 231166
Emergency Number, Europe: 01509 231166

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>%</th>
<th>EINECS#</th>
<th>Hazard Symbols:</th>
<th>Risk Phrases:</th>
</tr>
</thead>
<tbody>
<tr>
<td>7487-94-7</td>
<td>Mercuric chloride</td>
<td>&lt;0.001</td>
<td>231-299-8</td>
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<td>7558-79-4</td>
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<tr>
<td>7647-14-5</td>
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<td>7778-77-0</td>
<td>Potassium dihydrogen</td>
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</tbody>
</table>

potassium orthophosphate

Text for R-phrases: see Section 16

Hazard Symbols: None listed
Risk Phrases: None listed

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Not available

Potential Health Effects

Eye: Low hazard for normal industrial handling.
Skin: Low hazard for usual industrial handling.
Ingestion: Low hazard for usual industrial handling.
Inhalation: Low hazard for usual industrial handling.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated
clothing and shoes. Get medical aid if irritation develops or persists.

**Ingestion:** If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid if irritation or symptoms occur.

**Inhalation:** Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.

**Notes to Physician:**

---

### Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.

**Extinguishing Media:** Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.

---

### Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:** Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal.

---

### Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Use only in a well-ventilated area. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation.

**Storage:** Store in a cool, dry place. Store in a tightly closed container.

---

### Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

**Exposure Limits**

CAS# 7487-94-7:

- United States OSHA: 0.1 mg/m³ Ceiling (Mercury, aryl and inorganic compounds).
- Belgium - TWA: (mercury, aryl and inorganic compounds): 0.1 mg/m³ VLE (as Hg)
- France - VME: (mercury, aryl and inorganic compounds): 0.1 mg/m³ VME (as Hg)
- Germany: (mercury, aryl and inorganic compounds): 0.1 mg/m³ VME (as Hg) Germany: (mercury inorganic compounds): Skin absorber
- Malaysia: (mercury, aryl and inorganic compounds): 0.1 mg/m³ TWA (as Hg)
- Netherlands: (mercury inorganic compounds): 0.15 mg/m³ STEL Netherlands: (mercury inorganic compounds): 0.05 mg/m³ MAC
- Russia: (mercury inorganic compounds): 0.2 mg/m³ TWA (as Hg) Russia: (mercury inorganic compounds): 0.05 mg/m³ STEL (as Hg)
- Spain: (mercury, aryl and inorganic compounds): 0.1 mg/m³ VLA-ED (as Hg)

CAS# 7558-79-4:

- Russia: 5 mg/m³ TWA

CAS# 7647-14-5:

CAS# 7732-18-5:

CAS# 7778-77-0:
Personal Protective Equipment

**Eyes:** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

**Clothing:** Wear appropriate protective clothing to minimize contact with skin.

**Respirators:** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

### Section 9 - Physical and Chemical Properties

**Physical State:** Liquid

- **Color:** clear colorless
- **Odor:** Not available
- **pH:** 7.0

**Vapor Pressure:** Not available

**Viscosity:** Not available

**Boiling Point:** Not available

**Freezing/Melting Point:** Not available

**Autoignition Temperature:** Not applicable

**Flash Point:** Not applicable.

**Explosion Limits: Lower:** Not available

**Explosion Limits: Upper:** Not available

**Decomposition Temperature:** Not available

**Solubility in water:** Miscible with water,

**Specific Gravity/Density:** 1.0

**Molecular Formula:** Solution

**Molecular Weight:** 0

### Section 10 - Stability and Reactivity

**Chemical Stability:** Stable.

**Conditions to Avoid:** None reported.

**Incompatibilities with Other Materials**

**Hazardous Decomposition Products** Irritating and toxic gases.

**Hazardous Polymerization** Has not been reported.

### Section 11 - Toxicological Information

**RTECS#:**

- CAS# 7487-94-7: OV9100000
- CAS# 7558-79-4: WC4500000
- CAS# 7647-14-5: VZ4725000
- CAS# 7732-18-5: ZC0110000
- CAS# 7778-77-0: TC6615500

**LD50/LC50:**

**CAS# 7487-94-7:** Draize test, rabbit, eye: 50 ug/24H Severe;
Draize test, rabbit, skin: 500 mg/24H Severe;
Oral, mouse: LD50 = 6 mg/kg;
Oral, rat: LD50 = 1 mg/kg;
Skin, rat: LD50 = 41 mg/kg;

RTECS:
**CAS# 7558-79-4:** Draize test, rabbit, eye: 500 mg/24H Mild; Draize test, rabbit, skin: 500 mg/24H Mild; Oral, rat: LD50 = 17 gm/kg; 

RTECS:

**CAS# 7647-14-5:** Draize test, rabbit, eye: 100 mg Mild; Draize test, rabbit, eye: 100 mg/24H Moderate; Draize test, rabbit, eye: 10 mg Moderate; Draize test, rabbit, skin: 50 mg/24H Mild; Draize test, rabbit, skin: 500 mg/24H Mild; Inhalation, rat: LC50 = >42 gm/m3/1H; Oral, mouse: LD50 = 4 gm/kg; Oral, rat: LD50 = 3000 mg/kg; Skin, rabbit: LD50 = >10 gm/kg; 

RTECS:

**CAS# 7732-18-5:** Oral, rat: LD50 = >90 mL/kg; 

RTECS:

**CAS# 7778-77-0:** Skin, rabbit: LD50 = >4640 mg/kg; 

**Carcinogenicity:**
Mercuric chloride - IARC: Group 3 (not classifiable) (Mercury inorganic compounds). Sodium phosphate dibasic - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65. Sodium chloride - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65. Water - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65. Potassium dihydrogen orthophosphate - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65. 

**Other:** See actual entry in RTECS for complete information.

### Section 12 - Ecological Information

**Other:** No information available.

### Section 13 - Disposal Considerations

Products considered hazardous for supply are classified as Special Waste and the disposal of such chemicals is covered by regulations which may vary according to location. Contact a specialist disposal company or the local authority or advice. Empty containers must be decontaminated before returning for recycling.

### Section 14 - Transport Information

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<tr>
<th>Shipping Name:</th>
<th>IATA</th>
<th>IMO</th>
<th>RID/ADR</th>
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<td>Not regulated as a hazardous material</td>
<td>Not regulated as a hazardous material</td>
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USA RQ: CAS# 7558-79-4: 5000 lb final RQ; 2270 kg final RQ

### Section 15 - Regulatory Information

**European/International Regulations**

European Labeling in Accordance with EC Directives

- Hazard Symbols: Not available
- Risk Phrases:
- Safety Phrases:

WGK (Water Danger/Protection)
CAS# 7487-94-7: 3
CAS# 7558-79-4: 1
CAS# 7647-14-5: 0
CAS# 7732-18-5: Not available
CAS# 7778-77-0: 1

Canada
CAS# 7487-94-7 is listed on Canada's DSL List
CAS# 7558-79-4 is listed on Canada's DSL List
CAS# 7647-14-5 is listed on Canada's DSL List
CAS# 7732-18-5 is listed on Canada's DSL List
CAS# 7778-77-0 is listed on Canada's DSL List

US Federal
TSCA
CAS# 7487-94-7 is listed on the TSCA Inventory.
CAS# 7558-79-4 is listed on the TSCA Inventory.
CAS# 7647-14-5 is listed on the TSCA Inventory.
CAS# 7732-18-5 is listed on the TSCA Inventory.
CAS# 7778-77-0 is listed on the TSCA Inventory.

Section 16 - Other Information

Text for R-phrases from Section 2

MSDS Creation Date: 12/12/1997
Revision #6 Date 9/24/2004

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantibility or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.

----------------------------------------------------------------------------------
Material Safety Data Sheet  
Buffer Solution pH 10.0

Section 1 - Chemical Product and Company Identification

**MSDS Name:**  
Buffer Solution pH 10.0

**Catalog Numbers:**  
LC12500, LC12510

**Synonyms:**  
None

**Company Identification:**  
LabChem Inc  
200 William Pitt Way  
Pittsburgh, PA 15238

**Company Phone Number:**  
(412) 826-5230

**Emergency Phone Number:**  
(800) 424-9300

**CHEMTREC Phone Number:**  
(800) 424-9300

Section 2 – Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>7732-18-5</td>
<td>Water</td>
<td>balance</td>
</tr>
<tr>
<td>1310-73-2</td>
<td>Sodium hydroxide</td>
<td>&lt;1</td>
</tr>
<tr>
<td>1303-96-4</td>
<td>Sodium tetraborate, decahydrate</td>
<td>0.5</td>
</tr>
<tr>
<td>None</td>
<td>Non-toxic blue dye (LC12510 only)</td>
<td>&lt;0.1</td>
</tr>
</tbody>
</table>

Section 3 - Hazards Identification

**Emergency Overview**

*Appearance:* LC12500: clear, colorless solution; LC12510: clear, blue solution

*Caution!* May cause eye and skin irritation.

**Target Organs:** None.

**Potential Health Effects**

**Eye:**  
May cause eye irritation.

**Skin:**  
May cause skin irritation.

**Ingestion:**  
May cause gastrointestinal irritation with nausea and vomiting.

**Inhalation:**  
May cause respiratory tract irritation.
Material Safety Data Sheet
Buffer Solution pH 10.0

**Chronic:**
Repeated ingestion may cause anorexia, irritation to gastrointestinal tract, nausea, vomiting, diarrhea, or skin rashes.

---

## Section 4 - First Aid Measures

**Eyes:**
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid at once. Do NOT allow victim to rub or keep eyes closed.

**Skin:**
Get medical aid at once. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

**Ingestion:**
Call a poison control center. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid at once.

**Inhalation:**
Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

**Notes to Physician:**
Treat symptomatically and supportively.

---

## Section 5 - Fire Fighting Measures

**General Information:**
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.

**Extinguishing Media:**
For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.

**Autoignition Temperature:**
Not applicable.

**Flash Point:**
Not applicable.

**NFPA Rating:**
Health- 1, Flammability- 0, Instability- 0.

**Explosion Limits:**
Lower: n/a  Upper: n/a

---

## Section 6 - Accidental Release Measures

**General Information:**
Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:**
Absorb spills with absorbent (vermiculite, sand, fuller's earth) and place in suitable containers labeled for later disposal.
Section 7 - Handling and Storage

Handling:
Wash thoroughly after handling. Avoid breathing dust, vapor, mist, or gas.

Storage:
Store capped at room temperature. Protect from heat and incompatibles.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls:
Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations below the Permissible Exposure Limits.

Exposure Limits:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>none listed</td>
<td>none listed</td>
<td>none listed</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>2 mg/m³ Ceiling</td>
<td>10 mg/m³ IDLH</td>
<td>2 mg/m³ TWA</td>
</tr>
<tr>
<td>Sodium tetraborate</td>
<td>2 mg/m³ TWA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(inhalable fraction, listed under Borate compounds, inorganic); 6 mg/m³ STEL (inhalable fraction, listed under Borate compounds, inorganic)</td>
<td>5 mg/m³ TWA</td>
<td>none listed</td>
</tr>
</tbody>
</table>

OSHA Vacated PELs:
Sodium tetraborate decahydrate: 10 mg/m³ TWA

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Physical State:</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color:</td>
<td>LC12500: colorless, LC12510: blue</td>
</tr>
<tr>
<td>Odor:</td>
<td>Odorless</td>
</tr>
</tbody>
</table>
Material Safety Data Sheet
Buffer Solution pH 10.0

pH: 10.0
Vapor Pressure: Not available
Vapor Density: Not available
Evaporation Rate: Not available
Viscosity: Not available
Boiling Point: Not available
Freezing/Melting Point: Not available
Decomposition Temperature: Not available
Solubility in water: Soluble
Specific Gravity/Density: 1.0
Molecular Formula: Not applicable
Molecular Weight: Not applicable

Section 10 - Stability and Reactivity

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
Incompatible materials.

Incompatibilities with Other Materials:
Strong oxidizers, acids.

Hazardous Decomposition Products:
Oxides of sodium and boron.

Hazardous Polymerization:
Has not been reported.

Section 11 - Toxicological Information

RTECS:
CAS# 7732-18-5: ZC0110000.
CAS# 1310-73-2: WB4900000.
CAS# 1303-96-4: VZ2275000.

LD50/LC50:
CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg.
CAS# 1310-73-2:
No information found.
CAS# 1303-96-4:
Oral, mouse: LD50 = 2 gm/kg
Oral, rat: LD50 = 2660 mg/kg.

Carcinogenicity:
CAS# 7732-18-5: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.
CAS# 1310-73-2: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.
CAS# 1303-96-4: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.
Epidemiology: No information found
Teratogenicity: No information found
Reproductive: No information found
Mutagenicity: No information found
Neurotoxicity: No information found

Section 12 - Ecological Information
No information found

Section 13 - Disposal Considerations
Dispose of in accordance with Federal, State, and local regulations.

Section 14 - Transport Information
US DOT
Shipping Name: Not regulated
Hazard Class: 
UN Number: 
Packing Group: 

Section 15 - Regulatory Information
US Federal
TSCA:
CAS# 7732-18-5 is listed on the TSCA Inventory.
CAS# 1310-73-2 is listed on the TSCA Inventory.
CAS# 1303-96-4 is listed on the TSCA Inventory.

SARA Reportable Quantities (RQ):
CAS# 1310-73-2: final RQ = 1000 pounds (454 kg)

CERCLA/SARA Section 313:
None of the components are reportable under Section 313.

OSHA - Highly Hazardous:
None of the chemicals in this product are considered highly hazardous by OSHA.

US State
State Right to Know:
Sodium hydroxide can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
Material Safety Data Sheet
Buffer Solution pH 10.0

Sodium tetraborate, decahydrate can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

California Regulations:
None.

European/International Regulations
Canadian DSL/NDSL:
CAS# 7732-18-5 is listed on Canada's DSL List.
CAS# 1310-73-2 is listed on Canada's DSL List.
CAS# 1303-96-4 is listed on Canada's DSL List.

Canada Ingredient Disclosure List:
CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.
CAS# 1310-73-2 is listed on Canada's Ingredient Disclosure List.
CAS# 1303-96-4 is listed on Canada's Ingredient Disclosure List.

Section 16 - Other Information

MSDS Creation Date: July 4, 1998
Revision Date: September 9, 2009

Information in this MSDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc. assumes no liability resulting from the use of this MSDS. The user must determine suitability of this information for his application.
SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Name 1413 uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
PPT as NaCl Pouch, 5650 uS/cm

Product Number(s) 00606-10, 35653-11, 00653-12, 00653-15, 00653-16, 00653-18, 00653-20, 35653-12, 00653-23, 00653-27, 00653-47, 35653-10, 00653-50, 35653-13, 35653-13, 35653-15

Pure substance/mixture Mixture

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Use as laboratory reagent

Uses advised against No Information available

1.3. Details of the supplier of the safety data sheet

Manufacturer/Supplier Cole-Parmer™
North America
625 East Bunker Court
Vernon Hills, IL
60061 USA
Tel: 1-800-323-4340

E-mail address info@coleparmer.com

Made in USA

1.4. Emergency telephone number

24 Hour Emergency Phone Number
CHEMTREC®
Within USA and Canada: 1-800-424-9300
Outside USA and Canada: 1-703-527-3887
SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture
Classification - Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

This mixture is classified as not hazardous according to regulation (EC) 1272/2008 [GHS]

Classification according to EU Directives 67/548/EEC or 1999/45/EC
For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

Symbol(s)
Not dangerous goods

2.2. Label elements

Product Identifier
Signal Word
None

EUH210 - Safety data sheet available on request

P202 - Do not handle until all safety precautions have been read and understood

2.3. Other hazards
No information available
### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1. Substances

<table>
<thead>
<tr>
<th>Component</th>
<th>Chemical Formula</th>
<th>EC-No.</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>DSD Classification - 67/548/EEC</th>
<th>CLP Classification - Regulation (EC) No 1272/2008</th>
<th>REACH Reg. No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>No information available</td>
<td>EEC No. 231-791-2</td>
<td>7732-18-5</td>
<td>90 - 100%</td>
<td>-</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Potassium Chloride</td>
<td>No information available</td>
<td>EEC No. 231-211-8</td>
<td>7447-40-7</td>
<td>0 - 10%</td>
<td>-</td>
<td>No information available</td>
<td></td>
</tr>
</tbody>
</table>

Note: *The exact percentage (concentration) of composition has been withheld as a trade secret.

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

Full text of H- and EUH-phrases: see section 16.
SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General Advice
Use first aid treatment according to the nature of the injury. For further assistance, contact your local Poison Control Center. Show this safety data sheet to the doctor in attendance.

Eye Contact
In case of eye contact, remove contact lens and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact
Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. If symptoms persist, call a physician.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. If symptoms persist, obtain medical attention.

Ingestion
Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately.

Protection of First-aiders
Use personal protective equipment. See Section 8 for more detail. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

4.2. Most important symptoms and effects, both acute and delayed

Most important symptoms/effects
No information available

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician
Treat symptomatically
SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media
No information available

5.2. Special hazards arising from the substance or mixture

Thermal decomposition can lead to release of irritating gases and vapors.

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Personal Precautions
Use personal protective equipment. Evacuate personnel to safe areas.

6.2. Environmental precautions

Environmental Precautions
Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

6.3. Methods and material for containment and cleaning up

Methods for Containment
Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up
Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.

Reference to Other Sections
Refer to protective measures listed in Sections 7 and 8
See Section 8 for information on appropriate personal protective equipment
See Section 12 for additional Ecological Information
See Section 13 for additional waste treatment information

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Advice on safe handling
To avoid risks to human health and the environment, comply with the instructions for use. Wear personal protective equipment. Avoid breathing dust/fume/gas/mist/vapours/spray. Ensure adequate ventilation, especially in confined areas.
General hygiene considerations
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Conditions
Keep container tightly closed in a dry and well-ventilated place. Store at room temperature in the original container. Keep away from direct sunlight.

7.3. Specific end use(s)

Specific Use
Laboratory reagent

Risk Management Methods (RMM)
The information required is contained in this Safety Data Sheet.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Derived No Effect Level (DNEL)  No information available
Predicted No Effect Concentration (PNEC)  No information available

8.2. Exposure controls

Engineering Measures
Showers
Eyewash stations
Ventilation systems

Personal protective equipment

Eye/face Protection
Wear chemical splash goggles. If splashes are likely to occur, wear: Face-shield.

Skin and body protection
Wear protective gloves/clothing.

Respiratory Protection
No protective equipment is needed under normal use conditions. In case of inadequate ventilation wear respiratory protection.

Environmental exposure controls
No information available

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical State  Liquid
Appearance  Clear
Odor: None
Odor Threshold: No information available
pH Range: 4.75 - 7.75

**Property** | **Values** | **Remarks • Method**
--- | --- | ---
Melting point/freezing point | No information available |  
Boiling Point/Range | ~ 100 °C / 212 °F |  
Flash Point (High in °C) | No information available |  
Evaporation Rate | No information available |  
Flammability (solid, gas) | No information available |  
Flammability Limit in Air |  
  Upper flammability limit: | No information available |  
  Lower flammability limit: | No information available |  
Vapor pressure | No information available |  
Vapor Density | No information available |  
Specific Gravity | No information available |  
Water Solubility | soluble |  
Solubility in other solvents | No information available |  
Partition coefficient | No information available |  
Autoignition Temperature | No information available |  
Decomposition Temperature | No information available |  
Kinematic Viscosity | No information available |  
Dynamic viscosity | No information available |  
Explosive Properties | No information available |  
Oxidizing Properties | No information available |  

**9.2. Other information**
- Softening Point: No information available
- Molecular Weight: No information available
- VOC Content(%): No information available
- Density: No Information available
- Bulk Density: No information available

**SECTION 10: STABILITY AND REACTIVITY**

10.1. Reactivity
No information available

10.2. Chemical stability
Stable under normal conditions

Explosion Data
- Sensitivity to Mechanical Impact: None
- Sensitivity to Static Discharge: None

10.3. Possibility of hazardous reactions
None under normal processing
10.4. Conditions to avoid
Extremes of temperature and direct sunlight

10.5. Incompatible materials
No information available

10.6. Hazardous decomposition products
Thermal decomposition can lead to release of irritating gases and vapors

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute Toxicity

Product Information
Product does not present an acute toxicity hazard based on known or supplied information.

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>&gt; 90 mL/kg (Rat)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium Chloride</td>
<td>= 2600 mg/kg (Rat)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Skin Corrosion/Irritation No information available
Serious eye damage/eye irritation No information available
Sensitization No information available
Mutagenic Effects No information available
Carcinogenic effects No information available
Reproductive Effects No information available
STOT - single exposure No information available
STOT - repeated exposure No information available
Aspiration hazard No information available

SECTION 12: ECOLOGICAL INFORMATION
12.1. Toxicity

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium Chloride</td>
<td>2500: 72 h Desmodesmus subspicatus mg/L EC50</td>
<td>750 - 1020: 96 h Pimephales promelas mg/L LC50 static</td>
<td>83: 48 h Daphnia magna mg/L EC50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1060: 96 h Lepomis macrochirus mg/L LC50 static</td>
<td></td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability
No information available

12.3. Bioaccumulative potential
No information available

12.4. Mobility in soil
No information available

12.5. Results of PBT and vPvB assessment
No information available

12.6. Other adverse effects
No information available

Endocrine Disruptor Information
No information available

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods
Waste from Residues / Unused Products
Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated Packaging
Improper disposal or reuse of this container may be dangerous and illegal.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO
14.1 UN-No Not Regulated
14.2 Proper Shipping Name Not Regulated
14.3 Hazard Class Not Regulated
14.4 Subsidiary Hazard Class Not Regulated
14.5 Packing Group Not Regulated
14.6 Marine Pollutant Not Applicable
14.6 Special Provisions None
14.7 Transport in bulk according to No information available
Annex II of MARPOL 73/78 and the IBC Code

RID
14.1 UN-No Not Regulated
14.2 Proper Shipping Name Not Regulated
14.3 Hazard Class Not Regulated
14.4 Packing Group Not Regulated
14.5 Environmental hazard Not Applicable
14.6 Special Provisions None

ADR
14.1 UN-No Not Regulated
14.2 Proper Shipping Name Not Regulated
14.3 Hazard Class Not Regulated
14.4 Packing Group Not Regulated
14.5 Environmental hazard Not Applicable
14.6 Special Provisions None

ICAO
14.1 UN-No Not Regulated
14.2 Proper Shipping Name Not Regulated
14.3 Hazard Class Not Regulated
Subsidiary Hazard Class Not Regulated
14.4 Packing Group Not Regulated
14.5 Environmental hazard Not Applicable
14.6 Special Provisions None

IATA
14.1 UN-No Not Regulated
14.2 Proper Shipping Name Not Regulated
14.3 Hazard Class Not Regulated
14.4 Packing Group Not Regulated
14.5 Environmental hazard Not Applicable
14.6 Special Provisions None

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

European Union

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

International Inventories

USINV Complies
CANINV Complies
EINECS/ELINCS
Encomplies
ENCS
Does not Comply
IECSC
Complies
KECL
Complies
PICCS
Complies
AICS
Complies

USINIV/ TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
CANINIV/ DSL/NDNL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
ENCS - Japanese Existing and New Chemical Substances
IECSC - Chinese Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

15.2. Chemical safety assessment

A chemical safety assessment according to regulation (EC) No. 1907/2006 is not required

SECTION 16: OTHER INFORMATION

Key or legend to abbreviations and acronyms used in the safety data sheet

Full text of R-phrases referred to under sections 2 and 3

No information available

Legend - SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA
TWA (time-weighted average)
STEL
STEL (Short Term Exposure Limit)

Ceiling
Maximum limit value

Prepared By
Thermo Fisher Scientific©
Water and Lab Products
22 Alpha Road
Chelmsford, MA 01824, USA
1-978-232-6000

Prepared For
Cole-Parmer™

Issue Date
No information available

Revision Date
21-May-2015

Expiration Date
SDS is valid 3 years from the revision date. Contact info@coleparmer.com for the latest revision.

Reason for revision
Update to CLP Format
This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet
SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Hydrochloric Acid, 31 – 36%

Product Name: Hydrochloric Acid, 31 – 36.7%

Identified Uses: acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

Company Information:
ASHTA Chemicals Inc.
P.O. Box 858
Ashtabula Ohio 44005
Phone: (440) 997-5221
Fax: (440) 998-0286
24-hour Emergency Phone: CHEMTREC: (800) 424-9300

SECTION 2: HAZARDS IDENTIFICATION

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

GHS label elements, including precautionary statements:

Signal Word: Danger

Pictogram(s):

Hazard Statements
H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.
H318 Causes serious eye damage.
H335 May cause respiratory irritation.

Precautionary Statements
P234 Keep only in original container.
P261 Avoid breathing dust/ fume/ mist/ vapors/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.
SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms:
CHEMICAL NAME: Hydrochloric acid
TRADE NAME: Hydrochloric acid, 31 – 36%
SYNONYMS: Muriatic acid, Chlorohydric acid, Hydrogen Chloride

C.A.S: 7647-01-0
EC: 231-595-7
WHMIS: D2A, E

CHEMICAL FORMULA: HCl (in aqueous solution)
CHEMICAL FAMILY: Inorganic Acid

SECTION 4 FIRST AID MEASURES

Description of first aid measures:
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

In case of skin contact
Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.
**SECTION 5  FIRE FIGHTING MEASURES**

Flash Point (Method): Non-combustible.

Extinguishing Media: Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.

Auto Ignition Temp: Non-combustible.

Special Fire Fighting Procedures: Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual Fire/Explosion Hazards: Releases flammable hydrogen gas when reacting with metals.

**SECTION 6  ACCIDENTAL RELEASE MEASURES**

**Environmental Precautions:**
Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

**Containment and Cleaning:**
Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill: Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.

Large Spill: Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

**SECTION 7: HANDLING AND STORAGE**

**Precautions to be taken for handling and storage:**
Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well ventilated area. Keep out of sun.
SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Principal Component: Hydrochloric Acid

Occupational Exposure Limits:
Regulatory Limits:

<table>
<thead>
<tr>
<th>Component</th>
<th>OSHA Final PEL TWA</th>
<th>OSHA Final PEL STEL</th>
<th>OSHA Final PEL Ceiling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrochloric Acid Mixture</td>
<td>---</td>
<td>---</td>
<td>5 ppm 7.59 mg/m³</td>
</tr>
</tbody>
</table>

ACGIH TLV = 5 ppm (7.59 mg/m³) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

Exposure Controls:

Eye Protection: Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection: Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended: Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended: Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless to light yellow liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>Pungent (irritating/strong)</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>0.3ppm (can cause olfactory fatigue)</td>
</tr>
<tr>
<td>pH</td>
<td>&lt;1 (in aqueous solution)</td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>-30°C (-22°F)</td>
</tr>
<tr>
<td>Initial boiling point</td>
<td>&gt;100°C (&gt;212°F)</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Auto-ignition Temp</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>No data available</td>
</tr>
</tbody>
</table>
Decomposition temperature | No data available
---|---
Flammability (solid, gas) | Not combustible
Upper/lower flammability or explosive limits | Not combustible
Water solubility | 100%
Molecular Weight | 36.46
Relative Density (Specific Gravity) | 1.16 (32% HCl solution)
| 1.19 (36.5% HCl solution)
Bulk Density | 8.75 lbs/gal (32% HCl solution)
| 9.83 lbs/gal (36.5% HCl solution)
Vapor Density (air = 1) | 1.267 at 20 °C
Vapor Pressure | 84 mm Hg @ 20°C
Partition Coefficient: n-octanol/water | No data available

### SECTION 10: STABILITY AND REACTIVITY

**Stability:**
Hydrochloric acid is stable under normal conditions and pressures.

**Conditions to avoid:**
Incompatible materials, metals, excess heat, bases.

**Incompatibility:**
Bases, amines, metals, permanganates, (e.g. potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.

**Hazardous decomposition products:**
Hydrogen chloride, chlorine, hydrogen gas.

**Polymerization:**
Hazardous polymerization WILL NOT occur.

### SECTION 11: TOXICOLOGICAL INFORMATION

**Information on likely routes of exposure:**

- **Inhalation:**
  Vapors and mist will irritate throat and respiratory system and cause coughing.

- **Skin contact:**
  Causes skin burns.

- **Eye contact:**
  Causes eye burns.

- **Ingestion:**
  Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

**Symptoms related to the physical, chemical and toxicological characteristics:**
Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

**Information on toxicological effects:**

- **Acute toxicity:**
  Harmful if swallowed.

- **Skin corrosion/irritation:**
  Causes severe skin burns and eye damage.

- **Serious eye damage/eye irritation:**
  Causes serious eye damage.

- **Respiratory sensitization:**
  Not available.
Skin sensitization: No data available.
Germ cell mutagenicity: No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity: This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity: This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure: May cause respiratory irritation.
Specific target organ toxicity - repeated exposure: No data available.
Aspiration hazard: Not available.
Chronic effects: Prolonged inhalation may be harmful.

Components Species Test Results:
Hydrochloric acid (CAS# 7647-01-0)
- Rat - Inhalation LC$_{50}$: 3124 ppm, (1 hour)
- Rabbit - Dermal LD$_{50}$: 5010 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: Because of the low pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity: This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity: Fish LC$_{50}$ Mosquito fish: 282 mg/l, 96 hours
Fish LC$_{50}$ Bluegill: 3.6 mg/l, 48 hours
Persistence and degradability: Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment.
Bioaccumulative Potential: No data available.
Mobility in soil: Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other adverse effects: No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation)

SECTION 13: DISPOSAL CONSIDERATIONS

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material, if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.
**SECTION 14: TRANSPORT INFORMATION**

**Shipping:**
- Usual Shipping Containers: Tank cars, bulk tankers.
- Usual Shelf Life: Indefinite (life of containers).
- Storage/Transport Temperatures: Ambient.

**Suitable Storage:**
- Materials/Coatings: Teflon, Tygon, Rubber, PVC and polypropylene materials.

**D.O.T. Information:**
- Labeling: Corrosive
- D.O.T. Identification Number: UN 1789
- D.O.T. Shipping Name: Hydrochloric Acid
- Hazard Class: 8
- Packing Group: II
- Hazard Guide: 157
- Placard: UN 1789

**SECTION 15: REGULATORY INFORMATION**

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:
- Hydrochloric Acid  CAS#: 7647-01-0

**SARA 311/312 Hazards**
Acute health hazard, reactive hazard.

**Massachusetts Right To Know Components**
- Hydrochloric Acid  CAS#: 7647-01-0

**Pennsylvania Right To Know Components**
- Hydrochloric Acid  CAS#: 7647-01-0

**New Jersey Right To Know Components**
- Hydrochloric Acid  CAS#: 7647-01-0

**California Prop. 65 Components**
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

**OSHA PSM/RMP Threshold for Accidental Release:**
- CAS# 7647-01-0 is regulated under OSHA PSM only if anhydrous HCl.
- CAS# 7647-01-0 is regulated under EPA RMP only if ≥ 37% HCl.
Toxic Substances Control Act (TSCA):
Hydrochloric Acid  CAS#: 7647-01-0

Comprehensive Environmental Response Compensation Liability Act: (CERCLA)
Hydrochloric Acid  CAS#: 7647-01-0

SECTION 16       OTHER INFORMATION

NFPA Rating:
Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. Makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations, and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A regulations apply to the above.

Version 1.0  For the new GHS SDS Standard  Revision Date: 12/31/2014
Version 1.1  Graphics updated  Revision Date: 3/9/2015
Version 1.2  Title updated  Revision Date: 6/2/2015
Version 1.3  Section 9 changes  Revision Date: 7/30/2015
Version 1.4  Section 1, 15 changes  Revision Date: 4/15/2016
1. Identification

Product Name: Nitric acid (65 - 70%)


Synonyms: Azotic acid; Engraver's acid; Aqua fortis

Recommended Use: Laboratory chemicals.

Uses advised against: No Information available

Company: Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number: CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification:
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxidizing liquids</td>
<td>Category 2</td>
</tr>
<tr>
<td>Corrosive to metals</td>
<td>Category 1</td>
</tr>
<tr>
<td>Skin Corrosion/irritation</td>
<td>Category 1 A</td>
</tr>
<tr>
<td>Serious Eye Damage/Eye Irritation</td>
<td>Category 1</td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
<td>Category 3</td>
</tr>
<tr>
<td>Target Organs - Respiratory system</td>
<td>Category 3</td>
</tr>
</tbody>
</table>

Label Elements:

Signal Word: Danger

Hazard Statements:
- May cause fire or explosion; strong oxidizer
- May be corrosive to metals
- Causes severe skin burns and eye damage
- May cause respiratory irritation
Precautionary Statements

Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Keep only in original container

Response
Immediately call a POISON CENTER or doctor/physician

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse

Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Ingestion
IF SWALLOWED: Rinse mouth.  DO NOT induce vomiting

Fire
In case of fire: Use CO2, dry chemical, or foam for extinction

Spills
Absorb spillage to prevent material damage

Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place

Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
None identified

Unknown Acute Toxicity
%.? percent of the mixture consists of ingredient(s) of unknown acute toxicity

### 3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>7697-37-2</td>
<td>65 - 70</td>
</tr>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>30 - 35</td>
</tr>
</tbody>
</table>

### 4. First-aid measures

General Advice
Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Immediate medical attention is required.

**Skin Contact**
Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.

**Inhalation**
If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Remove from exposure, lie down. Call a physician immediately.

**Ingestion**
Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.

**Most important symptoms/effects**
Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated.

**Notes to Physician**
Treat symptomatically.

### 5. Fire-fighting measures

**Suitable Extinguishing Media**
CO₂, dry chemical, dry sand, alcohol-resistant foam.

**Unsuitable Extinguishing Media**
No information available

**Flash Point**
Not applicable

**Autoignition Temperature**
No information available

**Explosion Limits**
Upper: No data available
Lower: No data available

**Oxidizing Properties**
Oxidizer

**Sensitivity to Mechanical Impact**
No information available

**Sensitivity to Static Discharge**
No information available

**Specific Hazards Arising from the Chemical**
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

**Hazardous Combustion Products**
Nitrogen oxides (NOₓ)

**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

### NFPA

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>OX</td>
</tr>
</tbody>
</table>

### 6. Accidental release measures

**Personal Precautions**
Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.

**Environmental Precautions**
Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.

**Methods for Containment and Clean Up**
Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.
7. Handling and storage

Handling
Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from clothing and other combustible materials.

Storage
Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>TWA: 2 ppm</td>
<td>(Vacated) TWA: 2 ppm</td>
<td>IDLH: 25 ppm</td>
</tr>
<tr>
<td></td>
<td>STEL: 4 ppm</td>
<td>(Vacated) STEL: 4 ppm</td>
<td>TWA: 2 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Vacated) STEL: 10 mg/m³</td>
<td>STEL: 4 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 2 ppm</td>
<td>TWA: 5 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 10 mg/m³</td>
<td>STEL: 10 mg/m³</td>
</tr>
</tbody>
</table>

Legend
ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures
Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles. Face-shield.

Skin and body protection
Long sleeved clothing.

Respiratory Protection
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures
Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear Colorless, Light yellow</td>
</tr>
<tr>
<td>Odor</td>
<td>Strong Acid</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>&lt; 1.0 (0.1M)</td>
</tr>
</tbody>
</table>
Melting Point/Range: -41 °C / -41.8 °F
Boiling Point/Range: Not applicable °C / °F
Flash Point: Not applicable
Evaporation Rate: No information available
Flammability (solid,gas): Not applicable
Flammability or explosive limits:
  Upper: No data available
  Lower: No data available
Vapor Pressure: 0.94 kPa (20°C)
Vapor Density: No information available
Specific Gravity: 1.40
Solubility: miscible
Partition coefficient; n-octanol/water: No data available
Autoignition Temperature: No information available
Decomposition Temperature: No information available
Viscosity: No information available
Molecular Formula: HNO3
Molecular Weight: 63.02

10. Stability and reactivity

Reactive Hazard: Yes
Stability: Oxidizer: Contact with combustible/organic material may cause fire.
Conditions to Avoid: Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.
Incompatible Materials: Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents
Hazardous Decomposition Products: Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors
Hazardous Polymerization: Hazardous polymerization does not occur.
Hazardous Reactions: None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Oral LD50: Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50: Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC50: Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>Not listed</td>
<td>Not listed</td>
<td>LC50 = 2500 ppm. (Rat) 1h</td>
</tr>
<tr>
<td>Water</td>
<td>-</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Toxicologically Synergistic Products: No information available
Delayed and immediate effects as well as chronic effects from short and long-term exposure:

Irritation: Causes severe burns by all exposure routes
Sensitization: No information available
Carcinogenicity: The table below indicates whether each agency has listed any ingredient as a carcinogen.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>IARC</th>
<th>NTP</th>
<th>ACGIH</th>
<th>OSHA</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component</td>
<td>Freshwater Algae</td>
<td>Freshwater Fish</td>
<td>Microtox</td>
<td>Water Flea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitric acid</td>
<td>Not listed</td>
<td>LC50: = 72 mg/L, 96h (Gambusia affinis)</td>
<td>Not listed</td>
<td>Not listed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Persistence and Degradability
- Miscible with water
- Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation
- No information available.

Mobility
- Will likely be mobile in the environment due to its water solubility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>-2.3</td>
</tr>
</tbody>
</table>

13. Disposal considerations

Waste Disposal Methods
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT
- UN-No     UN2031
- Proper Shipping Name NITRIC ACID
- Hazard Class 8
- Subsidiary Hazard Class 5.1
- Packing Group II

TDG
- UN-No     UN2031
- Proper Shipping Name NITRIC ACID
- Hazard Class 8
- Subsidiary Hazard Class 5.1
- Packing Group II

IATA
- UN-No     UN2031
Proper Shipping Name: NITRIC ACID
Hazard Class: 8
Subsidiary Hazard Class: 5.1
Packing Group: II

IMDG/IMO

UN-No: UN2031
Proper Shipping Name: NITRIC ACID
Hazard Class: 8
Subsidiary Hazard Class: 5.1
Packing Group: II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>IECS</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>X</td>
<td></td>
<td>231-714-2</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>X</td>
<td></td>
<td>231-791-2</td>
<td></td>
<td></td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>7697-37-2</td>
<td>65 - 70</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazard Categories

- Acute Health Hazard: Yes
- Chronic Health Hazard: Yes
- Fire Hazard: No
- Sudden Release of Pressure Hazard: No
- Reactive Hazard: Yes

CWA (Clean Water Act)

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>X</td>
<td>1000 lb</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Component   | Specifically Regulated Chemicals | Highly Hazardous Chemicals
---|---|---
Nitric acid | - | TQ: 500 lb

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>1000 lb</td>
<td>1000 lb</td>
</tr>
</tbody>
</table>

**California Proposition 65**
This product does not contain any Proposition 65 chemicals

**U.S. State Right-to-Know Regulations**

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Water</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**U.S. Department of Transportation**
Reportable Quantity (RQ): Y
DOT Marine Pollutant: N
DOT Severe Marine Pollutant: N

**U.S. Department of Homeland Security**
This product contains the following DHS chemicals:

<table>
<thead>
<tr>
<th>Component</th>
<th>DHS Chemical Facility Anti-Terrorism Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>2000 lb STQ</td>
</tr>
</tbody>
</table>

**Other International Regulations**

**Mexico - Grade**
No information available

**Canada**
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

**WHMIS Hazard Class**
C Oxidizing materials
E Corrosive material
D2B Toxic materials

---

### 16. Other information

**Prepared By**
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date**
12-Mar-2009

**Revision Date**
15-Dec-2015

**Print Date**
15-Dec-2015

**Revision Summary**
This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the
date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of SDS
Attachment 4

Shipping Determination
SHIPPING/TRANSPORTATION DETERMINATION FORM
Non-Regulated Shipping Determination

Date: 12/21/2017
Project Name: Ash Grove
Project Number: KC001721.0001

1) Check the following to certify the sample media being transported/shipped meet non-regulated or not restricted status:

☐ Samples will not be collected on this project

OR

☐ The following samples have been reviewed and do not meet criteria of a regulated shipment under DOT or IATA:

Check applicable media that will be sampled on the project:

☐ Soil
☐ Sediment
☐ Sludge
☐ Bldg. materials
☐ Articles
☐ Groundwater
☐ Surface water
☐ Process water
☐ Potable water
☐ Waste water
☐ Product
☐ Air samples
☐ Tissue, body part, or body fluid (1)
☐ Plant tissue, part or fluid
☐ Mold
☐ Investigation derived waste (all media types)
☐ Other:

☐ The following location(s) and media are not covered by above, are considered HazMat for shipping/transportation, and are subject to an additional shipping determination:

1a

2) For sample preservatives, the following checkboxes must be checked confirming a non-regulated/not restricted determination:

☐ Sample containers will be filled and preserved in accordance with EPA SW-846 protocols (2)
☐ Sample containers will not be field preserved with acids or bases by Arcadis staff
☐ Empty but preserved sample containers will not be return shipped to the laboratory or office
☐ EPA Method 5035 (TerraCore) samples will not be collected (3)

Supplemental information used to confirm section 1 and 2 conclusions:

Work plan/QAPP

3) Certify the following by checking the applicable categories that will be shipped or transported on this project (at least one category must be checked):

☐ Equipment and supplies will not be transported or shipped on this project.

OR

☐ Rental equipment being transported/shipped will not contain materials subject to DOT/IATA regulation (4)
☐ Field test kits, fire extinguishers and first aid kits will not be shipped
☐ Remediation chemicals transported in quantities >440 pounds gross weight per vehicle are not DOT regulated

☐ Other equipment and supplies used on this project are:

☐ Not regulated for transport; and/or
☐ Eligible for materials of trade exception (5)
The following equipment/supplies are not covered by above, are considered HazMat for shipping/transportation, and are subject to an additional shipping determination:

3a

Supplemental information used to confirm this conclusion:

Completion of the "Determination" worksheet is not required. Issue this worksheet to field staff.

3) Certification:
I certify that I am current in HazMat #1 or approved equivalent and the above determination is true and correct to the best of my knowledge.

Name: Brooke Glasrud

Signature:

Reviewed By: Tina Lloyd

Notes:
1) This category applies to mammals, reptiles, birds, fish, insects, arachnids and all other vertebrate and invertebrate organisms.
2) This category is limited to containers preserved with ≤4 ml of preservatives and excludes containers used to preserve human or animal tissue described in footnote 1.
3) Unhide and review the generic shipping determination form for TerraCores for details
4) Unhide and attach the generic shipping determination for rental equipment.
5) Unhide and attach the generic shipping determination for MOT transport.
ASH GROVE CONTRACTOR SAFETY MANAGEMENT DOCUMENTS
Receipt of Contractor Safety Packet

Contractor: _______________________________________

Project: _______________________________________

I acknowledge receipt of the Ash Grove Cement Company Contractor Safety Packet which consists of the following items:

✓ Completed Risk Exposure and Project Expectations Assessment Tool (REPEAT)
✓ Contractor Health & Safety Performance History
✓ Contractor Health and Safety Manual

Print Name:____________________________ Signature: ________________________

Title: ______________________________ Date: ____________________________
# Appendix A

## Job Planning Form

**Contractor Safety Management System**

### Section 1 - These questions are for Ash Grove to answer:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1. | A. Is the contractor Browz-compliant?  
    B. As of what date? | A.  
    B. |
| 2. | A. Has the contractor received,  
    signed and returned  
    acknowledgment of receipt of  
    the Contractor Safety Manual?  
    B. Do the people doing the work  
    have a copy of the Safety  
    Manual with them? | A.  
    B. |
| 3. | What is the job? What must be  
    accomplished? | Description: |
| 4. | What hazards pose a risk to the  
    safety of workers if the job is **not**  
    done? | |
5. When is the best time to do this job when there might be less risk?

6. What unique constraints does this job have, such as completion deadlines, to avoid shutting down operations?

7. Is this job:
   - Routine?
   - Repetitive?
   - Non-routine?
   - Emergency
   - Never been done before? 

(If the job is Non-routine, Emergency, or Never been done before, you must do a baseline risk assessment in the Risk Register. If the risk score is greater than or equal to 800, the plant manager must approve the work.)

Indicate the nature of the job:

Baseline Risk Score, if needed:

Plant Manager approval, if Risk Score is \( \geq 800 \):

Plant Manager Signature / Date

8. A. What other jobs will be taking place in the area or nearby that may affect, or be affected by, this job?
   B. How will you notify others about this job?

9. A. Does this work require the use or replacement of parts / equipment that are different from OEM specifications and therefore requires advanced approval?
   B. If yes, who must grant approval and by when?
<table>
<thead>
<tr>
<th></th>
<th>A. What Standard Operating / Maintenance Procedures, JSAs, or H&amp;S policies are available that are specific to this job?</th>
<th>A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>If there are procedures available, who will provide them to the contractor and by when?</td>
<td>B.</td>
</tr>
<tr>
<td></td>
<td>By whom and how often must this job have a safety inspection?</td>
<td>Contractor Employee (Name or Title):</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> Return safety inspection forms to the AGC Project Manager / Coordinator during the same shift on which the inspections are completed.</td>
<td>Frequency of Inspection:</td>
</tr>
<tr>
<td></td>
<td>Ash Grove Cement Employee (Name or Title):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequency of Inspection:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Who within Ash Grove is responsible for completing and posting the post-job evaluation?</td>
<td></td>
</tr>
<tr>
<td>Section 2 - These questions must be answered by the Contractor and Ash Grove:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>List the expected steps to complete this job.</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>4.</td>
<td>4.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>How long will this job take and during what hours will the work be done?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How many hours:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How many days:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How many weeks:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What hours will be worked:</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>How many people are needed to do the job?</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>A. Will a supervisor be present whenever workers are present?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B. If the answer is No, explain how the project will be staffed.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>If all workers are not English-speaking, will an interpreter be present at all times?</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Can you, the contractor, provide task training records for all personnel assigned to this job, including subcontractors?</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>What large mobile equipment (loaders, dozers, dump/haul trucks, excavators, skid steer loaders, cranes, etc.) will be used on this job?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>8. A.</td>
<td>Will you, the contractor, need Ash Grove to supply any tools / equipment / personnel or operators for this job? B. If yes, specify what is needed.</td>
<td>A. B.</td>
</tr>
<tr>
<td>9.</td>
<td>Is the job to take place indoors or outdoors?</td>
<td></td>
</tr>
<tr>
<td>10. A.</td>
<td>Will weather (hot, cold, raining, snow/ice, wind, etc.) adversely affect the ability to complete the job safely? B. What controls will be in place to manage the effect of adverse weather?</td>
<td>A. B.</td>
</tr>
<tr>
<td>11. A.</td>
<td>Does this work involve confined space entry? B. If yes, you, the contractor, must have a CSE program and employees trained in CSE procedures.</td>
<td>A. B.</td>
</tr>
<tr>
<td>12. A.</td>
<td>Does this work involve working at heights using a Personal Fall Arrest System (PFAS) or Fall Restraint System? B. If yes, you, the contractor, must provide the PFAS or fall restraint system and employees must be trained in the safe, correct use of that equipment. <strong>Note that a Working at Height Permit may be required.</strong></td>
<td>A. B.</td>
</tr>
<tr>
<td>13. A.</td>
<td>Will the work involve removing hand or guard rails, or the removal of walkway sections (grating, diamond plate, etc.), or the removal of roofing, equipment, ducts, etc. that will create an opening through which a person could fall? B. If yes, you, the contractor must obtain a Hazardous Opening Permit and meet or exceed Ash Grove requirements for personnel protection.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>13.</td>
<td>C. Will the work take place where other people (Ash Grove employees / contractors) are working that you may need to coordinate with or work around?</td>
<td>A.</td>
</tr>
<tr>
<td></td>
<td>D. If yes, list who must be coordinated with and when.</td>
<td>B.</td>
</tr>
<tr>
<td>14.</td>
<td>A. Is additional lighting needed for night work or for work in less well-lit areas?</td>
<td>A.</td>
</tr>
<tr>
<td></td>
<td>B. If yes, who will supply the additional lighting?</td>
<td>B.</td>
</tr>
<tr>
<td>15.</td>
<td>A. Will insects, animals, reptiles be present?</td>
<td>A.</td>
</tr>
<tr>
<td></td>
<td>B. If yes, how will this hazard be managed?</td>
<td>B.</td>
</tr>
<tr>
<td>16.</td>
<td>Does this work involve any of the following (circle all that apply)?</td>
<td>How will you prevent harm to people, property, the environment, or reputation should there be an unexpected or unwanted release of energy from any of these activities?</td>
</tr>
<tr>
<td></td>
<td>- Use of internal combustion engines (e.g. generators, welders, pressure washers, etc.) in enclosed areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Material handling / flatbed off-loading</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Chemical use or application</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Welding / Cutting / Arc Gouging</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Crane lift</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Energized electrical work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Use of high pressure water system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Use of explosives, blasting agents, Cardox tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Work on or around elevators</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Work on or over water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Vacuum truck operation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Quarry activities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Hauling / dumping at or onto a stockpile</td>
<td></td>
</tr>
</tbody>
</table>
- Operating tools or equipment with exposed rotating parts or shafts
- Work on a live rail line
- Excavation(s) more than 4 ft. deep
- Noise $\geq$ 90 dBA
- Steel erection
- Demolition
- Lay-down yard or similar area for temporary staging of materials or equipment?

### 17. Are any of the following permits required?

- Confined Space
- Hazardous Opening
- Working at Height
- Crane Lift Plan / Critical Lift Plan
- Hot Work
- Energized Work
- Other

If yes, the contractor must obtain the permit(s) before beginning the work.

### 18. What are the specific Stop-the-Job Triggers for this work?

1.
2.
3.
4.
5.

### 19. What are the signals for a Stop-the-Job Trigger?

(Verbal, hand signals, horn blast, etc.) – Specify:
This Job Planning Form was completed by:

______________________________________________  ______________________________________

Name and Title (Contractor Representative)  Date

______________________________________________  ______________________________________

Name and Title (Ash Grove Representative)  Date
b) Appendix B: Contractor Health and Safety Performance History

Please provide the information requested below. Accurate answers are required. Inaccurate information may disqualify you from work at Ash Grove Cement Company.

Company Name: ___________________________ Date: ___________________________

Project: ___________________________

Submitted by: ___________________________ Phone: ___________________________

1. Describe any fatalities\(^1\) your company has experienced during the previous five (5) years:

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

\(^1\) Any fatalities in last five years requires Ash Grove Vice President to approve contractor use.

2. Provide the following information for the last three years:

<table>
<thead>
<tr>
<th></th>
<th>20_ (e.g. 2012)</th>
<th>20_</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of OSHA / MSHA Citations(^1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of hospitalizations (1 or more nights)(^2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of amputations(^3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of injuries involving 5 or more days away from work(^4)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) 25 or more citations in any year requires plant manager approval.

\(^2\) 1 hospitalization - requires plant manager to approve contractor use; 2 or more require Vice President approval.

\(^3\) 1 amputation - requires plant manager to approve contractor use; 2 or more require Vice President approval.

\(^4\) 1-2 cases – requires plant manager to approve contractor; 3 or more require Vice President approval.

Audited by: ___________________________ Date: ___________________________
Appendix C: Contractor Health and Safety Manual

Contractors working on Ash Grove Cement Company premises are expected to work safely and follow the conventional health and safety practices and regulations outlined in this manual. These are not an exhaustive listing of every applicable health and safety rule, regulation, or practice that may apply to your work. However, they do represent a baseline of expected performance.

The manual consists of three sections:

1. Contractor On-Site Health and Safety Procedures

2. Summary of Applicable MSHA Regulations

3. Ash Grove Cement Company Plant Safety Rules

It is your responsibility as a contractor working on Ash Grove premises to know and understand the contents of this manual. If you have health and safety practices that exceed those provided here, you are most welcome to follow those. However, you may not use any health and safety practices that provide less protection than those identified here.

If at any time you have questions or are unsure about potential risks, it is your responsibility to stop working, contact your assigned Ash Grove project manager / coordinator and have the issue resolved.

We welcome you to Ash Grove and anticipate that you will meet or exceed the high health and safety expectations we have for you as a contractor or subcontractor working for our company.
Index

Section 1: Contractor On-Site Health and Safety Procedures…………………………… 2 – 14

Section 2: Summary of Applicable MSHA Regulations……………………………….. 15 – 19

Section 3: Ash Grove Cement Company Plant Safety Rules……………………………… 20 - 23
Section 1
Contractor On-Site Health and Safety Procedures
Section 1: Contractor Health and Safety Manual

Contractor Log and Sign-In

You must sign-in daily when arriving at the plant. Provide the names of each employee you have on site. Also, provide your Ash Grove representative with emergency contact information.

Injury and Illness Reporting

Contractors must immediately report all work-related injuries and illnesses occurring on Ash Grove property to an Ash Grove representative and the appropriate regulatory agency if warranted.

Training

Contractors must receive proper safety training in order to work on Ash Grove Cement property.

If you as a contractor or contractor employee meet the MSHA definition of a miner, your company must provide you the following training prior to arriving at the plant site:

- New Miner Training (24 hours) or Experienced New Miner Training before being assigned to work in the plant or quarry
- Task Training appropriate to assigned work
- Annual Refresher Training (8 hours)

All contractors must arrive at the site with proper documentation of your training, as is described in 30 CFR Part 46, and which is on the correct MSHA-approved form in a legible format.

All contractors, service workers, vendors, visitors and others must receive Site Specific Hazard Awareness Training before any work can take place.

Personal Protective Equipment

Required Personal Protective Equipment for Contractors performing work on Ash Grove property:

- Hard hat
- Safety glasses with side shields
- Safety-toed footwear
Contractors must use other PPE such as respirators, hearing protection, gloves, welding helmets, face shields, goggles, chemical resistant coveralls, personal flotation devices, etc., as conditions warrant.

**Airborne Contaminants**

Contractors must take steps to protect themselves from dust and dust containing crystalline silica or asbestos; welding fume; chemical vapors and gases, and other airborne contaminants. When working in conditions where exposures may occur, you must use an approved respirator and you must be fit-tested and medically approved to use the respirator. Contractors must use work practices that will prevent or minimize dust generation. In some cases air monitoring for airborne contaminants may be required.

**Workplace Examinations**

Contractors must perform daily workplace examinations in the area the contractor is working. Documentation of the daily workplace examinations must be kept. The documentation must have the date of the examination, the time the examination was performed, and the name of the person performing the examination. When hazards are found you must:

- Correct the hazard, or
- Barricade the hazard to protect other workers from the hazard, and
- Notify your immediate supervisor about the hazard and/or an Ash Grove representative.

**Control of Hazardous Energy**

Contractors working on machinery or equipment that can start up or move unexpectedly must protect themselves and others from hazardous energy by:

- Locking out the energy source, bleeding any retained energy or blocking against hazardous movement, and
- Tagging the energy source with your name, the date, and reason for the lockout,
- Testing to ensure that the lockout is effective, and by
- Notifying others who may be affected by the energy control procedures
- Knowing, understanding, and following Ash Grove’s group lockout procedures. You must talk with your Ash Grove representative about the plant’s procedures before you undertake any group lockout.

**Fall Protection**

Contractors must use fall protection where there is a danger of falling. The fall protection used must include:
• A fall protection plan developed for the project detailing the fall exposures and controls,
• An approved anchor point,
• Full body harness, and
• Appropriate connecting device such as a shock absorbing lanyard or self-retracting lifeline.
• Contractors using fall prevention systems must be able to provide task training documentation on the use of a fall arrest system.
• Fall protection is required when using mobile aerial lifts

Confined Spaces

Contractors must protect themselves when entering a confined space by:
• Determining if the entry requires a permit and obtaining a permit when needed
• Testing the atmosphere for hazardous gases, vapors, dusts, or fumes
• Taking steps to control or eliminate sources of hazardous atmospheres
• Locking out all supply and discharge points into the space
• Removing materials that could cause engulfment
• Isolating or removing other physical hazards
• Using appropriate fall protection
• Having an Attendant watch at all times during the entry
• Use a harness with an attached lifeline that is attended continuously by another person when entering bins, tanks, silos, hoppers, or surge piles

Mobile Equipment

Contractors must inspect each piece of mobile equipment before it’s put into service and document the inspection. Things to inspect for include but are not limited to:

• Functioning lights
• Windshield wipers
• Audible backup alarm
• Functioning service and parking brakes
• Proper oil, hydraulic and fuel levels
• Crack-free windshields
• Tire condition
• Steering condition

Any defects identified during the inspection that affect the safe operation of the mobile equipment must be corrected prior to placing the equipment into service. You must never approach mobile equipment without first getting the attention of the operator. You must never park mobile equipment in the blind spot of other mobile equipment. All parked
mobile equipment must be chocked. An audible warning must be given prior to placing mobile equipment into operation.

All mobile equipment operators must be appropriately task trained for the equipment they will operate, including equipment owned by Ash Grove.

Contractors wishing to use Ash Grove and/or rental mobile equipment on site (e.g. a forklift; loader; aerial lift; etc.) must receive approval from Ash Grove management / supervision before use.

Contractors must ensure that their employees are task trained on the specific piece of equipment before use and are responsible for providing necessary training, in accordance with their own Part 46 training plan. Documentation of training is required. You must have a record of the training available to provide to your Ash Grove representative upon request.

Ash Grove is not responsible for task training of contractor employees.

Crane Safety

Contractors using cranes on Ash Grove property must:

- Provide a certified operator; be ready to provide a copy of the certification to the assigned Ash Grove representative
- Supply personnel qualified to conduct set-up, maintenance, signaling, rigging and dismantling
- Supply equipment that has an up-to-date inspection and that is free of mechanical defects
- Conduct and document a pre-use inspection each shift before use
- Complete a pre-lift checklist and conduct a planning meeting prior to each lift
  - Use your own pre-lift checklist
  - Alternatively, use Ash Grove’s checklist if the contractor does not have one available.
  - Use of Ash Grove’s checklist does not constitute supervision or approval by Ash Grove
- Develop a lift plan or critical lift plan, as conditions dictate
- Coordinate lifts with the assigned Ash Grove representative

Electrical Safety

All electrical work must be done by a competent person if the work involves opening electrical enclosures such as breakers, motor starters, and knife switches; in some states you must meet state-specific requirements for electrical work. You must wear prescribed arc flash and/or voltage-rated protective gear, per NFPA 70E, when working on energized electrical circuits. De-energize and lockout electrical circuits before doing
work on them; obtain an electrical hot work permit if your work must be done on energized circuits. It is your responsibility to keep others out of harm’s way while you perform electrical work.

All power and extension cords must be continuity tested and checked. They must be of the correct gauge wire and in serviceable condition. Ground prongs must be in place and there can be no cuts in the external jacket and no exposed copper showing anywhere. You must use GFCI-protected electrical cords when working in wet environments and cords must be protected from damage by mobile equipment. Extension cords cannot be passed through doors, windows or other openings where the cord could become crimped, cut or otherwise damaged.

**Thermography Safety**

Contractors, and anyone assisting a contractor, must wear arc flash protective equipment when doing thermography work on electrical switchgear and components. You must keep others out of the area while this work is performed.

**Fire and Explosion Prevention**

Contractors must prevent fires and explosions by:

- Completing a Hot Work Permit when required for the work. Designate a Fire Watch as appropriate to the conditions.
- Testing the air for the presence of flammable gases, vapors or dusts before doing work involving open flames or the production of sparks in areas where these gases, vapors or dusts may be, or are, present. Contractors must not perform hot work when LEL readings are more than 10%.
- Removing or covering with a nonflammable tarp all flammable or combustible materials where hot work will be done
- Providing a readily available fire extinguisher in the immediate area where hot work is taking place;
- Using explosion-proof lighting when working in areas where waste fuel or coal dust is handled, stored, or processed.

**Working in Heat**

Good work practices for contractors working in areas with high temperatures, high humidity and/or hot surfaces, are:

- Have plenty of cool water or other hydrating drinks available and drink them often
- Use forced ventilation to provide cooling air flow when possible
- Allow the hot area to cool to the point that a supervisor or manager authorizes work in the area
- Monitor employees for signs of heat stress
- Schedule work for cooler portions of the day
• Inspect areas carefully for crusted over hot, dusty material that could flow, become airborne or fall on you. If such materials are found you must either remove / cover the material, wear appropriate PPE or not do the work until a safe environment can be provided
• Contact an Ash Grove representative whenever questions arise about heat, hot surfaces, or hot materials

Scaffolding

Good work practices for contractors using scaffolding are:
• Assign a competent person to oversee and inspect scaffold erection and use
• Inspect the scaffolding components for signs of damage; do not use scaffolding that is damaged.
• Use only scaffolding parts that are designed to fit together; do not use scaffolding erected from mis-matched parts.
• Ensure that the scaffold has appropriate handrails, toe boards and access ways (that is, ladders or steps)
• Ensure that the scaffold is stable and properly braced
• Ensure that the scaffold is anchored if it is four or more times higher than it is wide
• Use fall protection if there is a danger of falling.

Excavation, Trenching and Shoring

Contractors working in a trench or excavation that is four feet deep or greater must:
• Have an excavation competent person on-site for daily inspection of excavations
• Have ladder access within 25 feet of travel
• Enter only if the trench is properly benched, sloped, shored or shielded through the use of bracing or a trench box and the spoil pile is a safe distance from the edge of the excavation
• Ensure that there is no hazardous atmosphere present and no exposed utilities
• Stay out of the trench if water is seeping or running into it.
• Ensure that mobile equipment maintains a safe operating distance from the edge
• Erect fencing or other barricading to keep persons or equipment out of the excavation

Housekeeping / Safe Access

Contractors must keep their work areas clean and orderly. It is your responsibility to:

• Keep walkways and aisles free of tripping hazards; route extension cords, hoses, and cables under, to the side, or above walkways
• Clean up spilled materials
• Store tools, equipment, supplies in their appropriate storage area
• Dispose of boards with protruding nails
• Ensure ladders are in good condition with no splits or cracks in side rails and the ladder feet are in place
• Provide steps for any climbing point that is 19 inches or more above the walking surface and provide steps with handrails for access to any area requiring three or more steps
• Ensure that ladders or steps to mobile equipment are free of defects / not damaged and are in good condition

Hazard Communication

Contractors must provide health and safety information regarding the materials and chemicals brought onto Ash Grove property. That information must include:

• Safety Data Sheets (SDS or MSDS)
• Proper labels on containers
• Written Hazard Communication Program

Hazardous Openings – Holes in walkways; removed sections of handrails; other openings that a person could fall through

Contractors removing handrails or flooring must:

• Require that, in areas where handrails are removed to allow the passage of tools, equipment or materials, persons who are exposed to the fall hazard wear appropriate fall protection and tie off to a proper anchor point.
• Prohibit people without fall protection from passing through the area while the fall hazard exists.
• Close immediately, by some temporary means (e.g. chain, cable, rope, 2x4, etc.), the opening once the tools, equipment or materials have been moved through the opening created by the removal of handrails. You must pull the device used tightly enough to prevent anyone from falling due to the swinging of the chain, cable or rope. You must tie hazard tape (yellow or red) to the chain, cable or rope to clearly mark its presence and to indicate that handrail has been removed. NOTE: Hazard tape alone is not sufficient to protect or cover hazardous openings such as removed sections of handrail or floor openings.
• Protect employees working around holes created in flooring or walking surfaces by placing substantial barricades around the opening or through the use of fall protection and suitable anchor points.
• Ensure that holes in floors or walkways are not left unattended. You must either barricade the opening or place a ¾” thick piece of plywood or metal grating across the opening and clearly mark “HOLE” on both sides of the plywood or grating. You must require the use of fall protection when barricades or hole covers are removed.
• Notify all persons affected by the removal of handrails or flooring before removal begins
• Keep areas in the vicinity of the removed handrails or flooring free of any clutter or debris that would present tripping hazards.
Contractor Parking

- Agree upon designated parking areas for contractor personal vehicles prior to the construction start date
- Park only in the designated area
- Follow posted speed limit signs at all times while on the plant site
- Notify personnel that Ash Grove is not responsible for lost or stolen property from personal vehicles
- Set parking brakes and chock wheels when parking vehicles in any non-designated parking area in the plant or quarry

Laydown areas

- Agree on a laydown area, for the temporary storage of equipment and supplies related to construction activities prior to the construction start date
- Secure all mobile equipment with wheel chocks, set parking brakes, and blades or buckets set on the ground
- Establish a laydown area site plan for large construction when needed
- Ensure that delivery services know to place deliveries in the designated laydown area
- Ensure safe work practices are followed (e.g. remain out of the line-of-fire; keeping unnecessary personnel away) while off-loading materials, equipment or other supplies
- Identify an area for the storage of materials that may possess a particular hazard, such as gasoline, diesel fuel, epoxies, etc.
- Follow fire department regulations regarding how and how much of a hazardous or flammable material may be stored onsite.
- Provide containment for spills of certain liquids. Evaluate the location of storm drains and put in place the proper safe guards to protect them from contaminants entering
- Minimize hazards by limiting the height items, such as steel beams, are stacked or by revising the way they are stacked.
- Organize laydown areas to maintain clear driving and walking areas. Store materials in racks or on pallets whenever possible.
- Restore the laydown area to its original condition after the construction project is complete.

Sanitation (Hygiene)

Ash Grove offices, restrooms, locker rooms, and lunchrooms are reserved for Ash Grove personnel. Discuss the availability of sanitation services with your Project Manager prior to work commencing. Basic requirements for your employees include:
• Toilet and hand washing facilities sufficient for the anticipated number of employees on site
• Potable water
• Covered break and rest areas

**Machine Guarding**

Fixed guards are required on all moving equipment, including on exposed engine parts in mobile equipment that have the potential to cause injury and are less than seven feet away from walking or work areas: Gears, sprockets, chain drives, pulleys, shafts, flywheels, couplers, fan blades, etc. Specific requirements include:

• Construct guards of durable materials (expanded metal and steel), secured with proper fasteners, with minimal movement (less than ½ inch) potential
• Maintain tool guards in place. They must not be removed, obstructed or “pinned back”
• Equip hand operated power tools with a constant pressure switch
• Use only right angle / portable grinders that have the guard attached
• Adjust pedestal / bench grinders so that the tool rest is adjusted within 1/8” of the abrasive wheel; adjust the tongue guard to ¼”; and they must have a complete spindle guard
• Cut keyed / non keyed shafts to extend no more than half the shaft diameter or put an end cap on them
• Use only table saws equipped with original safeguards in place
• Use all powered saws with the guards in place, including on skilsaws, band saws, and similar equipment

**Illumination**

You must ensure your employees have sufficient illumination to conduct general and detail work for the conditions and work hours anticipated. This includes: surface structures, paths, walkways, stairways, lay down areas, excavation, storage and other work areas. Ash Grove has interior and exterior operational lighting; however that may not be sufficient for your project. Be prepared to provide light plants / bars, drop lights and other temporary direct illumination.

General illumination guidelines are:

<table>
<thead>
<tr>
<th>Area</th>
<th>Illumination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction / general task</td>
<td>5 footcandles</td>
</tr>
<tr>
<td>Walkways, storage</td>
<td>5 footcandles</td>
</tr>
<tr>
<td>Task and detail work</td>
<td>10 – 15 footcandles</td>
</tr>
<tr>
<td>Office</td>
<td>25 footcandles</td>
</tr>
</tbody>
</table>
Emergencies / Evacuations

Contractors must know what is expected of them in the event of an emergency. Emergencies could be due to injuries, fires, explosions, equipment or property damage, or from weather related causes.

Follow these procedures:

- Know the plant’s emergency / evacuation signal
- Follow any directions given to you by an Ash Grove representative
- Contact the Control Room Operator at 620.433.3552 or off-site emergency assistance (e.g. fire, EMS, police). The Control Room Operator will contact these agencies for you.
- Evacuate to the designated areas if directed to do so. At this plant those areas are:
  - West of Cement Dome if wind from East or South
  - West of Limestone Dome if wind from North or West.
- Be prepared to account for all personnel at the evacuation point
- Notify your Ash Grove representative immediately for any accident that may be immediately reportable to MSHA (see 30 CFR Part 50 for the definition of what qualifies as an “accident.” Immediately reportable accidents must be communicated to MSHA within 15 minutes of discovery in order to avoid mandatory fines.

Explosives / Blasting

To bring or use explosives on Ash Grove property you must:

- Possess a current and valid Bureau of Alcohol, Tobacco, Firearms and Explosives (ATFE) license or permit
- Have permission from Ash Grove management
- Use only properly trained and experienced personnel
- Store explosives and detonators in a safe and secure manner
- Placard vehicles used to transport explosives or detonators
- Have the proper fire extinguishers
- Work under written procedures designed to prevent premature detonation, fly rock, or other damage to property, equipment, or injury to personnel. Do not over-charge drill holes.
- Notify Ash Grove what your warning system is before you set off a blast

Unless you are a blasting contractor, while you are on Ash Grove property you must stay out of designated blasting areas within the quarry and you must follow all instructions given to you regarding blasts and explosives.
Ash Grove and various railroad companies operate locomotives, switch engines and railcars on the property. To work safely around this equipment you must:

- Stop at posted railroad crossings and look both ways to ensure the track is clear before proceeding; give the train traffic the right-of-way
- Comply with train crossing signals
- Follow directions given to you by locomotive engineers, trainmen, or switchmen; these may be given visually with hand signals or blue flags or audibly by voice or signal horns
- Park vehicles and equipment at least 20 feet from tracks to avoid collisions
- Walk across tracks, not down them
- Cross tracks quickly; get in the clear as soon as possible
- Go around rail car strings – do not cross between or under railcars
- Do not walk between two pieces of on-track equipment unless they are separated by at least 50 feet
- Keep at least 25 feet from the end of standing trains, cars, or locomotives. This will give you time to react safely to any movement of the equipment.
- Give railcars and engines a wide berth when crossing tracks to ensure that you are not struck should the railcars be bumped; rail equipment may move in either direction

If you are working on tracks or rail equipment, you must:

- Have one roadway worker designated to provide on-track safety for all members of the work group
- Use a Federal Railroad Administration (FRA) qualified flagman or watchman when working in the FRA Red Zone (within 4 feet from the outside rail on each side of the track)
- Be trained to recognize and respond to the hazards of railways; to understand the signals given by engineers, trainmen, and switchmen
- Expect movement of on-track equipment at any time
- Know how to detect and recognize approaching trains
- Know how to warn other workers about approaching trains
- Stop all work while trains are passing within the work zone
- Wear reflective vests or high visibility clothing to make you more visible
- Know the train traffic on adjacent tracks
- Place a blue flag 25 feet from the end of the last car on the track to warn others that work is taking place on rail equipment or track and that nothing on that track should be moved
- Place a blue flag on the control stand of a locomotive or in front of a locomotive or cut of railcars to indicate someone is working on the equipment and it is not to be moved
Use blue lanterns at night, rather than blue flags
Set the hand and air brakes on all cars in a string of cars
Chock the wheels of cars being worked on, and/or on strings of cars on or adjacent to the track being worked on
Provide adequate lighting when working before sunrise or after dusk

Environmental Controls (spills / emissions / waste generation and disposal)

As part of our ISO 14001 Environmental Management System, Ash Grove’s policy is to operate in compliance with environmental laws and regulations, minimize pollution and creation of waste, and retain vendors and contractors committed to responsible environmental management.

You must:

• Comply with all applicable federal, state, and local environmental laws and regulations.
• Consult with an Ash Grove representative to aid in identifying potential environmental impacts associated with your work activities and responsibilities.
• Aid in controlling fugitive dust, to minimize and manage hazardous and universal waste and be familiar with and follow Ash Grove’s spill prevention and control plan.
• Dispose of general waste, that is, wood, paper, cardboard, plastics, and scrap metal in designated dumpsters.
• Minimize the use of hazardous materials. When using hazardous material, you are responsible for maintaining control of those materials and for the proper storage of hazardous material when it’s not in use.
• Identify hazardous waste that you may generate before work begins. All containers must be properly labeled as hazardous waste.
• Contact the Environmental Manager if you have any questions or concerns regarding Ash Grove’s Environmental Policy or refer to our external web site at: http://www.ashgrove.com/about_environment.asp
Section 2
Summary of Applicable MSHA Regulations
Section 2: Summary of Applicable MSHA Regulations

The Mine Safety and Health Administration (MSHA) enforces safety and health regulations at all cement and lime plants operated by Ash Grove Cement Company. It is the responsibility of contractors, their employees and subcontractors as well as vendors to be aware of, and comply with, all MSHA regulations.

The following is a brief overview of some of the pertinent MSHA regulations. It is YOUR responsibility to be aware of all the specific MSHA rules and regulations that apply to your work on Ash Grove Cement Company property. Applicable regulations can be found in 30 Code of Federal Regulations (CFR), Parts 45, 46, 47, 50, 56, 62, 100, and 104.

Part 45 Independent Contractors

This Part describes how independent contractors can obtain an MSHA identification number and the information they are required to provide to Ash Grove Cement Company. It also establishes the mechanism by which independent contractors can receive citations and orders from MSHA.

Part 46 Training Regulations

You must have a Training Plan, approved by MSHA, and an individual named to be in charge of training. “Competent” individuals must deliver the training and the training must be given in a language understood by those receiving it. Depending on the situation, your training must include provisions for the following:

- comprehensive new miner training (24 hours)
- newly-hired, experienced miner training
- annual refresher training (8 hours)
- task training
- site-specific hazard awareness training

OSHA training that is relevant to work at a mine site can be substituted to meet some or all of the training requirements.

You must certify on MSHA Form 5000-23, or an equivalent form, that the required training has been given; this applies to OSHA training that you might substitute. NOTE: falsification of training records is a criminal offense! You must pay your employees while they are being trained. You must notify the appropriate Ash Grove Cement Company representative of any hazards created by the work you do on Ash Grove property.
Part 47 Hazard Communication

This part requires you to have a written hazard communication program, have an inventory of hazardous chemicals, maintain material safety data sheets (MSDSs), label containers of hazardous chemicals, and train employees. You must notify your Ash Grove representative about any hazardous chemical you bring on Ash Grove property and provide him or her with the appropriate MSDSs.

Part 50 Notification, Investigation, Records and Reports of Accidents, Injuries, Illnesses

Under this Part, you must:

- Report accidents immediately to MSHA. The term “accident” is defined by MSHA in Part 50.2.
- Investigate all reportable injuries, illnesses and accidents.
- Preserve evidence at an accident scene until released by an MSHA representative.
- Notify MSHA of reportable injuries and illnesses using Form 7000-1.
- Report quarterly employment information to MSHA using Form 7000-2.

Part 56 Safety and Health Standards

This Part contains MSHA’s enforceable safety and health rules for surface metal and nonmetal mines. Contractors, their employees and subcontractors are required to know and follow all MSHA rules contained in this Part. Part 56 is divided into the following subparts:

<table>
<thead>
<tr>
<th>A – General</th>
<th>B – Ground Control</th>
<th>C – Fire Prevention and Control</th>
<th>D – Air Quality and Physical Agents</th>
<th>E – Explosives</th>
</tr>
</thead>
<tbody>
<tr>
<td>K – Electricity</td>
<td>L – Compressed Air and Boilers</td>
<td>M – Machinery and Equipment</td>
<td>N – Personal Protection</td>
<td>O – Materials Storage and Handling</td>
</tr>
<tr>
<td>P – Illumination</td>
<td>Q – Safety Program</td>
<td>R – Personnel Hoisting</td>
<td>S – Miscellaneous</td>
<td></td>
</tr>
</tbody>
</table>

Again, it is the responsibility of contractors, their employees and subcontractors to know the details of each of these subparts and to comply with them. Below are listed just a few of the requirements from these subparts. Contractors or subcontractors must:
• Conduct workplace examinations once each shift. The examination must be documented with the person’s name, date and area inspected.
• Conduct pre-operational inspections of all mobile equipment. Remove from service until repaired any equipment that does not pass inspection.
• Provide safe access to all working areas.
• Provide fall protection whenever there is a danger of falling.
• Provide a safety harness, lifeline and attendant when entering a bin or silo.
• Prevent the use of any tool, equipment or machinery beyond its design capacity.
• Correct any defect in tools, equipment, machinery or materials that affects safety. Remove from service anything that cannot be immediately repaired and keep a record of those items.
• Prevent work on electrically energized equipment unless it has been locked out and each person working on the equipment has placed his or her lock on the shutoff mechanism.
• Ensure that all electrically operated equipment, including extension cords, is grounded.
• Implement a hearing conservation program for employees who are exposed to noise above 85 dBA on an 8-hour, time-weighted average basis.
• Test the atmospheres of confined spaces before entry to ensure safe entry conditions.
• Establish rules governing speed, right-of-way, direction of movement and the use of headlights for mobile equipment and vehicles used on the mine site.
• Ensure that compressed air is not directed at any person, in particular for cleaning off clothing.
• Ensure that moving machine parts are guarded.
• Ensure that the operators of mobile equipment wear seat belts.
• Ensure that horns and backup alarms are functional.
• Ensure that someone trained in CPR and first aid is available on all shifts.
• Ensure that all working areas are sufficiently illuminated.
• Use trashcans with covers wherever food is disposed.
• Prohibit the consumption of food or beverages in areas exposed to toxic substances.

Part 62 Occupational Noise Exposure

This part requires employee noise monitoring to determine if exposures equal or exceed the Action Level of 85 dBA, the Permissible Exposure Level (PEL) of 90 dBA, or the dual hearing protection level of 105 dBA over an 8-hour period. Employees exposed at or above the Action Level must be enrolled in a hearing conservation program that includes annual hearing tests. For employees exposed at or above the PEL, feasible engineering or administrative controls must be implemented. Hearing protection can be used but the other controls must be attempted and used where feasible. Exposures above the dual hearing protection level require that affected employees wear both muffs and plugs.
Part 100 Criteria and Procedures for Proposed Assessment of Civil Penalties

This section describes how MSHA assesses penalties for violation of Mine Act regulations.

Part 104 – Pattern of Violations

This section describes how the Agency decides whether a pattern of significant and substantial violations of Mine Act regulations exists at a particular site.
Section 3
Plant Safety Rules
Section 3: Plant Safety Rules

Rule 1

Fighting, horseplay and/or threats of violence against others are not allowed.

Rule 2

Employees, contractors and visitors may not possess, use or be under the influence of illegal drugs or alcohol while in or on Owner's property.

Rule 3

Firearms and other deadly weapons are not allowed in or on Owner's property. Any firearm or deadly weapon displayed on Owner's property shall result in the immediate removal of the offending employee, contractor or visitor.

Rule 4

All employees working on mine property who meet applicable MSHA criteria must receive 8 hours of documented MSHA refresher training each year, at Contractor and/or its Associates' expense. Newly employed, inexperienced miners will receive 24-hour MSHA-required training, at Contractor and/or its Associates' expense. Contractors and visitors will receive site specific hazard awareness training, as appropriate, by Owner's personnel. Except for site specific hazard training, Contractor and/or its Associates will be responsible for training, and documenting the training, of their employees. Such employees will receive documented “task” training as needed, at Contractor and/or its Associates' expense.

Rule 5

Fall protection will be used where there is a danger of falling. Owner's employees may not use body belts. Full body fall protection harnesses with appropriate lanyards will be used. Drivers will use fall protection platforms or fall arrest systems to access the tops of their trucks.

Rule 6

Personal protective equipment (PPE) will be used as job requirements demand, at Contractor and/or its Associates' expense. Minimum mandatory PPE required for work: hard hat, safety toe footwear, and safety glasses. Other PPE, such as respirators, hearing protection, gloves, welding helmets, face shields, goggles, chemical resistant coveralls, personal flotation devices, etc. will be used as required.
Rule 7

All incidents involving injuries (no matter how minor), equipment and/or property damage will be reported to Contractor and/or its Associates as well as to Owner. All MSHA reportable injuries/illnesses will be thoroughly investigated by Contractor and/or its Associates and a written report, meeting MSHA requirements, will be prepared and submitted to the plant manager at Owner's facility involved. All incident reports must be signed by the supervisor of the injured/ill employee.

Rule 8

All employees requiring doctor attention for job-related injuries may, based on the nature of the incident, receive a drug and alcohol test at the time of the doctor visit. All employees directly involved in equipment or property damage or causing injury to another employee that requires doctor treatment may be required to have a drug and alcohol test as part of the incident investigation.

Rule 9

All work areas will be maintained in as clean, dry and orderly a manner as is practicable. Tools, equipment, hoses, ropes, extension cords, pallets, etc. will not be left in pathways. All employees are responsible for picking up after themselves. Spills will be cleaned up as quickly as possible or the area will be barricaded to prevent access; corrections for causes of spills will be sought and implemented.

Rule 10

All employees are personally responsible for reporting to their supervisors unsafe conditions or unsafe work practices they observe. When it is appropriate (e.g., employees have the necessary skills, knowledge, direction, equipment or manpower, etc.) to directly intervene, all employees will immediately correct the unsafe situation.

Rule 11

All employees will control potentially hazardous energy (electrical, mechanical, pneumatic, hydraulic, suspended load, etc.) by means of appropriate energy control procedures. These procedures will be used when employees are working on, around or under equipment or machinery that could release energy and cause injury, property or equipment damage. Such procedures may include lockout, blocking, line blanking and draining, etc. Contractor and/or its Associates shall not disengage any power source without prior authorization from Owner's personnel on site.

Rule 12

Hazard control procedures and systems for confined spaces will be followed by Contractor and or its Associates. This includes the issuance of entry permits, hazard identification and establishment of rescue plans, which plans include the presence of an attendant and the use of lifelines. Contractor and/or its Associates shall be responsible for making their own arrangements for any necessary rescue services.
Appendix E: CONTRACTOR SAFETY PERFORMANCE CHECK

Contractor: ________________________________________________________________

Project Description: _______________________________________________________

<table>
<thead>
<tr>
<th>SAFETY REQUIREMENT</th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>All workers have received SSHAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>All PPE is adequate, maintained, and worn</td>
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<tr>
<td>Work site barricaded, access / traffic controlled</td>
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<tr>
<td>Work areas orderly and with adequate lighting</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workers protected from fall exposures</td>
<td></td>
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<td></td>
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<tr>
<td>LOTO according to proper procedures</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Mobile equipment: back up alarms, chocks</td>
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<td></td>
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<tr>
<td>Cranes / hoists inspected and used safely</td>
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<td></td>
<td></td>
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<tr>
<td>Workers safe distance from suspended loads</td>
<td></td>
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<tr>
<td>Ladders: inspected and secure</td>
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<tr>
<td>Electrical cords are in good condition</td>
<td></td>
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<tr>
<td>Confined space: Hazards evaluated &amp; controlled</td>
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<td></td>
</tr>
<tr>
<td>Scaffolding: inspected, stable, secured</td>
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</tr>
<tr>
<td>Power tools properly guarded and grounded</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemicals / materials properly labeled</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas cylinders are labeled and secured</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Aid / CPR certified person on site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flammables / combustibles are properly stored</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire extinguishers available and inspected</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavations: Proper shoring, set back</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot work permit completed when required</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily safety / tool box meeting held</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Were the MSHA required Daily Workplace Examinations completed? Yes_____No _____

Were the MSHA required Pre-Use Mobile Equipment Inspections completed? Yes_____No _____

Describe any incidents that have occurred during the project: (medical treatment, near miss, property or equipment damage) ____________________________________________________________

Additional safety concerns or comments: __________________________________________

______________________________________ Date: ________________________________
A copy of this report must be submitted to the Ash Grove Cement Company Project Coordinator
### Table 1. Summary of Estimated Costs
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

<table>
<thead>
<tr>
<th>Solid Waste Management Unit</th>
<th>Capital Cost ¹</th>
<th>Annual O&amp;M Cost ²</th>
<th>Total O&amp;M Cost (30 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWMU 1 - Paraffin Waste Disposal Landfill</td>
<td>$141,000</td>
<td>$19,000</td>
<td>$570,000</td>
</tr>
<tr>
<td>SWMU 16 - Industrial Waste Landfill</td>
<td>$17,000</td>
<td>$49,000</td>
<td>$1,470,000</td>
</tr>
<tr>
<td>SWMU17 North - North CKD Landfill</td>
<td>$17,000</td>
<td>$44,000</td>
<td>$1,560,000</td>
</tr>
<tr>
<td>SWMU 17 South - South CKD Landfill</td>
<td>$2,740,000</td>
<td>$47,000</td>
<td>$1,560,000</td>
</tr>
<tr>
<td>SWMU 23 - Inactive Kiln Dust Landfill</td>
<td>$80,000</td>
<td>$11,000</td>
<td>$330,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$2,995,000</strong></td>
<td><strong>$170,000</strong></td>
<td><strong>$5,490,000</strong></td>
</tr>
</tbody>
</table>

**Notes:**

1. Capital Cost includes: Development of Land Use Controls, Application of a Native Soil Cover or Application of a Compacted Clay Cap and Installation, as appropriate, and Implementation Cost. A contingency is incorporated in the Capital Cost.

2. Annual O&M Cost includes: Yearly O&M of the leachate collection systems, Annual O&M for the Cap/Covers, and annual groundwater sampling and monitoring for natural attenuation. A contingency is incorporated in the Annual O&M Cost.
Table 2. SWMU 1, Paraffin Waste Disposal Landfill - Capital Cost
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Land Use Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation and submittal of Deed Notice</td>
<td>1</td>
<td>LS</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Preparation and Submittal of Groundwater Restriction</td>
<td>1</td>
<td>LS</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>$15,000</td>
</tr>
<tr>
<td>II. Native Soil Cover</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobilization/Demobilization</td>
<td>1</td>
<td>LS</td>
<td>$15,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>Soil Erosion and Sedimentation Controls</td>
<td>1</td>
<td>LS</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Site Clearing, Grubbing, Mulching</td>
<td>0</td>
<td>acre</td>
<td>$1,000</td>
<td>$0</td>
</tr>
<tr>
<td>Surveying Services</td>
<td>1</td>
<td>day</td>
<td>$1,750</td>
<td>$1,750</td>
</tr>
<tr>
<td>Sub-Grading</td>
<td>0</td>
<td>acre</td>
<td>$1,000</td>
<td>$0</td>
</tr>
<tr>
<td>Furnish and Install Topsoil (6-Inches)</td>
<td>741</td>
<td>CY</td>
<td>$15</td>
<td>$11,111</td>
</tr>
<tr>
<td>Site Grading</td>
<td>1</td>
<td>LS</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Hydro-Seeding/stabilization</td>
<td>40,000</td>
<td>SF</td>
<td>$0.25</td>
<td>$10,000</td>
</tr>
<tr>
<td>Erosion Mat</td>
<td>0</td>
<td>SF</td>
<td>$0.50</td>
<td>$0</td>
</tr>
<tr>
<td>5-strand Fence</td>
<td>1,775</td>
<td>LF</td>
<td>$8.00</td>
<td>$14,200</td>
</tr>
<tr>
<td>Topsoil QA/QC Sampling (1 per 500 Cubic Yards)</td>
<td>2</td>
<td>EA</td>
<td>$100</td>
<td>$200</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>$67,261</td>
</tr>
<tr>
<td>III. Implementation Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering, Designs/Plans (% of Capital Cost)</td>
<td>10</td>
<td>%</td>
<td>$67,261</td>
<td>$6,726</td>
</tr>
<tr>
<td>Administration and Legal</td>
<td>1</td>
<td>LS</td>
<td>$2,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>Permitting</td>
<td>1</td>
<td>LS</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Procurement</td>
<td>1</td>
<td>LS</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Construction Management (% of Capital Costs)</td>
<td>10</td>
<td>%</td>
<td>$67,261</td>
<td>$6,726</td>
</tr>
<tr>
<td>Completion Report</td>
<td>1</td>
<td>LS</td>
<td>$15,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>$45,952</td>
</tr>
<tr>
<td>Cost Contingency (% of Capital Costs)</td>
<td>10</td>
<td>%</td>
<td>$128,213</td>
<td>$12,821</td>
</tr>
<tr>
<td>TOTAL CAPITAL COST</td>
<td></td>
<td></td>
<td></td>
<td>$141,035</td>
</tr>
</tbody>
</table>

Notes: EA - each, SF - square feet, CY - cubic yard, LS - lump sum
### Table 3. SWMU 16, Industrial Waste Landfill - Capital Cost
#### Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

#### I. Land Use Controls

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation and Submittal of Deed Notice</td>
<td>1</td>
<td>LS</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Preparation and Submittal of Groundwater Restriction</td>
<td>1</td>
<td>LS</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Soil Erosion and Sedimentation Controls</td>
<td>0</td>
<td>LS</td>
<td>$10,000</td>
<td>$0</td>
</tr>
<tr>
<td>Site Clearing, Grubbing, Mulching</td>
<td>0</td>
<td>Acre</td>
<td>$2,500</td>
<td>$0</td>
</tr>
<tr>
<td>Surveying Services</td>
<td>0</td>
<td>Day</td>
<td>$1,750</td>
<td>$0</td>
</tr>
<tr>
<td>Sub-Grading</td>
<td>0</td>
<td>Acre</td>
<td>$5,000</td>
<td>$0</td>
</tr>
<tr>
<td>Importation of Clean Fill Material for Site Grading of Cover System - Positive Drainage Area</td>
<td>0</td>
<td>Ton</td>
<td>$10</td>
<td>$0</td>
</tr>
</tbody>
</table>

**Subtotal (I)** $15,000

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Contingency (% of Capital Costs)</td>
<td>10</td>
<td>%</td>
<td>$15,000</td>
<td>$1,500</td>
</tr>
</tbody>
</table>

**TOTAL CAPITAL COST** $16,500

#### Alternative Components:
- In-Place Compacted Clay Cap
- In-Place Hydraulic Control
- Land Use Controls
- MNA and GW Monitoring

Notes: LS - lump sum
### Table 4. SWMU 17 North, North CKD Landfill - Capital Cost

Corrective Measures Implementation  
Ash Grove Cement Company  
Chanute, Kansas

#### Alternative Components:
- In-Place Compacted Clay Cap
- In-Place Hydraulic Control
- Land Use Controls
- GW Monitoring

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepar &amp; Submittal of Deed Notice</td>
<td>1</td>
<td>LS</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Prepar &amp; Submittal of Groundwater Restriction</td>
<td>1</td>
<td>LS</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Soil Erosion &amp; Sedimentation Controls</td>
<td>0</td>
<td>LS</td>
<td>$10,000</td>
<td>$0</td>
</tr>
<tr>
<td>Site Clearing, Grubbing, Mulching</td>
<td>0</td>
<td>Acre</td>
<td>$2,500</td>
<td>$0</td>
</tr>
<tr>
<td>Sub-Grading</td>
<td>0</td>
<td>Acre</td>
<td>$5,000</td>
<td>$0</td>
</tr>
<tr>
<td>Importation of Clean Fill Material for Site Grading of Cover System</td>
<td>0</td>
<td>Ton</td>
<td>$10</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$15,000</strong></td>
</tr>
<tr>
<td>Cost Contingency (% of Capital Costs)</td>
<td>10</td>
<td>%</td>
<td>$15,000</td>
<td>$1,500</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$16,500</strong></td>
</tr>
</tbody>
</table>

Notes: LS - lump sum
Table 5. SWMU 17 South, South CKD Landfill - Capital Cost
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

Alternative Components:
- Compacted Clay Cap
- In-Place Hydraulic Control
- Land Use Controls
- GW Monitoring

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Land Use Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation and Submittal of Deed Notice</td>
<td>1</td>
<td>LS</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Preparation and Submittal of Groundwater Restriction</td>
<td>1</td>
<td>LS</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>$15,000</td>
</tr>
<tr>
<td>II. Compacted Clay Cap (no liner, no vents, no geotextile)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobilization/Demobilization</td>
<td>1</td>
<td>LS</td>
<td>$15,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>Soil Erosion and Sedimentation Controls</td>
<td>1</td>
<td>LS</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Site Clearing, Grubbing, Mulching</td>
<td>1</td>
<td>Acre</td>
<td>$2,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>Surveying Services</td>
<td>20</td>
<td>Day</td>
<td>$1,750</td>
<td>$35,000</td>
</tr>
<tr>
<td>Sub-Grading</td>
<td>27</td>
<td>Acre</td>
<td>$5,000</td>
<td>$135,000</td>
</tr>
<tr>
<td>Importation of Clean Fill Material for Site Grading of Cover System - Positive Drainage Area (6-inches)</td>
<td>0</td>
<td>Ton</td>
<td>$10</td>
<td>$0</td>
</tr>
<tr>
<td>Install Cover Soil (1.5-feet)</td>
<td>65,340</td>
<td>CY</td>
<td>$15</td>
<td>$980,100</td>
</tr>
<tr>
<td>Furnish and Install Topsoil (6-Inches)</td>
<td>21,780</td>
<td>CY</td>
<td>$15</td>
<td>$326,700</td>
</tr>
<tr>
<td>Site Grading</td>
<td>27</td>
<td>Acre</td>
<td>$5,000</td>
<td>$135,000</td>
</tr>
<tr>
<td>Hydro-Seeding/stabilization</td>
<td>1,176,120</td>
<td>SF</td>
<td>$0.25</td>
<td>$294,030</td>
</tr>
<tr>
<td>Erosion Mat</td>
<td>0</td>
<td>SF</td>
<td>$0.50</td>
<td>$0</td>
</tr>
<tr>
<td>QA/QC - Liner Testing</td>
<td>0</td>
<td>LS</td>
<td>$5,000</td>
<td>$0</td>
</tr>
<tr>
<td>Clean Fill QA/QC Sampling (1 per 750 Cubic Yards)</td>
<td>59</td>
<td>EA</td>
<td>$750</td>
<td>$44,250</td>
</tr>
<tr>
<td>Topsoil QA/QC Sampling (1 per 500 Cubic Yards)</td>
<td>44</td>
<td>EA</td>
<td>$100</td>
<td>$4,400</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>$1,981,980</td>
</tr>
<tr>
<td>III. Implementation Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering, Designs/Plans (% of Capital Cost)</td>
<td>10</td>
<td>%</td>
<td>$1,981,980</td>
<td>$198,198</td>
</tr>
<tr>
<td>Administration and Legal</td>
<td>1</td>
<td>LS</td>
<td>$2,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>Permitting</td>
<td>1</td>
<td>LS</td>
<td>$20,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Procurement</td>
<td>1</td>
<td>LS</td>
<td>$50,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Construction Management (% of Capital Costs)</td>
<td>10</td>
<td>%</td>
<td>$1,981,980</td>
<td>$198,198</td>
</tr>
<tr>
<td>Completion Report</td>
<td>1</td>
<td>LS</td>
<td>$25,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>Subtotal</td>
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<td></td>
<td></td>
<td>$493,896</td>
</tr>
<tr>
<td>Subtotal (I through III)</td>
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</tr>
<tr>
<td>Cost Contingency (% of Capital Costs)</td>
<td>10</td>
<td>%</td>
<td>$2,490,876</td>
<td>$249,088</td>
</tr>
<tr>
<td>TOTAL CAPITAL COST</td>
<td></td>
<td></td>
<td></td>
<td>$2,739,964</td>
</tr>
</tbody>
</table>

Notes: LS - lump sum
Table 6. SWMU 23, Inactive Kiln Dust Landfill - Capital Cost
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

Alternative Components:
- In-place Native Soil Cover
- Land Use Controls
- GW Monitoring

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAPITAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Land Use Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation and Submittal of Deed Notice</td>
<td>1</td>
<td>LS</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Preparation and Submittal of Groundwater Restriction</td>
<td>1</td>
<td>LS</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td>$15,000</td>
<td></td>
</tr>
<tr>
<td>II. Native Soil Cover</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobilization/Demobilization</td>
<td>0</td>
<td>LS</td>
<td>$15,000</td>
<td>$0</td>
</tr>
<tr>
<td>Soil Erosion and Sedimentation Controls (Silt Fence, BMPs)</td>
<td>0</td>
<td>LS</td>
<td>$10,000</td>
<td>$0</td>
</tr>
<tr>
<td>Site Clearing, Grubbing, Mulching</td>
<td>0</td>
<td>Acre</td>
<td>$2,500</td>
<td>$0</td>
</tr>
<tr>
<td>Surveying Services</td>
<td>1</td>
<td>Day</td>
<td>$1,750</td>
<td>$1,750</td>
</tr>
<tr>
<td>Sub-Grading</td>
<td>0</td>
<td>Acre</td>
<td>$5,000</td>
<td>$0</td>
</tr>
<tr>
<td>Furnish and Install Topsoil (6-Inches)</td>
<td>741</td>
<td>CY</td>
<td>$15</td>
<td>$11,111</td>
</tr>
<tr>
<td>Site Grading</td>
<td>0</td>
<td>LS</td>
<td>$5,000</td>
<td>$0</td>
</tr>
<tr>
<td>Hydro-Seeding/stabilization</td>
<td>40,000</td>
<td>SF</td>
<td>$0</td>
<td>$10,000</td>
</tr>
<tr>
<td>Erosion Mat</td>
<td>0</td>
<td>SF</td>
<td>$1</td>
<td>$0</td>
</tr>
<tr>
<td>5-strand Fence</td>
<td>3,131</td>
<td>LF</td>
<td>$8</td>
<td>$25,048</td>
</tr>
<tr>
<td>Topsoil QA/QC Sampling (1 per 500 Cubic Yards)</td>
<td>0</td>
<td>EA</td>
<td>$100</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td>$47,909</td>
<td></td>
</tr>
<tr>
<td>III. Implementation Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering, Designs/Plans (% of Capital Cost)</td>
<td>10</td>
<td>%</td>
<td>$47,909</td>
<td>$4,791</td>
</tr>
<tr>
<td>Administration and Legal</td>
<td>0</td>
<td>LS</td>
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<td>Cost Contingency (% of Capital Costs)</td>
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Notes: EA - each, SF - square feet, CY - cubic yard, LS - lump sum
Table 7. SWMU 1, Paraffin Waste Disposal Landfill - O&M Costs
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

<table>
<thead>
<tr>
<th>Alternative Components:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Upgraded Native Soil Cover</td>
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<tr>
<td>• Land Use Controls</td>
</tr>
<tr>
<td>• Groundwater Monitoring</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POST-CLOSURE - OPERATION AND MAINTENANCE</strong></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>IV. O&amp;M - Cover/Cap (annual costs)</td>
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</tr>
<tr>
<td>Annual Inspection and Reporting</td>
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<td>$10,000</td>
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<tr>
<td>Mowing (twice per year)</td>
<td>2</td>
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<td>$500</td>
<td>$1,000</td>
</tr>
<tr>
<td>Cap Repair (isolated reseeding)</td>
<td>5,000</td>
<td>SF</td>
<td>$0.25</td>
<td>$1,250</td>
</tr>
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<td>LF</td>
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<td>$800</td>
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<td><strong>Annual Subtotal</strong></td>
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<td></td>
<td></td>
<td>$13,050</td>
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<tr>
<td>V. Groundwater Monitoring</td>
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<td></td>
</tr>
<tr>
<td>GW Sampling</td>
<td>1</td>
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<tr>
<td>GW Reporting</td>
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<td><strong>Subtotal per Year (IV through V)</strong></td>
<td></td>
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<td></td>
<td>$17,550</td>
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<tr>
<td>Annual O&amp;M Contingency (% of O&amp;M Costs)</td>
<td>10</td>
<td>%</td>
<td>$17,550</td>
<td>$1,800</td>
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<tr>
<td><strong>Annual O&amp;M COST</strong></td>
<td></td>
<td></td>
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<td>$19,000</td>
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</table>

Notes: EA - each, SF - square ft, LF - linear feet
Table 8. SWMU 16, Industrial Waste Landfill - O&M Costs
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

Alternative Components:
- In-Place Compacted Clay Cap
- In-Place Hydraulic Control
- Monitored Natural Attenuation
- Land Use Controls
- GW Monitoring

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>II. Leachate Trench and Treatment System O&amp;M</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acid Cost - Monthly</td>
<td>0</td>
<td>Month</td>
<td>$200</td>
<td>$0</td>
</tr>
<tr>
<td>Electricity - Monthly</td>
<td>12</td>
<td>Month</td>
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<td>System Repair - Monthly</td>
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<td>Month</td>
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<td>$1,200</td>
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<td>O&amp;M Labor and Expenses - Monthly Visit</td>
<td>12</td>
<td>Month</td>
<td>$1,000</td>
<td>$12,000</td>
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<tr>
<td>Treated Water Disposal - Monthly</td>
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<td>Month</td>
<td>$0</td>
<td>$0</td>
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<td><strong>Annual Subtotal</strong></td>
<td></td>
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<td>$15,600</td>
</tr>
<tr>
<td><strong>III. O&amp;M- Cover/Cap (annually)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Inspection and Reporting</td>
<td>1</td>
<td>EA</td>
<td>$2,000</td>
<td>$2,000</td>
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<td>2</td>
<td>EA</td>
<td>$500</td>
<td>$1,000</td>
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<tr>
<td>Cap Repair (isolated reseeding)</td>
<td>5,000</td>
<td>SF</td>
<td>$0.25</td>
<td>$1,250</td>
</tr>
<tr>
<td><strong>Annual Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td>$4,250</td>
</tr>
<tr>
<td><strong>IV. Monitored Natural Attenuation &amp; GW Monitoring</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MNA/GW Sampling</td>
<td>1</td>
<td>Event</td>
<td>$15,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>GW Reporting</td>
<td>1</td>
<td>EA</td>
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<td>$10,000</td>
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<tr>
<td><strong>Annual Subtotal</strong></td>
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<td>$25,000</td>
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<td>%</td>
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<td>$49,000</td>
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</table>

Notes: EA - each, SF - square feet
Table 9. SWMU 17 North, North CKD Landfill - O&M Costs
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

### Alternative Components:
- In-Place Compacted Clay Cap
- In-Place Hydraulic Control
- Land Use Controls
- GW Monitoring

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>II. Leachate Trench and Treatment System O&amp;M</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acid Cost - Monthly</td>
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<td>Month</td>
<td>$200</td>
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<td>Electricity - Monthly</td>
<td>12</td>
<td>Month</td>
<td>$200</td>
<td>$2,400</td>
</tr>
<tr>
<td>System Repair - Monthly</td>
<td>12</td>
<td>Month</td>
<td>$100</td>
<td>$1,200</td>
</tr>
<tr>
<td>O&amp;M Labor and Expenses - Monthly Visit</td>
<td>12</td>
<td>Month</td>
<td>$1,000</td>
<td>$12,000</td>
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<tr>
<td>Treated Water Disposal - Monthly</td>
<td>12</td>
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</tr>
<tr>
<td><strong>III. O&amp;M- Cover/Cap (annual costs)</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Annual Inspection and Reporting</td>
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<td>EA</td>
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<td>$2,000</td>
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<td>EA</td>
<td>$1,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>Cap Repair (isolated reseeding)</td>
<td>10,000</td>
<td>SF</td>
<td>$0.25</td>
<td>$2,500</td>
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<td><strong>Annual Subtotal</strong></td>
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<td><strong>$6,500</strong></td>
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<td><strong>IV. GW Monitoring</strong></td>
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<tr>
<td>GW Sampling (combined with South CKD)</td>
<td>1</td>
<td>Event</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>GW Reporting (combined with South CKD)</td>
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<td>EA</td>
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<td>$7,500</td>
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<td><strong>$17,500</strong></td>
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<td><strong>Subtotal per Year (II through IV)</strong></td>
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<td>%</td>
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<td><strong>$3,960</strong></td>
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Notes: EA - each, SF - square feet
Table 10. SWMU 17 South, South CKD Landfill - O&M Costs
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

Alternative Components:
- Compacted Clay Cap
- In-Place Hydraulic Control
- Land Use Controls
- GW Monitoring

### POST-CLOSURE - OPERATION AND MAINTENANCE

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IV. Leachate Trench and Treatment Building O&amp;M</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Acid Cost - Monthly</td>
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<td>Month</td>
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<td>$0</td>
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<tr>
<td>System Repair - Monthly</td>
<td>12</td>
<td>Month</td>
<td>$100</td>
<td>$1,200</td>
</tr>
<tr>
<td>O&amp;M Labor and Expenses - Monthly Visit</td>
<td>12</td>
<td>Month</td>
<td>$1,000</td>
<td>$12,000</td>
</tr>
<tr>
<td>Treated Water Disposal - Monthly</td>
<td>12</td>
<td>Month</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td><strong>Annual Subtotal</strong></td>
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<td></td>
<td></td>
<td>$15,600</td>
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<tr>
<td><strong>V. O&amp;M- Cover/Cap</strong></td>
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<td></td>
<td></td>
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<tr>
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<td>EA</td>
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<td>$5,000</td>
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<td>$2,000</td>
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<tr>
<td>Cap Repair (isolated reseeding)</td>
<td>10,000</td>
<td>SF</td>
<td>$0.25</td>
<td>$2,500</td>
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<tr>
<td><strong>Annual Subtotal</strong></td>
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<td></td>
<td>$9,500</td>
</tr>
<tr>
<td><strong>VI. GW Monitoring</strong></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>GW Sampling (combined with North CKD)</td>
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<td>$10,000</td>
</tr>
<tr>
<td>GW Reporting (combined with North CKD)</td>
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<td><strong>Annual O&amp;M COST</strong></td>
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</table>

Notes: EA - each, SF - square feet
Table 11. SWMU 23, Inactive Kiln Dust Landfill - O&M Costs
Corrective Measures Implementation
Ash Grove Cement Company
Chanute, Kansas

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. O&amp;M - Cover/Cap (annual costs)</td>
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<td></td>
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<tr>
<td>Annual Inspection and Reporting</td>
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<tr>
<td>Mowing (twice per year)</td>
<td>2</td>
<td>EA</td>
<td>$500</td>
<td>$1,000</td>
</tr>
<tr>
<td>Cap Repair (isolated reseeding)</td>
<td>5,000</td>
<td>SF</td>
<td>$0.25</td>
<td>$1,300</td>
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<td>Fence Repair</td>
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<td>LF</td>
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<td>$800</td>
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<td>Annual Subtotal</td>
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<td></td>
<td></td>
<td>$5,100</td>
</tr>
<tr>
<td>III. Monitored Natural Attenuation &amp; GW Monitoring</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>GW Sampling</td>
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<td>Event</td>
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<td>$2,000</td>
</tr>
<tr>
<td>GW Reporting</td>
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<td>EA</td>
<td>$2,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>Annual Subtotal</td>
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<tr>
<td>Subtotal per Year (II through III)</td>
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<td></td>
<td></td>
<td>$9,600</td>
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<tr>
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<td>%</td>
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<td>$960</td>
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<tr>
<td>Annual O&amp;M COST</td>
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<td></td>
<td>$10,560</td>
</tr>
</tbody>
</table>

Notes: EA - each, SF - square feet, CY - cubic yard, LF - linear feet
DEED NOTICE

THIS DEED NOTICE ON REAL PROPERTY ("Notice") is made on this _____ day of, 20__, by Ash Grove Cement Company, whose address is _______________________________ ("Declarant").

NOTICE IS HEREBY GIVEN to all present and future owners and occupants that:

1. Declarant is the owner of real property more particularly described on the attached Exhibit A [requires a legal description] and identified as [insert location of property including parcel numbers, street address, County of Neosho] State of Kansas ("the Property"); and

2. The Property is subject to the Operating Permit issued jointly by U.S. Environmental Protection Agency (USEPA) and the Kansas Department of Health and Environment (KDHE), RCRA #KSD031203318;

3. A purpose of the Operating Permit is to require certain measures and structures and use restrictions at areas on the Property where solid waste has been disposed, identified in the Operating Permit as solid waste management units (SWMU). The final corrective measures required by the Operating Permit are set forth in the Corrective Measures Implementation Plan dated ____________.

4. The following locations identified and delineated in the Operating Permit and final Corrective Measures Implementation Plan contain materials buried beneath the surface as follows:

   (a) SWMU 1    Paraffin Waste Disposal Landfill (waste paraffin)
   (b) SWMU 16    Industrial Waste Landfill (miscellaneous solid waste)
   (c) SWMU 17    Cement Kiln Dust (CKD) Landfill (cement kiln dust)
   (d) SWMU 23    Inactive Kiln Dust Landfill (cement kiln dust)
5. The Operating Permit and other documents and information related to the areas identified herein are available at:

a. Kansas Department of Health and Environment

    KDHE
    Environmental Program
    Bureau of Waste Management
    Kansas Department of Health and Environment
    Curtis State Office Building
    1000 SW Jackson
    Topeka, Kansas 66612

b. United States Environmental Protection Agency

    USEPA Region VII
    AWMD/WRAP
    2.3 – P44
    11201 Renner Blvd
    Lenexa, Kansas 66219

c. Public Information Repository

    Chanute Public Library
    111 North Lincoln Avenue
    Chanute, Kansas 66720

6. For as long as the Property is subject to the Operating Permit as described herein, each instrument hereafter conveying any interest in the Property, or any portion of the Property shall contain a recital acknowledging this Deed Notice and providing the recording location of this Deed Notice upon such conveyance substantially in the following form:

“The real property described herein is subject to the Operating Permit issued on ______________, 20__ as stated in the Deed Notice recorded in the ______________ County Deed Records on ______________, 20__ at [insert location of the Deed Notice (e.g., “Volume __, Page ___” or “Document Number _____”)] as if the same were fully set forth herein.”
I declare under penalty of perjury that the foregoing is true and correct.

ASH GROVE CEMENT COMPANY

BY:__________________________________

[Type name of authorized signatory]

TITLE:________________________________

DATE:______________________________
STATE OF KANSAS )
COUNTY OF ______________________) SS:

BEFORE ME, a Notary Public in and for said County and State, personally came
______________________________ by ___________________________, it’s
______________________________ who acknowledged that he/she did sign the foregoing Deed Notice as
[Choose one: owner, or authorized representative, or an officer of said company] and that the same is his/her voluntary act, [Insert if applicable: and the voluntary act of said company]. In testimony whereof, I have subscribed my name and affixed my seal on this _____ of
_________________________, 20__.

____________________________

NOTARY PUBLIC

My commission expires: _______________
Ash Grove Cement Company is the owner in fee simple of that certain real property located in the county of Neosho, Kansas and more particularly describes by the following description:

*See Exhibit A attached hereto*

by virtue of a deed dated ________________, _______, recorded in Book ____, Page ____, in the Office of the Register of Deeds, Neosho County, Kansas.

1. **PROPERTY USE**

The property includes at the date of filing certain designated areas of land containing solid wastes buried beneath the surface. These areas are identified as solid waste management units (SWMU) by the United States Environmental Protection Agency (USEPA), pursuant to the federal Resource Recovery and Conservation Act (RCRA), in the Operating Permit issued jointly by USEPA and the Kansas Department of Health and Environment (KDHE), RCRA #KSD031203318. The Operating Permit requires certain corrective measures to be taken by the permittee at the identified SWMU units. The SWMU areas identified in the Operating Permit that are subject to this Restrictive Covenant are:

- SWMU 1  Paraffin Waste Disposal Landfill
- SWMU 16 Industrial Waste Landfill
- SWMU 17 Cement Kiln Dust (CKD) Landfill
- SWMU 23 Inactive Kiln Dust Landfill

The property is otherwise designated as greenspace.
Current and future uses of the property within any of these identified SWMU areas shall be restricted as follows:

(1) The property will not be used for residential use.

(2) Groundwater Use Limitations — The property owner will not use or allow others to use the groundwater underlying the property for human consumption or the irrigation of gardens or other domestic use, or install or cause to be installed new wells for human consumption or domestic purposes. This groundwater use restriction will not limit the use of existing monitoring wells on the property (if any) or installation of new wells on the property to monitor groundwater quality or temporary dewatering wells for construction purposes.

(3) Surface Water Body Limitations — The property owner will not create or allow others to create water features such as ponds, lakes, streams, or other water features that have the potential to be affected by groundwater. These surface water body limitations will not include the use of stormwater conveyance ditches or stormwater retention basins that are constructed above the typical water table elevation for that portion of Plant area contained in the SWMU boundaries.

2. PROTECTION OF SYSTEMS

All future land uses must be conducted in a manner which will protect and preserve the integrity of the environment and all waste containment and monitoring systems designed, installed and operated during the implementation of corrective measures at the SWMU areas.

All present and future owners and tenants of this property must preserve and protect all permanent survey markers, benchmarks, environmental monitoring stations, and any measures installed to restrict public access, livestock use, or any other activity that could potentially damage the cover system over the waste installed on the property.

3. CONSTRUCTION: APPROVAL

Any subsequent property owners and/or tenants are required to consult with the USEPA Region VII and KDHE during planning of any improvement to the property and to obtain approval from the USEPA Region VII and KDHE in Topeka, Kansas before any work is done to any monitoring devices or systems, before improvement within the SWMU areas identified herein is performed, or before any excavation or construction of permanent structures, drainage ditches, changes to the contour or dirt work, changes in the vegetation grown, production or sale of food chain crops, or removal of any security fencing, signs or devices installed to restrict public access to the SWMU areas.
4. **EASEMENT TO USEPA AND KDHE**

The USEPA and the KDHE, their successors or assigns and any duly authorized agents or contractors employed by or on behalf of USEPA and KDHE are hereby granted a permanent easement to enter or come upon the property to perform the following actions at the identified SWMUs:

a. Complete any work necessary which may be specified in the Operating Permit or corrective measures plans approved thereunder;

b. Perform any maintenance or monitoring of any of the identified SWMUs during the implementation of corrective measures as required by the Operating Permit;

c. Sample, repair or reconstruct any environmental monitoring stations constructed as a requirement for implementation of corrective measures as required by the Operating Permit.

5. **DISCLOSURE**

Any offer or contract for the conveyance, sale, lease or other interest in the property must contain full and complete disclosure of all terms, conditions and requirements for long term care and land use which is imposed by current statutes, rules and regulations or the Operating Permit existing at the time of the offer or contract. The offer or contract must also contain provisions for continued protection and maintenance of the waste containment system and testing of the monitoring systems in accordance with this Restrictive Covenant.

6. **BINDING TERMS**

These limitations, restrictions, easements, conditions and covenants shall be permanent and shall run with the land and shall be binding on all parties now having or hereafter acquiring any right, title or interest in the property or any part thereof.

These covenants, easements and all related documents are permanent unless extinguished only by written agreement between the property owner and the KDHE.

**ACKNOWLEDGEMENT**

Ash Grove Cement Company

__________________________________________
(Signature)

__________________________________________
(Title)

__________________________________________
(Date)

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STATE OF KANSAS )
COUNTY OF JOHNSON ) ss:

BE IT REMEMBERED, that on this _____ day of _______________, 201__, before me the undersigned, a Notary Public in the and for the County and State aforesaid, came ____________________________________, authorized representative of Ash Grove Cement Company, who is personally known to be such person who executed the above document on behalf of said corporation, and such person duly acknowledged the execution of the same to be his /her act and deed.

IN TESTIMONY WHEREOF, I have hereunto set my, and affixed by official seal the day and year written above.

____________________
Notary Public

My Commission Expires: ________________