



May 28, 2015

Mr. Al Frakes
Division of Solid Waste Management
Tennessee Department of Environment and Conservation
William R. Snodgrass TN Tower
312 Rosa L. Parks Avenue, 14th Floor
Nashville, Tennessee 37243

Re: Kilgore Flares Company, LLC
Revised Part A and B Permit Renewal Application
Response to Notice of Deficiency

Dear Mr. Frakes:

On behalf of Kilgore Flares Company, LLC (Kilgore), EnSafe Inc. is submitting a revised Part B Permit Application and responses to the Notice of Deficiency (NOD) dated April 10, 2015. As required by the NOD, enclosed are 4 hard copies and 4 electronic copies (CD-ROM) of the revised application.

This letter also addresses each of the comments in the NOD. Each specific comment from the NOD is listed below followed by our response.

- 1. Tennessee Rule 0400-12-01-.07(5) requires that all applications, reports, or information submitted to the Commissioner shall be signed and certified.

Provide signed certifications for the submitted revised permit application, reports, and supporting information.

Response: The updated and signed Part A form is in Section A of the permit application. The signature for the entire Part B permit application is in Section L.

- 2. Tennessee Rule 0400-12-01-.05(16)(m) requires owners or operators choosing to open burn or detonate waste explosives must do so in accordance with the following table and in a manner that does not threaten human health or the environment.

Pounds of waste explosives or propellants	Minimum distance from open burning or detonation to the property of others
0 to 100	204 meters (670 feet)
101 to 1,000	380 meters (1,250 feet)
1,001 to 10,000	530 meters (1,730 feet)
10,001 to 30,000	690 meters (2,260 feet)

The open burn units do not meet the minimum distance requirement to the property of others.

Kilgore has provided a test report that has not provided basis or cause to deviate from the distance requirements defined in the interim status standards for future interim status operations or proposed operations under a TDEC hazardous waste management permit for this OB Unit.

Specific comments on the tests' design, measurements and conclusions in the report cannot be made at this time. The test reported conditions are not representative of Kilgore's operational procedures, wastes and treatment volumes being requested for permitting.

The Impact Test Report:

- a. The test should be run with representative waste and quantities.
- b. Provide details on the precautions being taken.
- c. Should TDEC decide to allow Kilgore to re-test, the TDEC would require:
 - i. Submittal of a test plan prior to Kilgore submitting any additional test reports, for TDEC approval.

Any proposed tests to be run must include Kilgore's actual treatment procedures, waste streams and volumes in order for the subsequent report to have representative data relevant to Kilgore's actual and proposed open burn operations, wastes and treatment volumes.

- ii. Any additional test for State consideration must consider all aspects of open burning including plume emissions and deposition. Though the Report recommended a 325-foot buffer be established beyond the Unit boundary HWOA fence plume character, expansion and deposition may require larger buffers in some directions/locations in addition to the general buffer expansion 325 feet around the Unit boundary fence.
- iii. The test be must completed during time periods when the Toone, Tennessee area are expected to have their near expected historical high average temperature, winds approaching the worst case wind speed and other worst case atmospheric conditions in which Kilgore would operate the OB Unit.
- iv. TDEC may also consider requiring Kilgore reevaluate the disposal of low reactivity rag, PPE, and other component wastes (such as Viton, which liberates phosgene when burned, and Teflon) by open burning. Separating these stable solid from the

highly reactive wastes for other off-site disposal in a more controlled manner would reduce the hazardous constituent releases from open burning. EPA and TDEC's long standing position is that open burning is not a preferred method for wastes that can be disposed in a more controlled manner than open burning, and open burning should be limited to that waste which there is no other options is too reactive to dispose otherwise.

Response: We have assumed TDEC will agree to receive a work plan for this demonstration. Kilgore is working on a revised protocol for the Thermal Flux Test and will submit under separate cover and additional conversation with TDEC on the approach.

3. Tennessee Rule 0400-12-01-.07(5)(b)9(i)(I) & (II) requires a detailed description of the unit being used or proposed for use, including the following:

- (I) Physical characteristics, materials of construction, and dimensions of the unit;

Response: Sections D-10 and D-11 provide the information for the proposed hazardous waste open burn units (HWOBUs) and the existing, interim status HWOBUS, respectively.

- (II) Detailed plans and engineering reports describing how the unit will be located, designed, constructed, operated, maintained, monitored, inspected, and closed to comply with the requirements of Rule 0400-12-01-.06(27)(b) and (c).

Response: Plan and cross-sectional views of a proposed HWOBU burn pan are provided on Sheet C-6.0 in Appendix D-1. Engineering drawings showing the locations, dimensions, and design plans and specifications of the proposed HWOBUs are provided in Appendix D-1.

Figure D-1 presents the location of the existing, interim status HWOBUs. See Figures D-2 through D-6 in Appendix D-2 for engineering drawings showing as-built details for the existing, interim status HWOBUs.

- a. Provide the detailed description for the burn units in use and for the proposed units.

Response: Sections D-10 (a) and D-11(a) provide the information for the proposed and existing, interim status HWOBUs, respectively.

- b. Provide the exact locations of the burn pans in use and the proposed burn units and pads.

Response: Appendix D-1 contains the location of the proposed HWOBUs. Figure D-1 presents the location of the existing, interim status HWOBUs.

- c. Provide a construction schedule for the new pans and pads. Provide the order the old units are taken out of service and the new units constructed. The new units must have a construction inspection by TDEC prior to being placed in service.

Response: The construction schedules can be found in Appendix D-3.

- d. Please submit design drawings and specifications, and engineering studies certified by a qualified Registered Professional Engineer.

Response: Plan and cross-sectional views of a proposed HWOBU burn pan are provided on Sheet C-6.0 in Appendix D-1. Engineering drawings showing the locations, dimensions, and design plans and specifications of the proposed HWOBUs are provided in Appendix D-1.

Figure D-1 presents the location of the existing, interim status HWOBUs. See Figures D-2 through D-6 in Appendix D-2 for engineering drawings showing as-built details for the existing, interim status HWOBUs.

- e. Provide a compliance-sampling plan to determine the open burning effect on the soils around the burn units.

Response: The HWOBA has been used for open burning for more than 40 years. Prior to RCRA, open burning was done in burn pits. As a result the soils in the HWOBA have been "affected" by open burning and contain ash. The HWOBA is therefore a SWMU and must be investigated and closed in accordance with the closure plan herein submitted. This, however, complicates any plan to test soils after permit issuance. The submitted air dispersion modeling provides an approximation of that effect on nearby soils.

- f. A hazardous waste determination must be made on the precipitation collected on a HWOBU concrete containment pad before it is discharged to the ground. Provide a compliance-sampling plan for the hazardous waste determination.

Response: See Section C-3 for the sampling plan.

- 4. Tennessee Rule 0400-12-01-.07(5)(b)9(iv) requires for any treatment unit, a report on a demonstration of the effectiveness of the treatment based on laboratory or field data.

Provide a work plan providing details for the effectiveness demonstration of the newly constructed units. The plan is to include notification of TDEC fifteen days prior to the demonstration. Send a demonstration results report to TDEC for review. Do not place the newly constructed units into service until TDEC's approves the results.

Response: See Section C-3(h) for details on the effectiveness demonstration.

5. Tennessee Rule 0400-12-01-.06(7)(c)2(iii) requires an estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the type(s) of the off-site hazardous waste management units to be used, if applicable; and Tennessee Rule 0400-12-01-.06(7)(c)2(iv) requires a detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard.

- a. The Plan states "The maximum potential volume of pyrotechnic waste treated at the HWOBA at any time will be equal to the 3,300-pound capacity of a single HWOBU burn pan."

The HWOBA houses 20-25 burn pans. The maximum volume of hazardous waste at the time of closure (including hazardous waste accumulation areas) is the amount that authorized under the permit. The Plan must be revised to the maximum amount that would be authorized under the permit.

Response: Kilgore's operational and safety procedures allow only one (1) pan to contain waste at any given time. Therefore, at closure, even an abrupt closure, only one pan may contain waste. Additionally, waste is not placed in a pan until minutes before a burn. The maximum amount of waste present at closure is therefore the maximum amount for one pan, which is 3,300 lbs.

- b. The Plan states "Once the Final Permit is issued by TDEC, Kilgore will implement partial closure by decontamination, removal, and disposal of the existing HWOBA burn pans. These closure activities will be sequenced to accommodate construction of new HWOBUs (concrete containment pads and burn pans)."

The Plan must address closure of hazardous waste open burn units (HWOBUs) that are in place at the time the permit is issued. There are currently 20-25 HWOBUs in the hazardous waste open burn area (HWOBA).

The Plan must address whether each existing HWOBUs will be replaced or decommissioned. If decommissioned, the Plan must address the HWOBUs associated concrete pad and potentially contaminated soil surrounding the HWOBUs. If a specific HWOBUs is replaced, the Plan must provide a schedule for replacing that specific HWOBUs and whether the existing concrete pad will be used in the same capacity. The Plan must address waste characterization of the concrete pads if they are to be disposed of.

The Plan addresses closure of 10 newly proposed HWOBUs, but does not provide a schedule for closure of the existing HWOBUs or a detailed description of how existing HWOBUs will be replaced. Additionally, the Plan must address waste characterization of the concrete pads at closure.

The Plan must address vertical extent of potentially contaminated soil in addition to areal extent. The Plan makes no provisions for QA/QC samples.

- c. Based upon the planned closed scenario or schedule of closure and installation of pans, provide the maximum number of pans in existence and the effect on the total maximum cost.

Response: Revised Sections D-10 and D-11 provide the information for the proposed HWOBUs and the existing, interim status HWOBUs, respectively.

Revised Section I-1(a) discusses the partial closure activities of the existing interim status HWOBUs. Revised Section I-1(b) discusses the final closure activities of the HWOBA. The costs are discussed in Section I-4(a) for the existing interim status HWOBUs. Final closure costs are discussed in Section I-4(b). Please note that the financial assurance mechanism revision to match the estimated partial and final closure costs will occur in July 2015, upon the renewal of the current letter of credit.

- 6. Site History, Page B-4, last paragraph states that in 2008 a Corrective Measures Study (CMS) was completed that identified monitoring only as the corrective measures alternative that had the best potential to achieve the remedial goals for the site.

A Corrective Measure Study (CMS) was submitted by Kilgore in 2008. The Division submitted comments on August 29, 2008 but did not approve the monitoring only remedy

as proposed. Kilgore did not respond to these comments, therefore the monitoring only remedy is not approved as the final remedial action for the site.

Response: Agree. This issue will be addressed with an updated CMS. References to monitoring only have been removed.

7. Appendix B-3, SWMU List

- a. SWMUs 1, 1a, 1b, 1c, and 1f are proposed for long term monitoring.

The long term monitoring remedy has not been approved for these SWMUs. They will require a completion of the CMS from 2008.

- b. SWMU 2 and AOC-2 current status is "closed".

Kilgore will define the term closed. If Kilgore is using the term closed to describe a No Further Action (NFA) determination for the units, Kilgore will provide the appropriate supporting documentation.

- c. SWMUs 3, 4, and 5 current status "closure proposed".

Refer to above comment.

- d. SWMUs 6, 7, 8, 9, and 11 and AOC-1 current status is NFA.

Kilgore will include supporting documentation for the NFA status.

Response: Appendix B-3 has been updated. Any SWMUs for which supporting documentation could not be found will be addressed with an updated CMS.

- 8.** B-2(a), Surface Waters, Page B-5 lists Mill Creek as near the facility and refers to Figure B-1. Label Mill Creek on Figure B-1.

Response: Mill Creek has been added to the figures. See Section B.

- 9.** C-6 Sampling and Analysis Plan for Groundwater Detection, Groundwater Compliance, and Closure Activities at the HWOBA, page C-10.

Kilgore will submit, as part of the permit application, a groundwater sampling and analysis plan. In addition, Kilgore is required to submit a Monitoring Well Plugging and Abandonment Plan as part of the permit application.

Response: A stand alone Sampling and Analysis Plan (SAP) is in Appendix C-4. Attachments 1 and 2 of the SAP are The Well Inspection and Maintenance Plan and The Well Closure Plan, respectively.

10. E-1, Existing Interim Status Monitoring Data, Page E-2, first paragraph states that Kilgore does not currently operate a land treatment unit.

Comment: This permit is being issued for a land treatment unit. Kilgore will remove this statement from the application.

Response: This comment has been removed.

11. E-5(a), Description of Monitoring Wells, Page E-4, first paragraph Kilgore proposes to use wells 39, 40, 41, and 42 as point of compliance wells. These wells are located on the property boundary. Kilgore is required to use the monitoring wells that are closer to the treatment unit and within the property boundary such as MW-4, -28, -29, and -30.

Response: Section E has been updated to reflect a change in monitoring wells to MW-4, 28, 29, and 30.

The second sentence states that two up gradient monitoring wells will be installed for the unit.

Kilgore will include a justification explaining why two new background wells are necessary for the unit.

Response: Section E has been updated to state that only one up gradient well will be installed.

Construction for the proposed background wells includes using 20 foot well screens.

Ten foot screens are normally the maximum length recommended by EPA guidance. Kilgore is required to use ten foot well screens for any new monitoring wells constructed at the unit.

Response: Section E has been updated to state that ten foot well screens will be used for new monitoring wells constructed at the HWOBA.

Kilgore will include monitoring well construction data presented on a table for existing and proposed wells for the monitoring system.

Response: All information readily available on the wells has been included in the permit application in Section E.

12. E-7(a)(3) List of Hazardous Constituents to be Monitored in a Compliance Program

Kilgore will add perchlorate and white phosphorus to the analytical list. If the two constituents are not detected during groundwater monitoring, Kilgore may request they be removed from the sampling program.

Response: Ammonium perchlorate has been added to the analytical list. Kilgore has never used white phosphorus. However soil tests for white phosphorus in the PPE area and the Marine Marker area are scheduled for May 27, 2015 to confirm that this is not a constituent in soils.

13. E-7(a)(5), Detailed Plans for an Engineering Report Describing GW Monitoring System, Page E-8, second paragraph.

Please review above comments concerning point of compliance wells.

Response: See response to above comments.

14. E-8(d)(3) Monitoring Well Data and Statistical Analytical Procedures, page E-15,

If Kilgore uses the proposed wells as point of compliance wells and there is a statistically significant exceedance, the plume will already have migrated past the property boundary. Kilgore is required to move the point of compliance wells from the property boundary.

Response: See response to comment 11.

15. F-2 Inspection Schedule

Include in this section a schedule for inspecting monitoring wells

Response: The monitoring well inspection plan is in Appendix F-3.

16. Appendix F-2

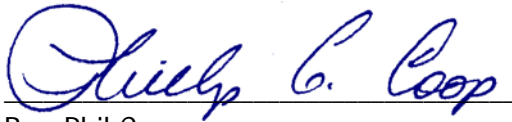
Include in this appendix an inspection checklist for the monitoring wells.

Response: The monitoring well inspection plan is in Appendix F-3.

If you have any questions or need additional information, please feel free contact us at (901) 372-7962.

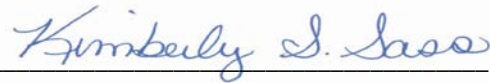
Sincerely,

EnSafe Inc.



By: Phil Coop

Senior Project Manager



By: Kimberly S. Sass, EI, CHMM

**KILGORE FLARES COMPANY, LLC
RCRA PART B PERMIT APPLICATION
SUBPART X, MISCELLANEOUS UNIT TREATMENT FACILITY**

**Volume 1 of 2
Sections A to C**

Prepared for:



**Kilgore Flares Company, LLC
Toone, Tennessee 38381**

and



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Revision: 9

May 2015

**KILGORE FLARES COMPANY, LLC
RCRA PART B PERMIT APPLICATION
SUBPART X, MISCELLANEOUS UNIT TREATMENT FACILITY**

Volume 2 of 2
Sections D to L

Prepared for:



Kilgore Flares Company, LLC
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and



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LIST OF ACRONYMS AND ABBREVIATIONS

AAQS	Ambient Air Quality Standards
AOC	Area of Concern
bgs	below ground surface
CaCO ₃	calcium bicarbonate
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CMS	Corrective Measures Study
COC	contaminant of concern
CPR	Cardiovascular Pulmonary Resuscitation
CRA	Conestoga Rovers and Associates
DAPC	Division of Air Pollution Control
DCE	dichloroethene
DoD	Department of Defense
DOT	Department of Transportation
DSWM	Division of Solid Waste Management
GC/MS	Gas Chromatography/Mass Spectrophotometry
GED	General Education Degree
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high-density polyethylene
HWAA	Hazardous Waste Accumulation Area
HWOBA	Hazardous Waste Open Burn Area
HWOBU	Hazardous Waste Open Burn Unit
HxCDD	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
ICP	inductively coupled source plasma emission spectroscopy
Kilgore	Kilgore Flares Company, LLC
LCS/LCSD	laboratory control sample/laboratory control sample duplicates
LDR	Land Disposal Restrictions
MDL	method detection limit
mg/L	milligrams per liter
mph	miles per hour
MS/MSD	matrix spike/matrix spike duplicate
NAAQS	National Ambient Air Quality Standards
NPDES	National Pollutant Discharge Elimination System
OCDD	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin
OCDF	1,2,3,4,6,7,8,9-Octachlorodibenzofuran
ORP	oxygen-reduction potential

PPE	Personal Protective Equipment
PQL	practical quantitation limit
PWS	Public Water Supply
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylene trinitramine
RFA	Resource Conservation and Recovery Act Facility Assessment
RFI	Resource Conservation and Recovery Act Facility Investigation
SAP	Sampling and Analysis Plan
SDS	Safety Data Sheet
SWMU	Solid Waste Management Unit
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TEMA	Tennessee Emergency Management Agency
THWMR	Tennessee Hazardous Waste Management Regulations
TMSP	Tennessee Storm Water Multi-Sector General Permit
TOC	total organic carbon
TTF	Test and Treatment Facility
U.S.C.	United States Code
U.S. EPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
WAP	Waste Analysis Plan
WI	Work Instruction

<p>SEND COMPLETED FORM TO: The Appropriate State or Regional Office.</p>	<p>United States Environmental Protection Agency RCRA SUBTITLE C SITE IDENTIFICATION FORM</p>		
<p>1. Reason for Submittal</p> <p>MARK ALL BOX(ES) THAT APPLY</p>	<p>Reason for Submittal:</p> <p><input type="checkbox"/> To provide an Initial Notification (first time submitting site identification information / to obtain an EPA ID number for this location)</p> <p><input type="checkbox"/> To provide a Subsequent Notification (to update site identification information for this location)</p> <p><input type="checkbox"/> As a component of a First RCRA Hazardous Waste Part A Permit Application</p> <p><input type="checkbox"/> As a component of a Revised RCRA Hazardous Waste Part A Permit Application (Amendment # _____)</p> <p><input type="checkbox"/> As a component of the Hazardous Waste Report (If marked, see sub-bullet below)</p> <p><input type="checkbox"/> Site was a TSD facility and/or generator of >1,000 kg of hazardous waste, >1 kg of acute hazardous waste, or >100 kg of acute hazardous waste spill cleanup in one or more months of the report year (or State equivalent LQG regulations)</p>		
<p>2. Site EPA ID Number</p>	<p>EPA ID Number <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p>		
<p>3. Site Name</p>	<p>Name: <input type="text"/></p>		
<p>4. Site Location Information</p>	<p>Street Address: <input type="text"/></p>		
	<p>City, Town, or Village: <input type="text"/></p>	<p>County: <input type="text"/></p>	
	<p>State: <input type="text"/></p>	<p>Country: <input type="text"/></p>	<p>Zip Code: <input type="text"/></p>
<p>5. Site Land Type</p>	<p><input type="checkbox"/> Private <input type="checkbox"/> County <input type="checkbox"/> District <input type="checkbox"/> Federal <input type="checkbox"/> Tribal <input type="checkbox"/> Municipal <input type="checkbox"/> State <input type="checkbox"/> Other</p>		
<p>6. NAICS Code(s) for the Site (at least 5-digit codes)</p>	<p>A. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p>	<p>C. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p>	
	<p>B. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p>	<p>D. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p>	
<p>7. Site Mailing Address</p>	<p>Street or P.O. Box: <input type="text"/></p>		
	<p>City, Town, or Village: <input type="text"/></p>		
	<p>State: <input type="text"/></p>	<p>Country: <input type="text"/></p>	<p>Zip Code: <input type="text"/></p>
<p>8. Site Contact Person</p>	<p>First Name: <input type="text"/></p>		<p>MI: <input type="text"/> Last: <input type="text"/></p>
	<p>Title: <input type="text"/></p>		
	<p>Street or P.O. Box: <input type="text"/></p>		
	<p>City, Town or Village: <input type="text"/></p>		
	<p>State: <input type="text"/></p>	<p>Country: <input type="text"/></p>	<p>Zip Code: <input type="text"/></p>
	<p>Email: <input type="text"/></p>		
	<p>Phone: <input type="text"/></p>	<p>Ext.: <input type="text"/></p>	<p>Fax: <input type="text"/></p>
<p>9. Legal Owner and Operator of the Site</p>	<p>A. Name of Site's Legal Owner: <input type="text"/></p>		<p>Date Became Owner: <input type="text"/></p>
	<p>Owner Type: <input type="checkbox"/> Private <input type="checkbox"/> County <input type="checkbox"/> District <input type="checkbox"/> Federal <input type="checkbox"/> Tribal <input type="checkbox"/> Municipal <input type="checkbox"/> State <input type="checkbox"/> Other</p>		
	<p>Street or P.O. Box: <input type="text"/></p>		
	<p>City, Town, or Village: <input type="text"/></p>		<p>Phone: <input type="text"/></p>
	<p>State: <input type="text"/></p>	<p>Country: <input type="text"/></p>	<p>Zip Code: <input type="text"/></p>
	<p>B. Name of Site's Operator: <input type="text"/></p>		<p>Date Became Operator: <input type="text"/></p>
	<p>Operator Type: <input type="checkbox"/> Private <input type="checkbox"/> County <input type="checkbox"/> District <input type="checkbox"/> Federal <input type="checkbox"/> Tribal <input type="checkbox"/> Municipal <input type="checkbox"/> State <input type="checkbox"/> Other</p>		

10. Type of Regulated Waste Activity (at your site)
 Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

A. Hazardous Waste Activities; Complete all parts 1-10.

- Y N **1. Generator of Hazardous Waste**
 If "Yes," mark only one of the following – a, b, or c.
- a. LQG: Generates, in any calendar month, 1,000 kg/mo (2,200 lbs/mo.) or more of hazardous waste; or Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lbs/mo) of acute hazardous waste; or Generates, in any calendar month, or accumulates at any time, more than 100 kg/mo (220 lbs/mo) of acute hazardous spill cleanup material.
- b. SQG: 100 to 1,000 kg/mo (220 – 2,200 lbs/mo) of non-acute hazardous waste.
- c. CESQG: Less than 100 kg/mo (220 lbs/mo) of non-acute hazardous waste.
- If "Yes" above, indicate other generator activities in 2-10.

- Y N **2. Short-Term Generator** (generate from a short-term or one-time event and not from on-going processes). If "Yes," provide an explanation in the Comments section.

- Y N **3. United States Importer of Hazardous Waste**

- Y N **4. Mixed Waste (hazardous and radioactive) Generator**

- Y N **5. Transporter of Hazardous Waste**
 If "Yes," mark all that apply.
- a. Transporter
- b. Transfer Facility (at your site)

- Y N **6. Treater, Storer, or Disposer of Hazardous Waste** Note: A hazardous waste Part B permit is required for these activities.

- Y N **7. Recycler of Hazardous Waste**

- Y N **8. Exempt Boiler and/or Industrial Furnace**
 If "Yes," mark all that apply.
- a. Small Quantity On-site Burner Exemption
- b. Smelting, Melting, and Refining Furnace Exemption

- Y N **9. Underground Injection Control**

- Y N **10. Receives Hazardous Waste from Off-site**

B. Universal Waste Activities; Complete all parts 1-2.

- Y N **1. Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more) [refer to your State regulations to determine what is regulated]. Indicate types of universal waste managed at your site. If "Yes," mark all that apply.**
- a. Batteries
- b. Pesticides
- c. Mercury containing equipment
- d. Lamps
- e. Other (specify) _____
- f. Other (specify) _____
- g. Other (specify) _____

- Y N **2. Destination Facility for Universal Waste**
 Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities; Complete all parts 1-4.

- Y N **1. Used Oil Transporter**
 If "Yes," mark all that apply.
- a. Transporter
- b. Transfer Facility (at your site)

- Y N **2. Used Oil Processor and/or Re-refiner**
 If "Yes," mark all that apply.
- a. Processor
- b. Re-refiner

- Y N **3. Off-Specification Used Oil Burner**

- Y N **4. Used Oil Fuel Marketer**
 If "Yes," mark all that apply.
- a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner
- b. Marketer Who First Claims the Used Oil Meets the Specifications

D. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR Part 262 Subpart K

❖ You can ONLY Opt into Subpart K if:

- you are at least one of the following: a college or university; a teaching hospital that is owned by or has a formal affiliation agreement with a college or university; or a non-profit research institute that is owned by or has a formal affiliation agreement with a college or university; AND
- you have checked with your State to determine if 40 CFR Part 262 Subpart K is effective in your state

Y N 1. Opting into or currently operating under 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories
See the item-by-item instructions for definitions of types of eligible academic entities. Mark all that apply:

- a. College or University
- b. Teaching Hospital that is owned by or has a formal written affiliation agreement with a college or university
- c. Non-profit Institute that is owned by or has a formal written affiliation agreement with a college or university

Y N 2. Withdrawing from 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories

11. Description of Hazardous Waste

A. Waste Codes for Federally Regulated Hazardous Wastes. Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g., D001, D003, F007, U112). Use an additional page if more spaces are needed.

B. Waste Codes for State-Regulated (i.e., non-Federal) Hazardous Wastes. Please list the waste codes of the State-Regulated hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.

12. Notification of Hazardous Secondary Material (HSM) Activity

Y N Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 261.2(a)(2)(ii), 40 CFR 261.4(a)(23), (24), or (25)?

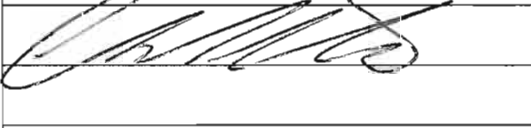
If "Yes," you must fill out the Addendum to the Site Identification Form: Notification for Managing Hazardous Secondary Material.

13. Comments

Item 4 - Site Location. Since there is not a permanent structure at the Hazardous Open Burn Area (HWOBA), 911 emergency services will not issue a street address for the HWOBA. The Test Tunnel/Marine Location Marker Test Area address is 1450 Keller Road, Toone, TN, which is approximately 2,700 feet northeast of the HWOBA.

Item 10: Eligible Academic Entities with Laboratories - This section is not applicable to Kilgore

14. Certification. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. For the RCRA Hazardous Waste Part A Permit Application, all owner(s) and operator(s) must sign (see 40 CFR 270.10(b) and 270.11).

Signature of legal owner, operator, or an authorized representative	Name and Official Title (type or print)	Date Signed (mm/dd/yyyy)
	Chuck Stout Vice President of operations and General Manager	05/28/2015

United States Environmental Protection Agency
HAZARDOUS WASTE PERMIT INFORMATION FORM

1. Facility Permit Contact	First Name:		MI:	Last Name:	
	Contact Title:				
	Phone:		Ext.:		Email:

2. Facility Permit Contact Mailing Address	Street or P.O. Box:				
	City, Town, or Village:				
	State:				
	Country:			Zip Code:	

3. Operator Mailing Address and Telephone Number	Street or P.O. Box:				
	City, Town, or Village:				
	State:			Phone:	
	Country:			Zip Code:	

4. Facility Existence Date	Facility Existence Date (mm/dd/yyyy):
-----------------------------------	---------------------------------------

5. Other Environmental Permits

A. Facility Type <i>(Enter code)</i>	B. Permit Number	C. Description

6. Nature of Business:

7. Process Codes and Design Capacities – Enter information in the Section on Form Page 3

- A. PROCESS CODE** – Enter the code from the list of process codes below that best describes each process to be used at the facility. If more lines are needed, attach a separate sheet of paper with the additional information. For “other” processes (i.e., D99, S99, T04 and X99), describe the process (including its design capacity) in the space provided in Item 8.
- B. PROCESS DESIGN CAPACITY** – For each code entered in Item 7.A; enter the capacity of the process.
1. **AMOUNT** – Enter the amount. In a case where design capacity is not applicable (such as in a closure/post-closure or enforcement action) enter the total amount of waste for that process.
 2. **UNIT OF MEASURE** – For each amount entered in Item 7.B(1), enter the code in Item 7.B(2) from the list of unit of measure codes below that describes the unit of measure used. Select only from the units of measure in this list.
- C. PROCESS TOTAL NUMBER OF UNITS** – Enter the total number of units for each corresponding process code.

Process Code	Process	Appropriate Unit of Measure for Process Design Capacity	Process Code	Process	Appropriate Unit of Measure for Process Design Capacity
Disposal			Treatment (Continued)		
D79	Underground Injection Well Disposal	Gallons; Liters; Gallons Per Day; or Liters Per Day	T81	Cement Kiln	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; BTU Per Hour; Liters Per Hour; Kilograms Per Hour; or Million BTU Per Hour
D80	Landfill	Acre-feet; Hectares-meter; Acres; Cubic Meters; Hectares; Cubic Yards	T82	Lime Kiln	
D81	Land Treatment	Acres or Hectares	T83	Aggregate Kiln	
D82	Ocean Disposal	Gallons Per Day or Liters Per Day	T84	Phosphate Kiln	
D83	Surface Impoundment Disposal	Gallons; Liters; Cubic Meters; or Cubic Yards	T85	Coke Oven	
D99	Other Disposal	Any Unit of Measure Listed Below	T86	Blast Furnace	
Storage			T87	Smelting, Melting, or Refining Furnace	
S01	Container	Gallons; Liters; Cubic Meters; or Cubic Yards	T88	Titanium Dioxide Chloride Oxidation Reactor	
S02	Tank Storage	Gallons; Liters; Cubic Meters; or Cubic Yards	T89	Methane Reforming Furnace	
S03	Waste Pile	Cubic Yards or Cubic Meters	T90	Pulping Liquor Recovery Furnace	
S04	Surface Impoundment	Gallons; Liters; Cubic Meters; or Cubic Yards	T91	Combustion Device Used in the Recovery of Sulfur Values from Spent Sulfuric Acid	
S05	Drip Pad	Gallons; Liters; Cubic Meters; Hectares; or Cubic Yards	T92	Halogen Acid Furnaces	
S06	Containment Building Storage	Cubic Yards or Cubic Meters	T93	Other Industrial Furnaces Listed in 40 CFR 260.10	
S99	Other Storage	Any Unit of Measure Listed Below	T94	Containment Building Treatment	Cubic Yards; Cubic Meters; Short Tons Per Hour; Gallons Per Hour; Liters Per Hour; BTU Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Metric Tons Per Day; Gallons Per Day; Liters Per Day; Metric Tons Per Hour; or Million BTU Per Hour
Treatment			Miscellaneous (Subpart X)		
T01	Tank Treatment	Gallons Per Day; Liters Per Day	X01	Open Burning/Open Detonation	Any Unit of Measure Listed Below
T02	Surface Impoundment	Gallons Per Day; Liters Per Day	X02	Mechanical Processing	Short Tons Per Hour; Metric Tons Per Hour; Short Tons Per Day; Metric Tons Per Day; Pounds Per Hour; Kilograms Per Hour; Gallons Per Hour; Liters Per Hour; or Gallons Per Day
T03	Incinerator	Short Tons Per Hour; Metric Tons Per Hour; Gallons Per Hour; Liters Per Hour; BTUs Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Gallons Per Day; Metric Tons Per Hour; or Million BTU Per Hour	X03	Thermal Unit	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; BTU Per Hour; or Million BTU Per Hour
T04	Other Treatment	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Short Tons Per Day; BTUs Per Hour; Gallons Per Day; Liters Per Hour; or Million BTU Per Hour	X04	Geologic Repository	Cubic Yards; Cubic Meters; Acre-feet; Hectare-meter; Gallons; or Liters
T80	Boiler	Gallons; Liters; Gallons Per Hour; Liters Per Hour; BTUs Per Hour; or Million BTU Per Hour	X99	Other Subpart X	Any Unit of Measure Listed Below

Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code
Gallons	G	Short Tons Per Hour	D
Gallons Per Hour	E	Short Tons Per Day	N
Gallons Per Day	U	Metric Tons Per Hour	W
Liters	L	Metric Tons Per Day	S
Liters Per Hour	H	Pounds Per Hour	J
Liters Per Day	V	Kilograms Per Hour	X
		Million BTU Per Hour	X
		Cubic Yards	Y
		Cubic Meters	C
		Acres	B
		Acre-feet	A
		Hectares	Q
		Hectare-meter	F
		BTU Per Hour	I

7. Process Codes and Design Capacities (Continued)

EXAMPLE FOR COMPLETING Item 7 (shown in line number X-1 below): A facility has a storage tank, which can hold 533.788 gallons.

Line Number	A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY		C. Process Total Number of Units	For Official Use Only					
				(1) Amount (Specify)	(2) Unit of Measure							
X 1	S	0	2	533.788	G	001						
1												
2												
3												
4												
5												
6												
7												
8												
9												
1 0												
1 1												
1 2												
1 3												

Note: If you need to list more than 13 process codes, attach an additional sheet(s) with the information in the same format as above. Number the line sequentially, taking into account any lines that will be used for "other" process (i.e., D99, S99, T04, and X99) in Item 8.

8. Other Processes (Follow instructions from Item 7 for D99, S99, T04, and X99 process codes)

Line Number (Enter #s in sequence with Item 7)	A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY		C. Process Total Number of Units	For Official Use Only					
				(1) Amount (Specify)	(2) Unit of Measure							
X 2	T	0	4	100.00	U	001						

9. Description of Hazardous Wastes - Enter Information in the Sections on Form Page 5

- A. EPA HAZARDOUS WASTE NUMBER** – Enter the four-digit number from 40 CFR, Part 261 Subpart D of each listed hazardous waste you will handle. For hazardous wastes which are not listed in 40 CFR, Part 261 Subpart D, enter the four-digit number(s) from 40 CFR Part 261, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.
- B. ESTIMATED ANNUAL QUANTITY** – For each listed waste entered in Item 9.A, estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in Item 9.A, estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.
- C. UNIT OF MEASURE** – For each quantity entered in Item 9.B, enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure, taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed hazardous waste: For each listed hazardous waste entered in Item 9.A, select the code(s) from the list of process codes contained in Items 7.A and 8.A on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all listed hazardous wastes.

For non-listed waste: For each characteristic or toxic contaminant entered in Item 9.A, select the code(s) from the list of process codes contained in Items 7.A and 8.A on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

NOTE: THREE SPACES ARE PROVIDED FOR ENTERING PROCESS CODES. IF MORE ARE NEEDED:

1. Enter the first two as described above.
2. Enter "000" in the extreme right box of Item 9.D(1).
3. Use additional sheet, enter line number from previous sheet, and enter additional code(s) in Item 9.E.

2. PROCESS DESCRIPTION: If code is not listed for a process that will be used, describe the process in Item 9.D(2) or in Item 9.E(2).

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER – Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in Item 9.A. On the same line complete Items 9.B, 9.C, and 9.D by estimating the total annual quantity of the waste and describing all the processes to be used to store, treat, and/or dispose of the waste.
2. In Item 9.A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In Item 9.D.2 on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING Item 9 (shown in line numbers X-1, X-2, X-3, and X-4 below) – A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operations. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES													
				(1) PROCESS CODES (Enter Code)										(2) PROCESS DESCRIPTION (If code is not entered in 9.D(1))			
X	1	K 0 5 4	P	T	0	3	D	8	0								
X	2	D 0 0 2	P	T	0	3	D	8	0								
X	3	D 0 0 1	P	T	0	3	D	8	0								
X	4	D 0 0 2															Included With Above

9. Description of Hazardous Wastes (Continued. Use additional sheet(s) as necessary; number pages as 5a, etc.)

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES											
				(1) PROCESS CODES (Enter Code)					(2) PROCESS DESCRIPTION (If code is not entered in 9.D(1))						
1															
2															
3															
4															
5															
6															
7															
8															
9															
1	0														
1	1														
1	2														
1	3														
1	4														
1	5														
1	6														
1	7														
1	8														
1	9														
2	0														
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2	8														
2	9														
3	0														
3	1														
3	2														
3	3														
3	4														
3	5														
3	6														

10. Map

Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements.

11. Facility Drawing

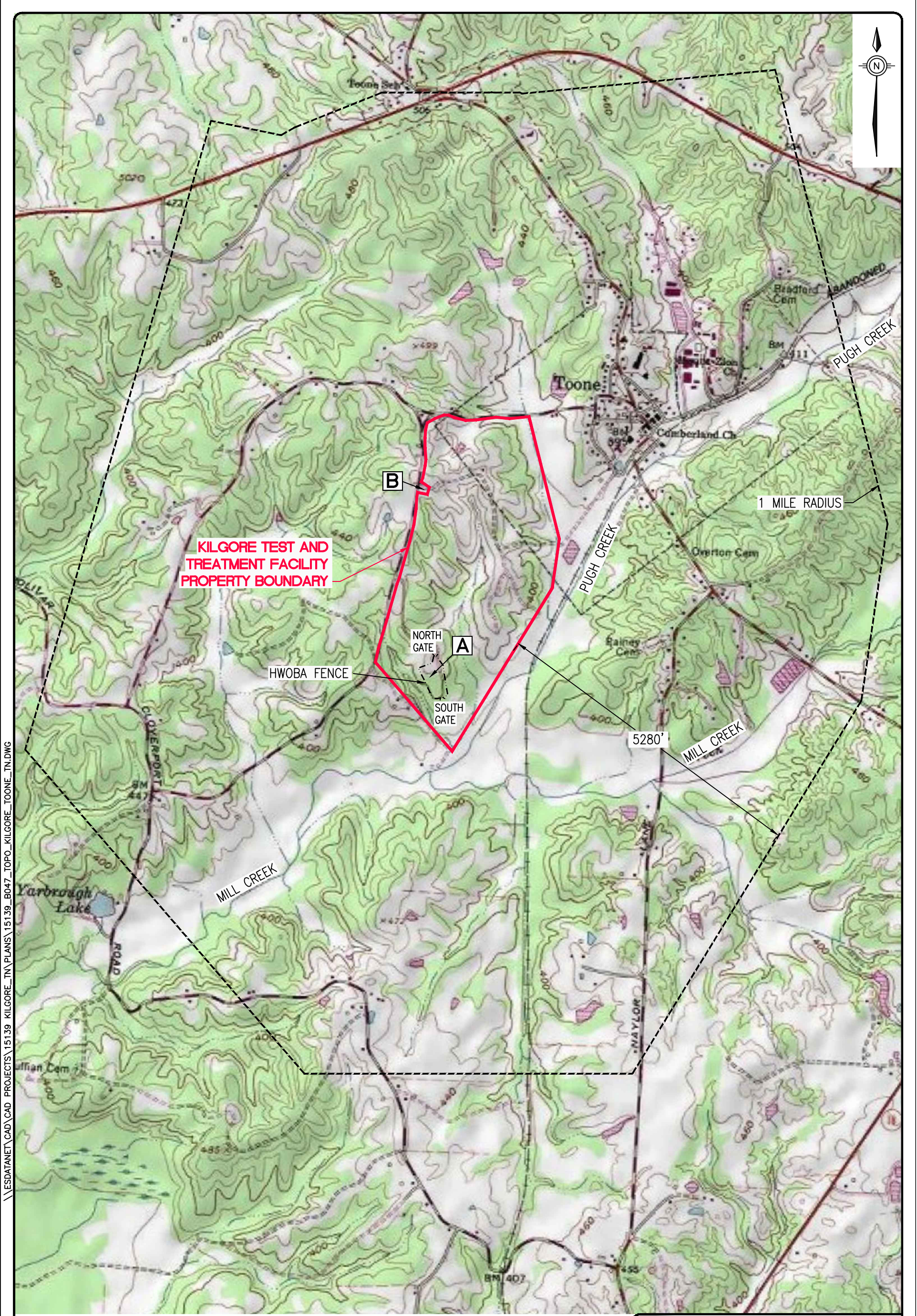
All existing facilities must include a scale drawing of the facility (see instructions for more detail).

12. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas (see instructions for more detail).

13. Comments

Appendix A-1
Figures

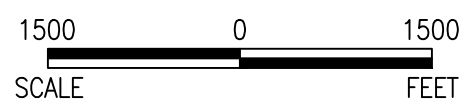


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USA Topo Maps - Copyright:© 2013 National Geographic Society, i-cubed
Boliver East, Tennessee Quadrangle

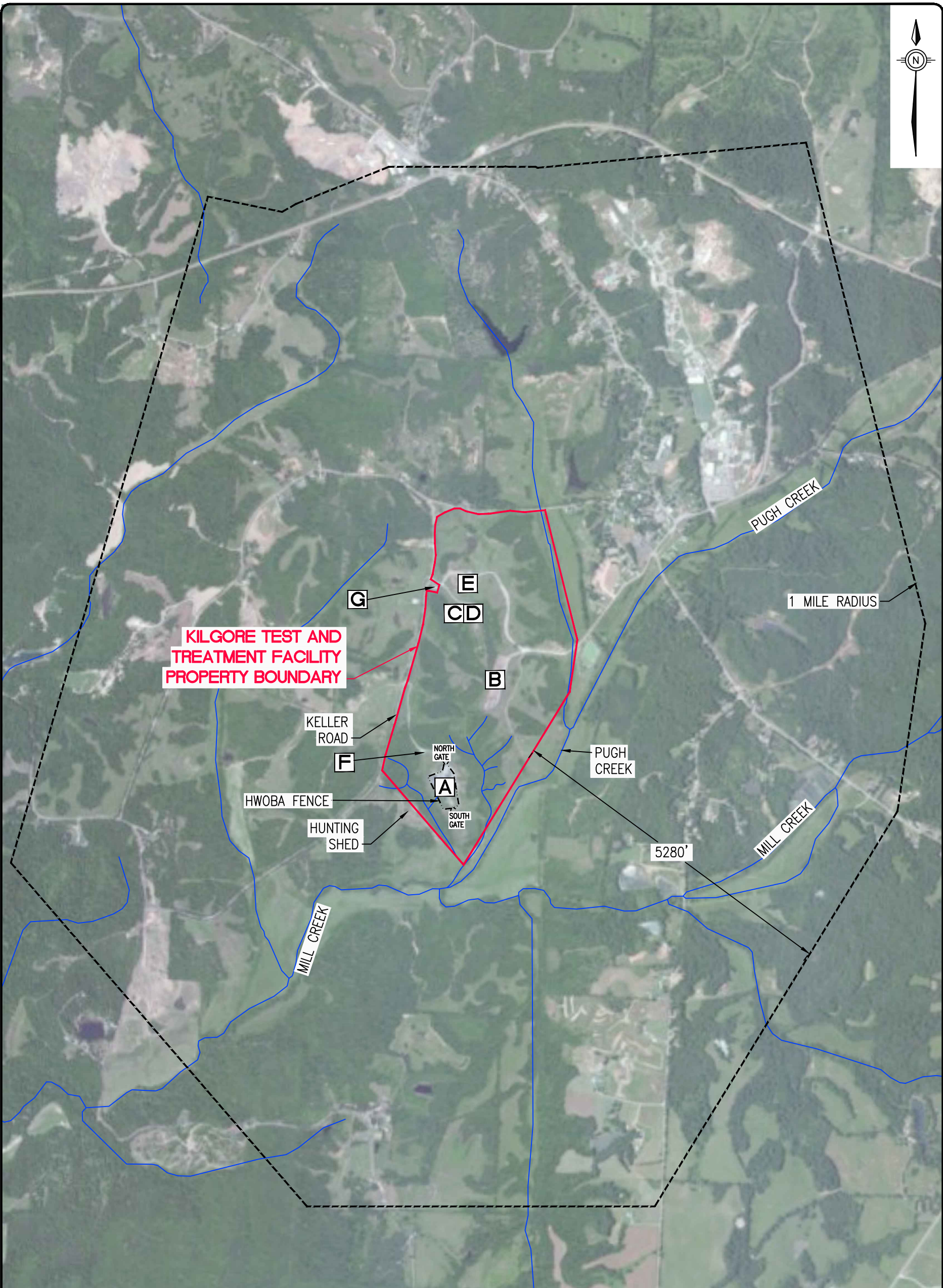
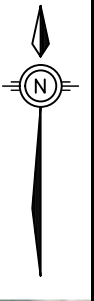
FIGURE A-1
TOPOGRAPHIC MAP
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

- LEGEND
- A** - HAZARDOUS WASTE OPEN BURN AREA (HWOPA)
 - B** - TOWN OF TOONE WATER TOWER



REQUESTED BY: K.SASS
DRAWN BY: BRONSON
DWG DATE: 05/09/15
DWG NO: 15139_B047





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World_Imagery - Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

LEGEND

- A** - HAZARDOUS WASTE OPEN BURN AREA (HWOBA)
- B** - PPE TEST AREA
- C** - TEST TUNNEL
- D** - MARINE LOCATION MARKER TEST AREA
- E** - POLE BARN TEST AREA
- F** - HWOBA OBSERVATION AREA
- G** - TOWN OF TOONE WATER TOWER

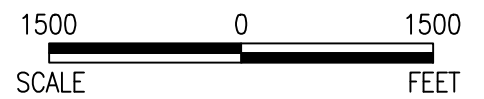
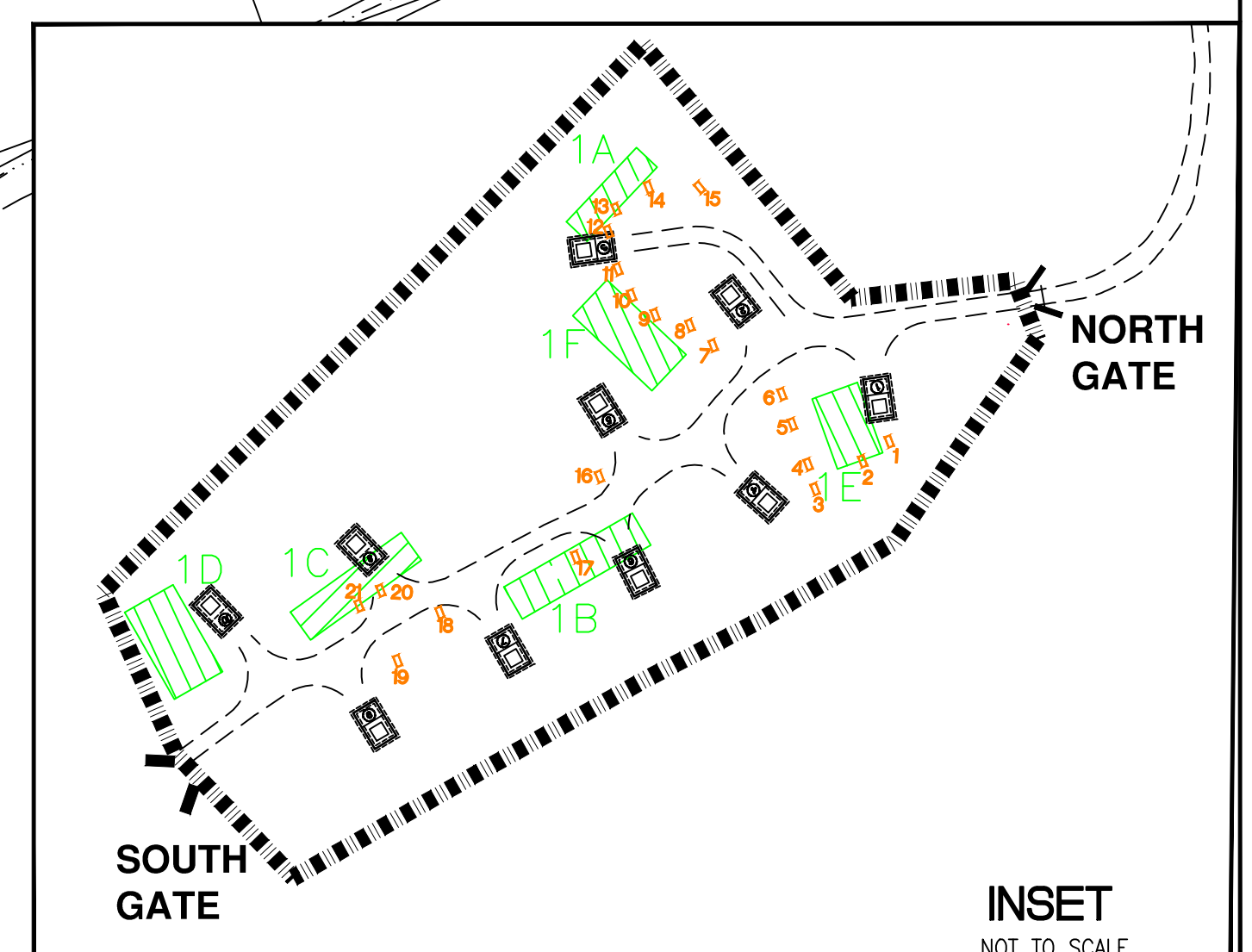
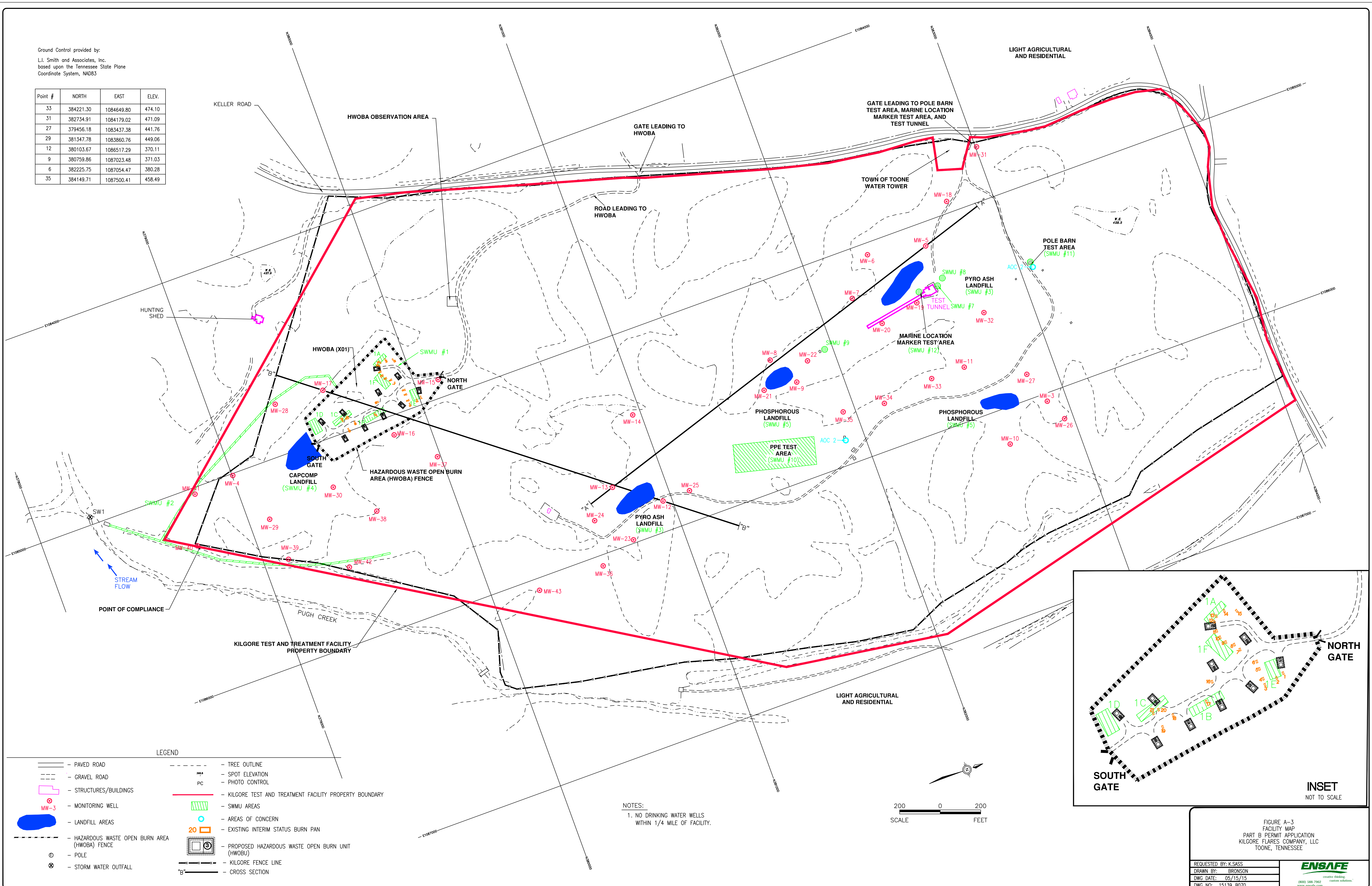


FIGURE A-2
AERIAL MAP
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: K.SASS	
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B067	

Ground Control provided by:
 L.I. Smith and Associates, Inc.
 based upon the Tennessee State Plane
 Coordinate System, NAD83

Point #	NORTH	EAST	ELEV.
33	384221.30	1084649.80	474.10
31	382734.91	1084179.02	471.09
27	379456.18	1083437.38	441.76
29	381347.78	1083860.76	449.06
12	380103.67	1086517.29	370.11
9	380759.86	1087023.46	371.03
6	382225.75	1087054.47	380.28
35	384149.71	1087500.41	458.49



LEGEND

- PAVED ROAD
- GRAVEL ROAD
- STRUCTURES/BUILDINGS
- MONITORING WELL
- LANDFILL AREAS
- HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
- POLE
- STORM WATER OUTFALL
- TREE OUTLINE
- SPOT ELEVATION
- PHOTO CONTROL
- KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
- SWMU AREAS
- AREAS OF CONCERN
- EXISTING INTERIM STATUS BURN PAN
- PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
- KILGORE FENCE LINE
- CROSS SECTION

NOTES:
 1. NO DRINKING WATER WELLS WITHIN 1/4 MILE OF FACILITY.

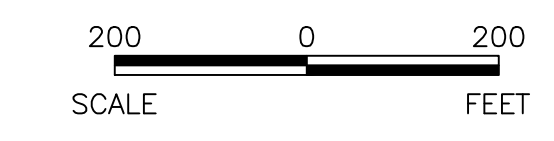


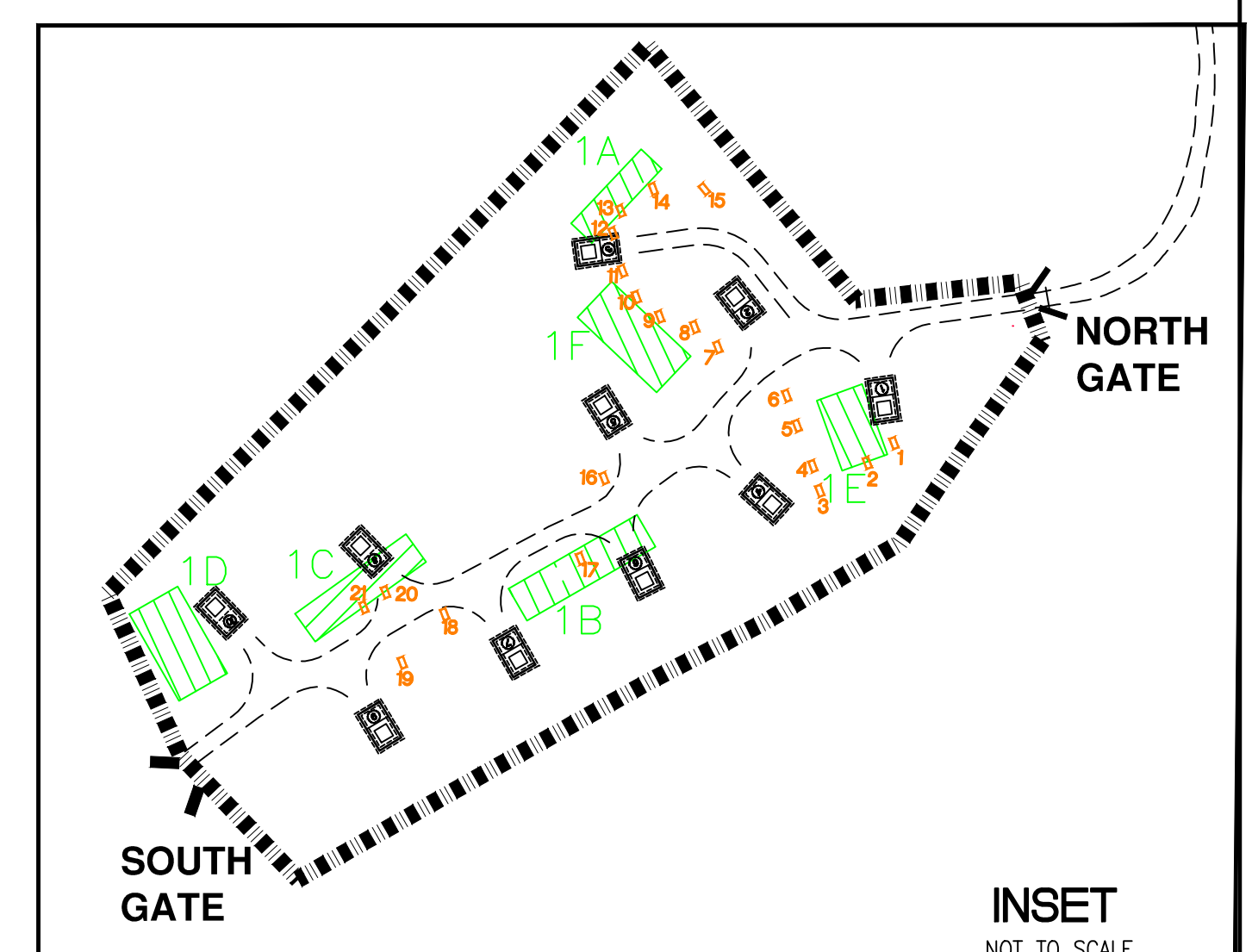
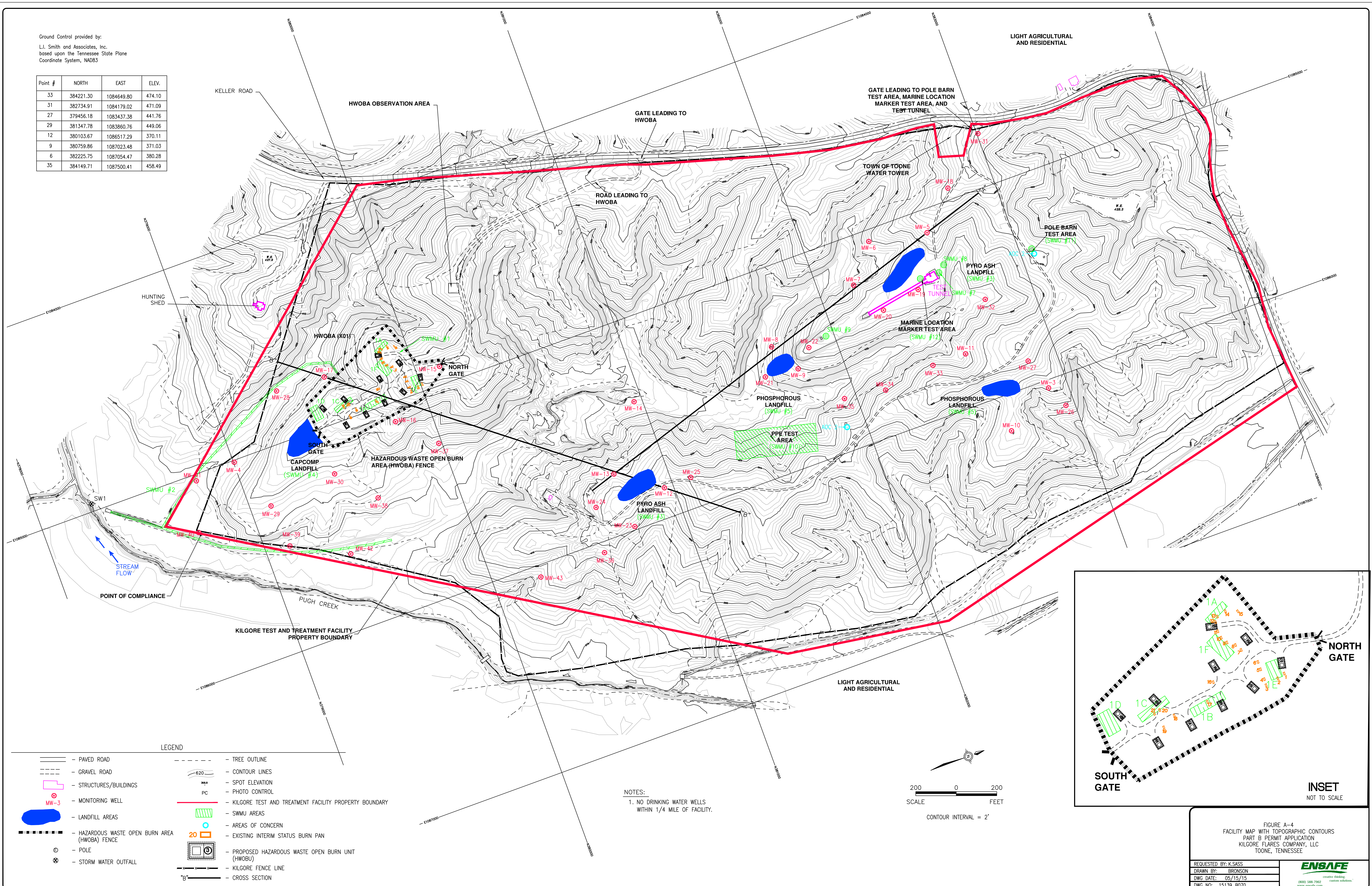
FIGURE A-3
 FACILITY MAP
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY: K.SASS
 DRAWN BY: BRONSON
 DWG DATE: 05/15/15
 DWG NO: 15139_B070

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Ground Control provided by:
L.I. Smith and Associates, Inc.
based upon the Tennessee State Plane
Coordinate System, NAD83

Point #	NORTH	EAST	ELEV.
33	384221.30	1084649.80	474.10
31	382734.91	1084179.02	471.09
27	379456.18	1083437.38	441.76
29	381347.78	1083860.76	449.06
12	380103.67	1086517.29	370.11
9	380759.86	1087023.48	371.03
6	382225.75	1087054.47	380.28
35	384149.71	1087500.41	458.49



- LEGEND**
- PAVED ROAD
 - GRAVEL ROAD
 - STRUCTURES/BUILDINGS
 - MONITORING WELL
 - LANDFILL AREAS
 - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
 - POLE
 - STORM WATER OUTFALL
 - TREE OUTLINE
 - CONTOUR LINES
 - SPOT ELEVATION
 - PHOTO CONTROL
 - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
 - SWMU AREAS
 - AREAS OF CONCERN
 - EXISTING INTERIM STATUS BURN PAN
 - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
 - KILGORE FENCE LINE
 - CROSS SECTION

NOTES:
1. NO DRINKING WATER WELLS WITHIN 1/4 MILE OF FACILITY.

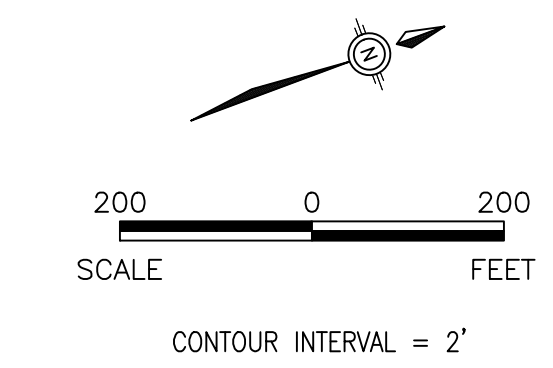


FIGURE A-4
FACILITY MAP WITH TOPOGRAPHIC CONTOURS
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: K.SASS
DRAWN BY: BRONSON
DWG DATE: 05/15/15
DWG NO: 15139_B070

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Appendix A-2
Photographs

**Kilgore Flares Company, LLC
Part B Permit Application
Revision 9 – May 2015**



Photo 1: Looking south at the warning sign posted on the North Gate entrance to the Hazardous Waste Open Burn Area. (Photo taken 2-24-2014)



Photo 2: Looking south from the North Gate entrance to the Hazardous Waste Open Burn Area at a trailer used to haul 55-gallon drums of treated ash to one of the Kilgore Test and Treatment Facility landfills. (Photo taken 1-22-2014)

**Kilgore Flares Company, LLC
Part B Permit Application
Revision 9 – May 2015**



Photo 3: Looking east at waste magnesium pyrotechnic burn pans beyond which is the Hazardous Waste Open Burn Area Fence and east-bordering perimeter access road. (Photo taken 1-22-2014)



Photo 4: Looking west at waste magnesium pyrotechnic burn pans within the northwest portion of the Hazardous Waste Open Burn Area. (Photo taken 1-22-2014)

**Kilgore Flares Company, LLC
Part B Permit Application
Revision 9 – May 2015**



Photo 5: Picture taken looking south toward the central portion of the Hazardous Waste Open Burn Area near waste phosphorous pyrotechnic burn pans. (Photo taken 1-22-2014)



Photo 6: Picture taken looking south along the newly constructed road at the Hazardous Waste Open Burn Area south gate. (Photo taken 1-22-2014)

SECTION B FACILITY DESCRIPTION

B-1 GENERAL DESCRIPTION

This application was prepared in accordance with Title 40 Code of Federal Regulations (CFR) 264 Subpart X (Miscellaneous Units), appropriate sections of 40 CFR 270, and Tennessee Hazardous Waste Management Regulations (THWMR) 0400-12-01-.07(5).

B-1(a) Site Location

Kilgore Flares Company, LLC (Kilgore), is in northern Hardeman County, Tennessee, in the Town of Toone. Kilgore is comprised of the main production plant and the approximately 240-acre Test and Treatment Facility (TTF) that includes the 5-acre Hazardous Waste Open Burn Area (HWOBA), the Personal Protective Equipment (PPE) Test Area, the Test Tunnel/Marine Location Marker Test Area, and the Pole Barn Test Area. The HWOBA is where the Resource Conservation and Recovery Act (RCRA) hazardous waste treatment operations take place. Individual burning pans within the HWOBA are referred to as Hazardous Waste Open Burn Units (HWOBUs). Figure B-1 is a topographic map of the TTF and surrounding area. Figure B-2 is an aerial view of the TTF and surrounding area. All figures for Section B are in Appendix B-1.

The site address of the HWOBA is:
Kilgore Flares Company, LLC
Keller Road
Toone, Tennessee 38381

The mailing address of Kilgore is:
Kilgore Flares Company, LLC
155 Kilgore Drive
Toone, Tennessee 38381

Since there is not a permanent structure at the HWOBA, 911 emergency services will not issue a street address to that location. The Test Tunnel/Marine Location Marker Test Area physical address is 1450 Keller Road, which is approximately 2,700 feet northeast of the HWOBA.

B-1(b) Owner/Operator

Kilgore Flares Company, LLC, is a subsidiary of Chemring Group PLC, which is located in the United Kingdom:

Chemring Group PLC
Roke Manor
Olds Salisbury Lane

Romsey
Hampshire
SO51 0ZN
Contact: Michael Flowers, Chief Executive Officer
Phone: 01489 881880

The legal owner of the land at the TTF is:
Kilgore Flares Company, LLC
155 Kilgore Drive
Toone, Tennessee 38381
Contact: Chuck Stout, Vice President of Operations/General Manager
Phone: (731) 658-5231

The contact person responsible for hazardous waste management activities at Kilgore is:

Vice President Health, Safety, and Environmental/Environmental Manager
Kilgore Flares Company, LLC
155 Kilgore Drive
Toone, Tennessee 38381
Phone: (731) 658-5231

B-1(c) Current Operations

B-1(c)(1) Main Production Plant

Kilgore manufactures pyrotechnic devices (e.g. distress signal flares, location markers, and illuminating rounds) for the U.S. Department of Defense (DoD) and commercial users at its main production plant with approximately 175 buildings spread across the entire property. Primary processes include mixing, drying, soldering, milling, extrusion, pelletization, surface coating, testing, space heating, and storage.

Hazardous waste generated at the main production plant includes scrap composition from upset conditions in the mixing/drying process, grains that do not pass quality control standards, and rags and miscellaneous materials from clean-up operations. The hazardous waste is accumulated in 30-gallon steel drums lined with conductive bags. During accumulation, diesel fuel is added to the drums to stabilize the waste. Full drums are collected and staged in covered concrete-bermed hazardous waste accumulation areas (HWAAs).

B-1(c)(2) Testing Operations

Flares are regularly burned as part of testing, research, development, and quality control operations at the following locations:

- Buildings 1, 50, and 193 at the main production plant
- Proving Grounds (including Pole Barn Test Area and Marine Location Marker Test Area)
- PPE Test Area

Hazardous waste generated the Marine Location Marker Test Area is shipped offsite for disposal and is not treated at the HWOBA.

B-1(c)(3) Hazardous Waste Open Burn Area

The only source of waste treated at the HWOBA is the hazardous waste pyrotechnics generated during the manufacturing process at Kilgore's main production plant. Unfired flares or other energetic materials, which are not normally generated at the TTF, may also be accumulated in ammunition cans and transported to the HWOBA for treatment. These wastes are considered RCRA hazardous because they meet the definition of ignitable (D001) and reactive (D003) hazardous wastes per 40 CFR Parts 261.21 and 261.23 and THWMR 0400-12-01-.02(3)(b) and (d), respectively. Some hazardous wastes generated from the manufacturing process also meet the definition of a toxicity characteristic waste for barium (D005), chromium (D007), and lead (D008), and/or may contain traces of acetone that meets the definition of the listed hazardous waste F003.

During normal operations, trained hazardous waste technicians transport the hazardous waste pyrotechnics daily in a dedicated hazardous waste pyrotechnic trailer from the main production plant to the HWOBA. Kilgore has notified as a hazardous waste transporter and all transportation operations are conducted under the main production plant's hazardous waste transporter's permit and/or identification number (U.S. Environmental Protection Agency [U.S. EPA] ID TND 00-702-0159). A copy of the current permit is in Appendix B-2.

Open burning only occurs between the hours of 9 a.m. to 2 p.m., 5 days a week. Upon issuance of the Final Part B permit by TDEC, the daily treatment capacity may not exceed 3,300 pounds of waste pyrotechnics per day. The estimated annual quantity of pyrotechnic waste generated at Kilgore's main production plant and treated at the HWOBA is 858,000 pounds, with an additional 24 pounds per year of barium (D005) and 24 pounds per year of lead (D008) wastes. These quantities are listed in the Part A Application.

B-1(c)(4) Interim Status Operations

Currently, the HWOBA houses 21 steel burn pans, which are approximately 8 feet long by 4 feet wide by 2 feet high. One to two burn pans are used per burn. The maximum amount of waste pyrotechnics treated is 1,500 pounds per day, not to exceed 7,500 pounds per week, and 390,000 pounds per year, with an additional 24 pounds per year of barium (D005) waste and 24 pounds per year of lead (D008) waste. The burn pans are situated on a gravel area. Once the hazardous waste is ready for treatment, it is placed in the steel pans and ignited (by use of newspaper and a 4- to 5-minute fuse). The waste is allowed to burn openly and completely, thereby rendering it non-ignitable and non-reactive. Ash and residue are not disturbed for 72 hours after treatment. After the 72 hours, the non-hazardous ash is containerized in steel drums and taken to the Bolivar-Hardeman County landfill for disposal under Special Waste Agreements.

The hazardous waste technicians maintain a daily log of all hazardous waste generated at the main production plant, transported from the main production plant to the HWOBA, and treated at the HWOBA. Manifests are completed each time hazardous waste is transported from the main production plant to the HWOBA.

B-1(d) Site History

Kilgore has manufactured pyrotechnic devices for the DoD and commercial users since 1962. Hazardous waste has been treated in the same manner at the 5-acre HWOBA since approximately 1989. Within the HWOBA, there may be four unlined burial pits that were used for historical burning of phosphorous waste and burial of the ash generated. The exact size and location of the burial pits has not been determined; however, it is believed that the pits were small excavations and the accumulated ash was buried in place. Figures B-3 and B-4 depict the possible locations of the four unlined burial pits which were identified as solid waste management units (SWMUs) in a September 6, 1991, *Revised RCRA Facility Assessment (RFA)* by A.T. Kearney, Inc., of Atlanta, Georgia.

The former burial pits were subsequently investigated, which included advancing soil borings, and collecting and analyzing soil samples to determine areas of contamination that would require some level of corrective action prior to construction of concrete burn pads. Although those efforts were unsuccessful in locating the pits, soil analytical data indicates any existing contamination is in a highly localized area and has not spread to adjacent areas.

In 2008, a Corrective Measures Study (CMS) was completed that identified, screened, developed, evaluated, and compared remedial action alternatives that may be required to mitigate hazards and threats to human health and the environment from soil and groundwater contamination at the SWMUs. Based on the rationale and decision factors in the CMS, the monitoring-only remedy was identified as the corrective measures alternative that had the best potential to achieve the remedial goals for this site.

Appendix B-3 summarizes information regarding the SMWUs and areas of concern (AOCs) at the TTF.

B-1(e) Wind Rose

Figure B-5 presents a wind rose for Memphis, Tennessee, generated using 2008 through 2012 meteorological data from weather station 13893 in Memphis, Tennessee. The data processed for the Memphis wind rose is raw, 1-hour data. The wind rose for Memphis is included since it is the nearest weather station to the facility that maintains long-term climatic records.

Figure B-6 presents a wind rose for Paducah, Kentucky, generated using 2008 through 2012 meteorological data from weather station 3816 in Paducah, Kentucky. The data processed for the Paducah wind rose is from processed, 1-minute data. The Paducah wind rose is included since it was used in the air dispersion modeling completed to support this Subpart X Application.

B-2 TOPOGRAPHIC MAP

Topographic maps are provided as Figures B-1, B-3, and B-4 to meet the requirements of 40 CFR 270.14(b)(19), 270.14(c),(2),(3), and (4). Figures B-3 and B-4 show the topography of the facility created from an aerial survey and tied into eight surveyed ground control points. Other maps illustrating the TTF and HWOBA in its entirety are at a scale, indicated in the legends, sufficient to allow the reviewer to identify and measure required information pertinent to this permit application.

The topographic maps show the legal boundaries of the TTF, as well as the following features.

B-2(a) Surface Waters

The only surface waters near the facility are Pugh and Mill Creeks, to the south, which flow southwest into the Hatchie River, and are designated on Figure B-1.

B-2(b) Surrounding Land Use

Land use within 1,000 feet of the TTF consists of wooded areas, undeveloped pasture, and residential. The land use surrounding the HOWBA includes the PPE Test Area, the Test Tunnel, wooded areas, and some undeveloped pastures. Figures B-2 through B-4 depict land use up to 1,000 feet surrounding the TTF.

B-2(c) Access Controls

The HOWBA is surrounded by an 8-foot-high chain-link fence supported by steel posts. Access to the HOWBA is via an aluminum fence gate (North Gate) that is 8 feet high. In addition, the surrounding property is enclosed by a 3-foot-high barbed wire gated fence with access to the HOWBA from Keller Road. Both the internal and external gates are locked when the HOWBA is not in operation. Kilgore's Environmental and Security departments control access to the HOWBA. The Testing and Security departments control access to other areas of the TTF. Only authorized personnel will be allowed access to the property. The following warning is at the gate into the HOWBA, "Dangerous Area, No Trespassing — Authorized Personnel Only; Warning — Do Not Enter; No Smoking."

Access control features are shown on Figures B-1 to B-4.

B-2(d) Injection and Withdrawal Wells

The 1999 RCRA Facility Investigation (RFI) and 2000 RFI Phase II investigated SWMUs that were identified in the 1991 RFA. The RFIs included soil and groundwater sampling within the TTF. Volatile organic compounds (VOCs) were identified in groundwater in monitoring wells downgradient (i.e., southeast) from the HOWBA. The contaminated groundwater was attributed to former burial pits, landfills, and past open burning operations in the area surrounding the HOWBA.

Kilgore performed a local reconnaissance of the rural surrounding area to determine users of groundwater immediately surrounding the TTF. Based on that reconnaissance, no injection or withdrawal wells were located within 1,000 feet of the HOWBA. An environmental database report, which mapped the nearest federal- and state-registered wells and public water supply (PWS) system wells. According to the report, there are no federal or state wells within 1 mile of the HOWBA. The nearest PWS, the Toone Water Treatment Unit and water supply wells, was mapped 1.25 miles northeast and up-gradient of the HOWBA. Copies of the 2000 and 2014 reports are in Appendix B-4.

The nearest water supply well is a residential drinking water well approximately 3,400 feet north-northwest and upgradient of the HWOBA. Other residences within 1 mile north of the HWOBA that also have drinking water wells are upgradient of the HWOBA.

B-2(e) Buildings and Other Structures

The Test Tunnel and Pole Barn Test Area are approximately 2,600 feet and 3,000 feet north-northeast of the HWOBA, respectively, and the PPE Test Area and storage shed are approximately 1,750 feet and 1,250 feet northeast of the HWOBA, respectively; all are within the TTF property boundary. The observation area from which open burning can be monitored is approximately 200 feet northwest of the HWOBA, within the TTF. A hunting shed is approximately 800 feet southwest of the HWOBA, outside the TTF property boundary.

The nearest occupied structure is a residence 3,400 feet north-northwest of the HWOBA. The nearest public road is Keller Road, which is approximately 800 feet west of the HWOBA and borders the TTF property boundary to the west. There are no passenger railroads within 1 mile of the HWOBA. The hunting shed, when occupied, is the structure with the nearest human receptor. Other public receptors are detailed in Section B-3.

The only planned structures at the HWOBA are 10 concrete pads upon which the new burn pans will be located. Each concrete pad and burn pan combination will be referred to as a HWOBU.

Figures B-3 and B-4 show all the buildings and structures within 1,000 feet of the TTF.

B-2(f) Drainage and Flood Control Barriers

Run-Off Control System

Natural surface drainage at the HWOBA is provided by the contour of the surrounding land. Precipitation runoff follows the land contours, discharging to east and west ditches that are tributaries of Pugh Creek. The storm water discharge from the HWOBA is monitored pursuant to the Tennessee Storm Water Multi-Sector General Permit (TMSP) for Sector C, Permit ID TNR050159.

The conditions of the TMSP require Kilgore to visually observe on a quarterly basis the storm water to determine color, odor, clarity, floating solids, settled solids, suspended solids, foam, and oil sheen. Kilgore continues to conduct these inspections and document conditions of the storm water.

Storm, Sanitary, and Process Sewers

No storm, sanitary, or process sewers are located at or within 1,000 feet of the HWOBA.

Loading and Unloading Areas

Hazardous waste drums are unloaded at the HWOBA adjacent to each designated burn pan. The operators manually transfer the contents of the containers into the pans, simultaneously staging the materials for treatment. Loading and unloading procedures are detailed in Section F of this permit application.

Fire Control Facilities

The transport vehicle contains water packs and a fire blanket for fire control. The vehicle is parked north of the HWOBA during treatment operations. Emergency response and fire-fighting equipment are detailed in Section F of this permit application.

Flood Control

No flood control or drainage barriers are at the HWOBA. Since the HWOBA is not in the 100-year floodplain, those types of barriers and/or structures are not required. Figure B-7 shows the 100-year floodplain, relevant to the TTF.

B-2(g) Additional Topographic Map Information

Miscellaneous Thermal Treatment Units, Property Boundaries, and Point of Compliance Location

The TTF, which includes the HWOBA, is primarily surrounded by wooded areas, undeveloped pastures, and residences. The TTF property boundary is identified on Figures B-1 through B-4.

The point of compliance, shown on Figures B-3 and B-4, is a vertical plane located downgradient of the HWOBA. The proposed groundwater monitoring system designates four monitoring wells along the point of compliance to monitor groundwater contamination downgradient of the HWOBA. Additional groundwater monitoring information is in Section E of this Application.

B-2(g)(1) Regional Geology

The major regional formations present in the Hardeman County area are (in ascending order) the Midway, Wilcox, and Claiborne Groups. The formations strike slightly east of north and dip toward the west off the flank of the Nashville Basin and Dome into the Mississippi Embayment and the

Mississippi River at a rate of 20 to 50 feet per mile. Additionally, Quaternary and Holocene deposits of alluvium, loess, and terrace sands cover the hills and stream valleys throughout the county. These deposits are mainly sand, silt, and clay and are distributed in various thicknesses depending upon the slope of the underlying surface.

Alluvium, loess, and fluvial deposits are the dominant Quaternary lithologies present across the Hardeman County area. The alluvium consists of sand, gravel, silt, and clay and is commonly 50 feet thick (Parks and Carmichael, 1990). The loess, if present, consists of windblown silt, silty clay, and minor sand, and provides a thin blanket beneath the alluvium in this area. Fluvial deposits are typically characterized by sand, gravel, minor clay, and ferruginous sandstone. Those deposits generally underlie the loess in upland areas and their thickness varies greatly due to erosion and redistribution. Erosional surfaces mark both the top and the base of the deposits at some locations.

The Gulf Coastal Plain deposits of the Tertiary Claiborne Group, Wilcox, and the Midway Formations underlie Hardeman County. The Claiborne Group consists of the Memphis Sand of western Tennessee (Parks and Carmichael, 1990). The Memphis Sand interval consists of sand, silt, clay, and minor lignite. The upper portion of the formation consists of predominantly fine-grained sand that grades into the thick coarse-grained sand intervals with various clay lenses interspersed throughout most of the unit.

The Wilcox Formation in western Tennessee, near the Mississippi River, consists of the Flour Island Formation, the Fort Pillow Sand, and the Old Breastworks Formation (Parks and Carmichael, 1990).

The Flour Island Formation is comprised of clay and silt with some sand and lignite. The Fort Pillow Sand consists of fine to very coarse sand with minor clay. The Old Breastworks Formation is predominantly clay and silt with some lignite and sand.

In west Tennessee in Shelby County, the Flour Island Formation acts as a confining unit to the Fort Pillow Sand, separating this formation from the overlying Memphis Sand. Where present, the Old Breastworks Formation and the Midway Formation act as the confining unit below the Fort Pillow Sand. To the east in Fayette and Hardeman counties, the Claiborne and Wilcox formations rise toward the surface along regional dip. The Flour Island confining unit pinches out, and the Memphis Sand and the Flour Island Formation become stratigraphically contiguous. In Hardeman County, the formations are lithologically similar with no

clear breaks to mark formation changes. The similar composition and sandy lithology of those formations make them nearly indistinguishable. At surface, the units form sand hill outcrops in Fayette and Hardeman counties.

The deeper Midway Formation consists of the Porter's Creek Clay and the Clayton Formation (Parks and Carmichael, 1990). The Porter's Creek Clay and Clayton Formation consist of a widespread, generally thick body of clay with local interbeds or lenses of fine sand. These units function as the lower confining units to the overlying Wilcox and Claiborne sands. The Porter's Creek Clay and the Clayton Formation continue east and crop out in eastern Hardeman County.

Upper Cretaceous deposits that underlie the Midway Formation in Hardeman County include the McNairy Sand and the Owl Creek Formation, which crop out east of Hardeman County.

B-2(g)(2) Area Geology

The following discussion of stratigraphy in the Toone area, across the TTF, and the surrounding property contains information from published sources, local sources, and the 1991 RFA and 1999 and 2000 RFIs.

The TTF rests on a thin veneer of soil developed from underlying deposits. The soil, along with loess and alluvium, form a mantle over the stable substrate of the exposed sands of the Claiborne and Wilcox Formations that crop out at or near the surface. Direct observations of the lithologic assemblage beneath the HWOBA were made during three subsurface investigations. In the first investigation in 1996, five temporary piezometers were installed around the HWOBA for groundwater flow characterization. In 1999, three new monitoring wells (MW-15, MW-16, and MW-17) were installed and sampled along with one pre-existing monitoring well (MW-4) at the HWOBA. In 2000, three additional monitoring wells (MW-28, MW-29, and MW-30) were installed and all seven site wells were sampled.

Lithologic observations were made in each of the seven wells. Figures B-3 and B-4 show the location of the monitoring wells. Other deep stratigraphic well information for Hardeman County was obtained from a local water well driller (Wilson, 2000).

Additional subsurface information was obtained from 21 other adjacent wells completed around five SWMUs located within approximately one-half mile of the HWOBA. The wells were completed

in 1999 and 2000 for the RFI being conducted at the TTF. Figures B-3 and B-4 show the locations of the other 21 wells and the SWMUs. Information from those wells provided confirmation of the stratigraphic consistency in the subsurface lithology of the Wilcox and Claiborne formations beneath the entire HWOBA. This information has been used to construct two cross-sections (Figures B-8 and B-9) detailing the subsurface stratigraphy. Additional subsurface information from the 1999 and 2000 RFIs is detailed in Section E.

All wells at the HWOBA and surrounding property are completed and screened in first water in the upper portions of the Claiborne and Wilcox formations. Information concerning stratigraphy and hydrology in the deeper Claiborne and Wilcox formations was obtained from reports prepared for Comprehensive Environmental Response, Compensation, and Liability Act subsurface investigations at the Bolivar-Hardeman County Landfill, approximately 3 miles northeast of the HWOBA.

For the Bolivar-Hardeman County Landfill, Conestoga Rovers and Associates (CRA), of Waterloo, Ontario, has submitted various reports to TDEC on behalf of Velsicol Corporation. These reports provide site characterization information (CRA, 1990), pre-design groundwater investigations results, pumping test results (CRA, 1993), and information from a feasibility study (CRA, 1991). Copies of these reports obtained from the Tennessee Department of Environment and Conservation (TDEC) are in Appendix B-5.

The investigation efforts at this local Bolivar-Hardeman County Landfill provides valuable nearby site information concerning the deep stratigraphy in the Claiborne and Wilcox formations, particularly concerning stratigraphic relationships and hydrology throughout the aquifer. These results can be applied to the aquifer beneath the HWOBA based on close geographic proximity, setting, and location along the same ridge above Mill Creek. The results from the Bolivar-Hardeman County Landfill investigations provide sufficient deep aquifer characterization, serving to obviate the need for similar investigations at the HWOBA.

B-2(g)(2)(i) Soils

Six different soil units have been mapped in the area of the TTF. A copy of the Hardeman County soil survey sheet (Figure B-10) shows the distribution of these soil types in the Toone area. The six units include the Enville silt loam, Iuka silt loam, Smithdale-Lexington complex, Smithdale sandy clay loam, Smithdale and Lucy soils, and Smithdale-Providence complex. Three of the six — the Smithdale-Lexington Complex, the Smithdale and Lucy soils, and the Smithdale-Providence Complex — soil units appear in the immediate area of the HWOBA. The

six soil units descriptions detailed below include the standardized designations for each unit for reference to the soil map.

The **Enville silt loam (14)** is developed within the Pugh Creek stream valley and along an unnamed creek valley flowing into Pugh Creek. This soil is very deep, poorly drained, with a relatively high sand content on floodplains. Permeability is moderate and the available water capacity is high. This soil is occasionally flooded.

The **Iuka silt loam (35)** lies within the Pugh and Mill creeks' stream valleys south-southwest of Toone, near the HWOBA. This soil is very deep, moderately well drained, with a relatively high sand content on floodplains. Permeability is moderately rapid and the available water capacity is high to moderate. This soil floods occasionally.

The **Smithdale-Lexington Complex (61D3)** is developed along the west side of the HWOBA. This soil group is developed on 8 to 12 percent slopes, severely eroded, very deep, and well drained. The upper portion of this complex is silty with the lower portion loamy. It has moderate permeability and the available water capacity is moderate to high.

The **Smithdale sandy clay loam (61E3)** is developed on 12 to 25 percent slopes along the west and east sides of the HWOBA. This soil is very deep and well drained, loamy throughout, and has moderate permeability. The rooting zone is deep and the available water capacity is moderate to high.

The **Smithdale and Lucy soils (61F)** underlie most of the HWOBA. This soil is developed on 20 to 45 percent slopes, is very deep, and is well drained. It is loamy throughout, has moderate permeability, and has a moderate to high available water capacity.

The **Smithdale-Providence Complex (64D3)** trends along the western slope of the hillside of the HWOBA. This soil is developed on 5 to 12 percent slopes, severely eroded, very deep, and moderately well drained. It has a compact, slowly permeable fragipan in the subsurface that restricts root growth, water, and air movement. The available water capacity is moderate to high.

HWOBA Soils

Soils directly beneath the HWOBA consist of Smithdale sandy loam and loam derived from loess and loamy Tertiary marine sands. These well-drained soils are typical of soils forming on

8 to 45 percent slopes. The typical pedon of Smithdale soils consists of A and E horizons of sandy loam from surface to 14 inches. Permeabilities in these soil types typically range from 1×10^{-2} to 1×10^{-4} meters per day.

Quaternary Deposits

The overlying soil is developed from the underlying Quaternary loess and fluvial alluvial deposits, as well as the underlying Tertiary sands where exposed. The loess consists of predominantly silty clay with intermixed traces of fine- and medium-grained sand. Along stream courses, the loess grades into fluvial sands, commonly brown, yellow, and red, and fine- to medium-grained with traces of coarse sand and pebbles. Some locations contain abundant iron staining and cementation with ferruginous deposits.

Beneath the HWOBA, soils derived from loess overlie the Tertiary sands. Thin beds of alluvial deposits are present along the east and west ditches leading from the unit down to Pugh Creek at the base of the hill.

Tertiary Lithology

The overlying Quaternary sands grade quickly into the underlying Tertiary Claiborne and Wilcox formations. The HWOBA is in an outcrop area for Claiborne and Wilcox sands represented by the undifferentiated Claiborne and Memphis Sand (500-foot sand) and the Fort Pillow Sand (1,400-foot sand). These sands consist of sand, silt, clay, and minor lignite; containing fine-to-medium or medium-to-coarse sand with minor lenses of clay and silt (Parks and Carmichael, 1991). As seen in boring logs of the HWOBA monitoring wells, the Tertiary Sands consist of white to reddish white, fine- to medium-grained sand with mica flakes. Very thin (<0.1 inch) white montmorillonite clay stringers are frequently encountered within the sand. These clay stringers probably represent clay deposits developed from pyroclastic ash falls. Sands and clay stringers have been encountered to a depth of 68 feet beneath the unit. Discontinuous clay layers were encountered in borings at the Bolivar-Hardeman County Landfill (CRA, 1991). Those layers were typically not interconnected and only seen to retard water movement creating confined conditions in local areas (CRA, 1993).

B-2(g)(3) Regional Hydrology

In western Tennessee, extensive groundwater aquifers are developed in Tertiary sand sequences that underlie the Gulf Coast province. In Shelby County, Tertiary aquifers provide the municipal and industrial water supplies. Claiborne age aquifers include the Cockfield and Cook Mountain

formations, and the Memphis Sand. Of these, the Memphis Sand (500-foot Sand) is the primary drinking water aquifer in the area. The Memphis Sand overlies deeper Wilcox formations, including the Flour Island Formation and the Fort Pillow Sand.

In western Tennessee near the Mississippi River, the Flour Island Formation acts as a confining unit to the Fort Pillow Sand, separating this formation from the overlying Memphis Sand. Where present, the Old Breastworks Formation, along with the Midway Formation, acts as the confining unit below the Fort Pillow Sand.

To the east in Fayette and Hardeman Counties, the Claiborne and Wilcox formations rise toward the surface along regional dip. The Flour Island confining unit pinches out, and the Memphis Sand and the Fort Pillow Sand become stratigraphically contiguous and virtually indistinguishable lithologically. This combined marine sequence forms sand hill outcrops in Fayette and Hardeman Counties.

The deeper Midway Formation, underlying the Claiborne and Wilcox formations, consists of the Porter's Creek Clay and the Clayton Formation (Parks and Carmichael, 1990). The Porter's Creek Clay consists of a widespread, generally thick body of clay with local interbeds or lenses of fine sand. The Clayton Formation generally consists of clay with local interbeds or lenses of fine sand. These formations act as the lower confining units to the overlying Claiborne and Wilcox aquifer. These units continue east and crop out in eastern Hardeman County.

Upper Cretaceous deposits underlie the Midway Formation in Hardeman County. These units include the McNairy Sand and the Owl Creek Formation, and they crop out east of Hardeman County in McNairy County.

Area Hydrology

Two principal aquifers are in the Toone area. The aquifers exist in fluvial deposits, and sands and gravels of the Tertiary Eocene Claiborne and Wilcox Groups. The local fluvial aquifer develops in the alluvial sands and gravels deposited principally along the Hatchie River bottoms, approximately 3 miles southwest of Kilgore. The depth of this aquifer varies from 1 foot to approximately 10 feet, depending upon the location of the fluvial deposits relative to the Hatchie River.

Groundwater in the sands and gravels of the Claiborne and the Wilcox Formations constitute the surficial aquifer. This aquifer underlies the entire area beneath TTF and the area within and

beyond 5 miles of the HWOBA. In central and western Hardeman County, the exposed sand hills and loess-covered sand hills of the formations represent the outcrop/subcrop of the surficial aquifer. Recharge through infiltration of rainfall occurs directly to the aquifer across the area since the surficial aquifer is under water-table (unpressurized) conditions. Recharge is enhanced since surficial and aquifer lithologies contain a high percentage of sand in the matrix.

Groundwater Quality

Water in the confined Memphis Sand aquifer in western Tennessee near the Mississippi River is generally of the calcium bicarbonate (CaCO₃) type but locally, in the surficial aquifer in Hardeman County, it is a sodium bicarbonate or mixed type. Water in Hardeman County contains low concentrations of most major cation and anion constituents and is generally suitable for many uses. Dissolved-solids concentrations range from 19 to 333 milligrams per liter (mg/L). Hardness (CaCO₃) ranges from soft (5 mg/L) to very hard (306 mg/L) but is generally soft. Iron concentrations range up to 22.63 mg/L. Inorganic trace constituents include arsenic, barium, cadmium, chromium, copper, lead, mercury, strontium, and zinc. Most of these constituents are present in very low concentrations with most below U.S. EPA Maximum Contaminant Levels for drinking water.

Groundwater quality investigations to determine the presence of hazardous substances have been conducted at the HWOBA and surrounding TTF. A Groundwater Summary Report of the status of groundwater quality in relation to the activities at the TTF is being submitted under separate cover.

B-2(g)(4) HWOBA Hydrology

The depth to groundwater beneath the HWOBA ranges from 1 to 60 feet below ground surface (bgs), based on data obtained from four existing onsite monitoring wells and five piezometers, and surveyed locations on the banks of Mill and Pugh creeks. These depths also depend upon the location and surface elevation of each well measured. Water levels vary widely due to the rolling topography, the elevation differences between each of the gauging locations, and seasonal rainfall variations.

At the HWOBA, initial static water level measurements were made in 1997 from temporary piezometers, and from observations of surveyed stream levels in Pugh Creek. Groundwater flow was determined to be to the south-southwest. Figures B-11 (a) through (d) and B-12 (a) through (d) are piezometric maps displaying groundwater flow beneath the HWOBA and TTF from March and December 2006 groundwater sampling events.

The maps are based on observations made in 40 monitoring wells installed at the various RCRA SWMUs. The direction of groundwater flow across the HWOBA and TTF property generally trends to the south-southwest, towards local drainage and the Hatchie River. The figures (B-11 and B-12 series) confirm that groundwater flows in the direction of topography, laterally through the sands of the surficial aquifer. Those maps document groundwater flow variations over time and under different seasonal weather variations.

Groundwater beneath the HWOBA was encountered in the surficial Claiborne and Wilcox aquifer in all seven monitoring wells at depths ranging from 2 to 61 feet. Groundwater was flowing in this zone across a gradient ranging from 0.0026 to 0.0142 feet/feet based on static water levels in the HWOBA wells (Section E and RFI Phase II, 2000).

The following equation (Driscoll, 1986) was used for the calculation of groundwater velocity:

$$V = \frac{K \times i}{n}$$

where: V = Groundwater velocity in feet per day
K = Hydraulic conductivity in feet per day
i = Hydraulic gradient in feet/feet
n = porosity

A groundwater velocity of 0.50 feet per day was calculated for flow in the aquifer. This calculation is based on an average hydraulic gradient in HWOBA well MW-15 of 0.0130 (RFI Phase II, 2000), an average aquifer hydraulic conductivity of 9.7 feet per day (CRA, 1993), and a porosity of 0.25 (CRA, 1990 and Driscoll, 1986).

During a previous investigations at the HWOBA, a perched groundwater zone was reportedly encountered above the deeper zone encountered in three wells gauged in 1999 and four wells in 2000. The zone was reportedly evident only during seasonal groundwater recharge. At the HWOBA, no evidence of this zone was noted during installation and gauging of the five temporary piezometers in 1997. A shallow perched zone was encountered in one HWOBA monitoring well, MW-17, during the 1999 RFI. In that well, shallow groundwater was apparently perched at a depth of 7 feet bgs, likely on two thin clay stringers interbedded in the aquifer sands. This zone was not encountered in the other three wells at the unit. Another perched zone was encountered in four of

the wells at one of the other RCRA SWMUs. That perched zone was limited in extent, well above the local deeper potentiometric surface.

The limited extent and ephemeral nature of perched zones is characteristic of the Claiborne and Wilcox aquifer as seen at the Bolivar-Hardeman County Landfill (CRA, 1990). Perched groundwater was rarely encountered at that site, and was very limited in both vertical and horizontal extents.

At the HWOBA, VOCs have been detected in several monitoring wells during sampling conducted since 2003. Four compounds — 1,1-dichloroethene (DCE), cis-1,2-DCE, tetrachloroethylene, and trichloroethene — have been detected above applicable screening levels.

B-2(g)(5) Drinking Water

The surficial sands contain water of sufficient quality and quantity to be considered a viable water supply aquifer for the Hardeman County area. Most domestic wells are screened in this zone. Most residents, industries, and municipalities in Hardeman County have their own private wells, or well fields completed in these aquifers. In many cases, water for public consumption is stored in tanks. Yields from the surficial aquifer in the vicinity of the HWOBA are reported to be up to 2,000 gallons per minute.

B-3 DESCRIPTION OF TREATMENT UNIT

B-3(a) Location

Table B-1 contains the distance from the HWOBA to the nearest property boundaries, onsite and offsite buildings, public roads, passenger railroads, and receptor within the TTF property boundary.

Table B-1
Approximate Distances To/From HWOBA

Location	Distance (in feet)
TTF Property Boundary	570
PPE Test Area	1,750
Hunting Shed (offsite)	800
Public Roadway (Keller Road)	800
Passenger Railroad	>125,000
Receptor Human (Hunting Shed, if occupied)	800
Receptor Environmental (Pugh Creek)	1,150

B-3(b) Design

Currently, there are 21 steel burn pans at the HWOBA, which are approximately 8 feet long by 4 feet wide by 2 feet high, and only one to two pans are used each day. The burn pans are situated on a gravel area. Once the hazardous waste is ready for treatment, it is placed in the steel pans, in which it is ignited (by use of newspaper and a 4- to 5-minute fuse).

The proposed HWOBUs design is described in Section D-10 of this Application, and the details for the existing, interim status HWOBUs is described in Section D-11 of this Application.

B-3(c) Operation

Open burning only occurs between the hours of 9 a.m. to 2 p.m., 5 days a week. The daily treatment capacity may not exceed 3,300 pounds of waste pyrotechnics per day. The estimated proposed annual quantity of pyrotechnic waste (D001, D003, D007, and F003) generated at Kilgore's main production plant and treated at the HWOBA is approximately 858,000 pounds per year. Additionally, 24 pounds per year of barium (D005) and 24 pounds per year of lead (D008) wastes may be burned at the HWOBA. The proposed and current quantities are listed in the Part A Permit Application. The burn pans are loaded for treatment by Kilgore hazardous waste technicians.

After open burning is completed, the pans cannot be reused for a minimum of 72 hours; at the end of that time, the pans must be misted with water, cleaned of any residues, and inspected. If a misfire occurs, treatment personnel cannot return to the burn pan until the next working day's treatment activities for safety reasons. Therefore, during a misfire, waste may remain in the burn pans for up to 72 hours (if the misfire occurs on a Friday and open burning is not conducted again until the following Monday).

B-3(d) Maintenance, Monitoring, Inspection

All equipment at the HWOBA is inspected before each use. Open burning operations are monitored and maintenance is conducted as required by Kilgore Work Instructions (WIs). Sections D-10(h) and D-11(h) of this application provides additional information on inspections, monitoring, and maintenance of equipment at the proposed and existing HWOBUs, respectively.

B-3(e) Closure

In the event that the HWOBA is closed, Kilgore will follow the Closure Plan, which is described in Section I.

B-4 FACILITY LOCATION INFORMATION

The following are provided in accordance with 40 CFR 270.14(b)(11) relating to the requirements for facility location information.

B-4(a) Seismic Requirements

The facility is not listed in Appendix VI of 40 CFR Part 264; therefore, the requirements for the seismic standard do not apply to this Permit Application.

B-4(b) Floodplain Standard/100-Year Flood Plain Area

The location of the 100-year floodplain in relationship to the TTF is shown on Figure B-7. This map, issued by the Federal Emergency Management Agency, contains floodplain information for Hardeman County, Tennessee, and indicates that the TTF is an area of minimal flood hazard.

B-5 TRAFFIC PATTERNS AND VOLUMES

Keller Road is the main road to the HWOBA and runs along the western border of the facility. Keller Road is a rural, two-lane, paved road, which provides access to the Town of Toone from the west. The HWOBA is approximately 800 feet south of Keller Road. There is one gate entrance at Keller Road that leads to the Test Tunnel and Pole Barn Test Area and another gate entrance at Keller Road that leads to the HWOBA. Figures B-3 and B-4 shows the locations of the internal access roads and adjacent offsite roads.

B-5(a) Vehicle Information and Quantity of Waste Moved Per Shipment

The internal access road to the HWOBA is routinely used only by the hazardous waste technicians and other Kilgore personnel authorized to be onsite. As such, traffic is limited to approximately 15 vehicle round trips during a typical 5-day work week. Types of vehicles typically traveling the road include pickup trucks and transport trailers.

Equipment used for moving containers consists of up to two dedicated hazardous waste pyrotechnic transportation trailers. No more than 1,500 pounds of waste are transported from the main production plant to the HWOBA in any single shipment. The trailers meet the appropriate requirements of U.S. Department of Transportation (DOT) regulations in 49 CFR Part 177 — Carriage by Public Highway — including 177.835 Class I (explosive) materials. Both truck/trailer combinations used to haul the waste pyrotechnics have received a DOT Hazardous Materials Certificate of Registration and TDEC has issued Kilgore a Permit to Transport Hazardous Waste (TND007020159).

B-5(b) Waste Transfers and Pickup Stations

The hazardous waste drums are transported from the HWAAAs at the main production plant to the HWOBA via the trailers discussed in Section B-5(a). The drums are secured to the trailer with load locks. After the drums are loaded into the trailer, it is hauled from the main production plant to the HWOBA. Figure B-13 shows the route used to transport the waste to the HWOBA. Once the waste reaches the HWOBA, the drums are manually unloaded and moved to the burn pans. There are no pickup stations at the HWOBA.

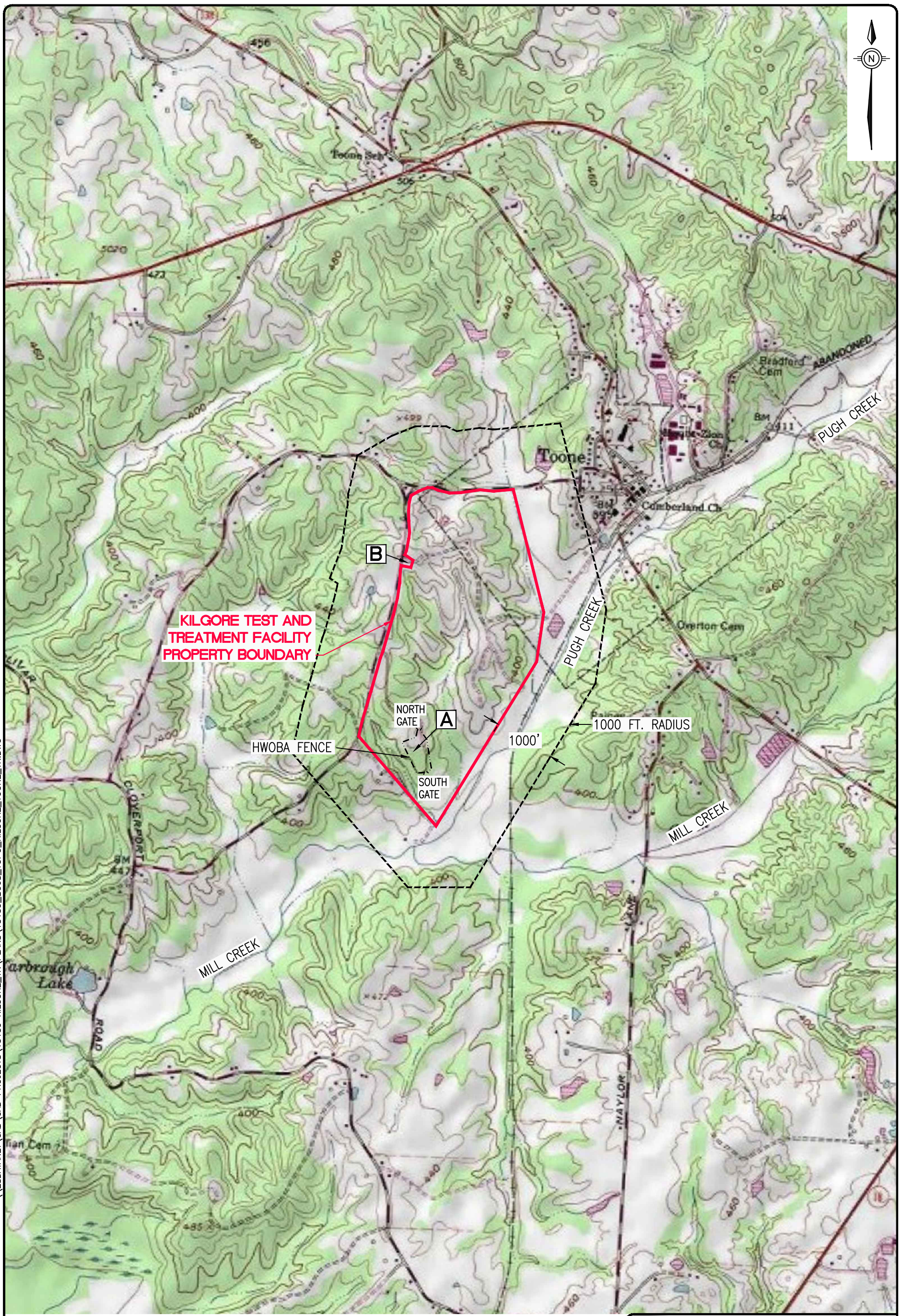
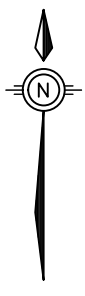
B-5(c) Traffic Control

All intersections between the main production plant and the HWOBA are controlled by stop or yield signs. Due to the size and location of the town, traffic on Kilgore and Keller roads is insignificant and the traffic control is adequate for safely transporting hazardous waste pyrotechnics. Figure B-13 shows the route to and from the main production plant to the HWOBA, including traffic control signs.

B-5(d) Road Surfacing and Load-Bearing Capacity

Figures B-3 and B-4 shows the access roads to the HWOBA. The roads through Toone are paved; however, all internal roads within the facility and the HWOBA are gravel. All roads are well-maintained and capable of handling heavy trucks and equipment. In late 2013, the road inside the HWOBA fence line was improved by adding crushed limestone. Gravel roads within the HWOBA are subject to localized flooding during severe weather conditions, during which time most HWOBA activities are not conducted; therefore, the roads do not pose a hazard for or threat to the movement of hazardous waste or emergency vehicles.

Appendix B-1
Figures



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USA Topo Maps - Copyright:© 2013 National Geographic Society, i-cubed
Boliver East, Tennessee Quadrangle

LEGEND

- A** - HAZARDOUS WASTE OPEN BURN AREA (HWOBA)
- B** - TOWN OF TOONE WATER TOWER

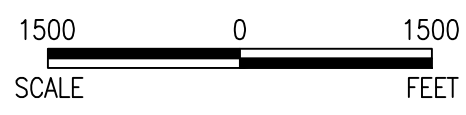
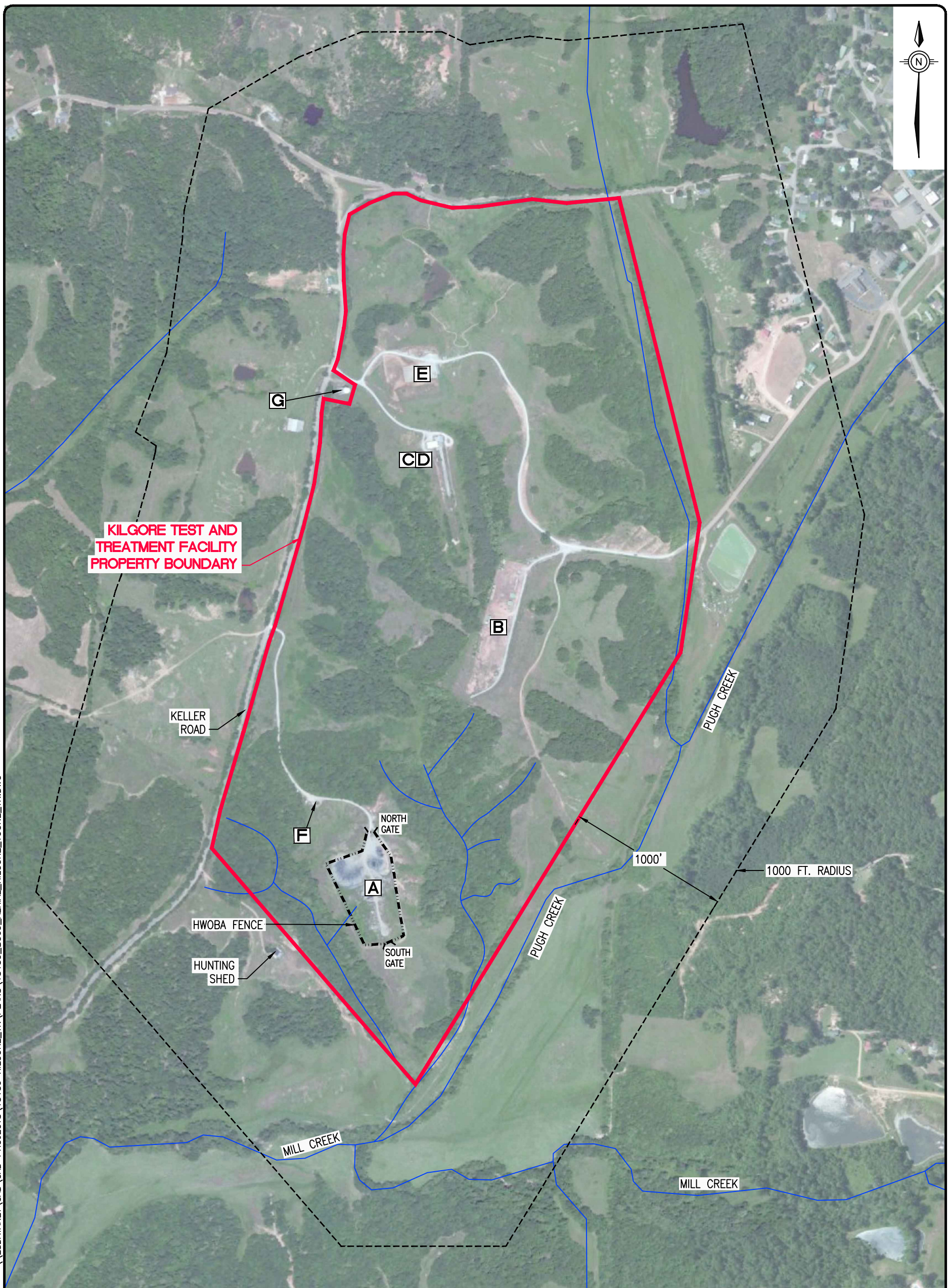
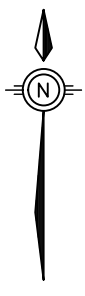


FIGURE B-1
TOPOGRAPHIC MAP
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: K.SASS	
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B068	



KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY

KELLER ROAD

PUGH CREEK

1000'

1000 FT. RADIUS

PUGH CREEK

MILL CREEK

MILL CREEK

World_Imagery - Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

LEGEND

- A** - HAZARDOUS WASTE OPEN BURN AREA (HWOBA)
- B** - PPE TEST AREA
- C** - TEST TUNNEL
- D** - MARINE LOCATION MARKER TEST AREA
- E** - POLE BARN TEST AREA
- F** - HWOBA OBSERVATION AREA
- G** - TOWN OF TOONE WATER TOWER

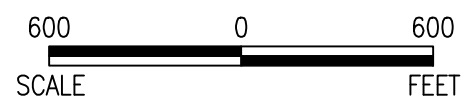


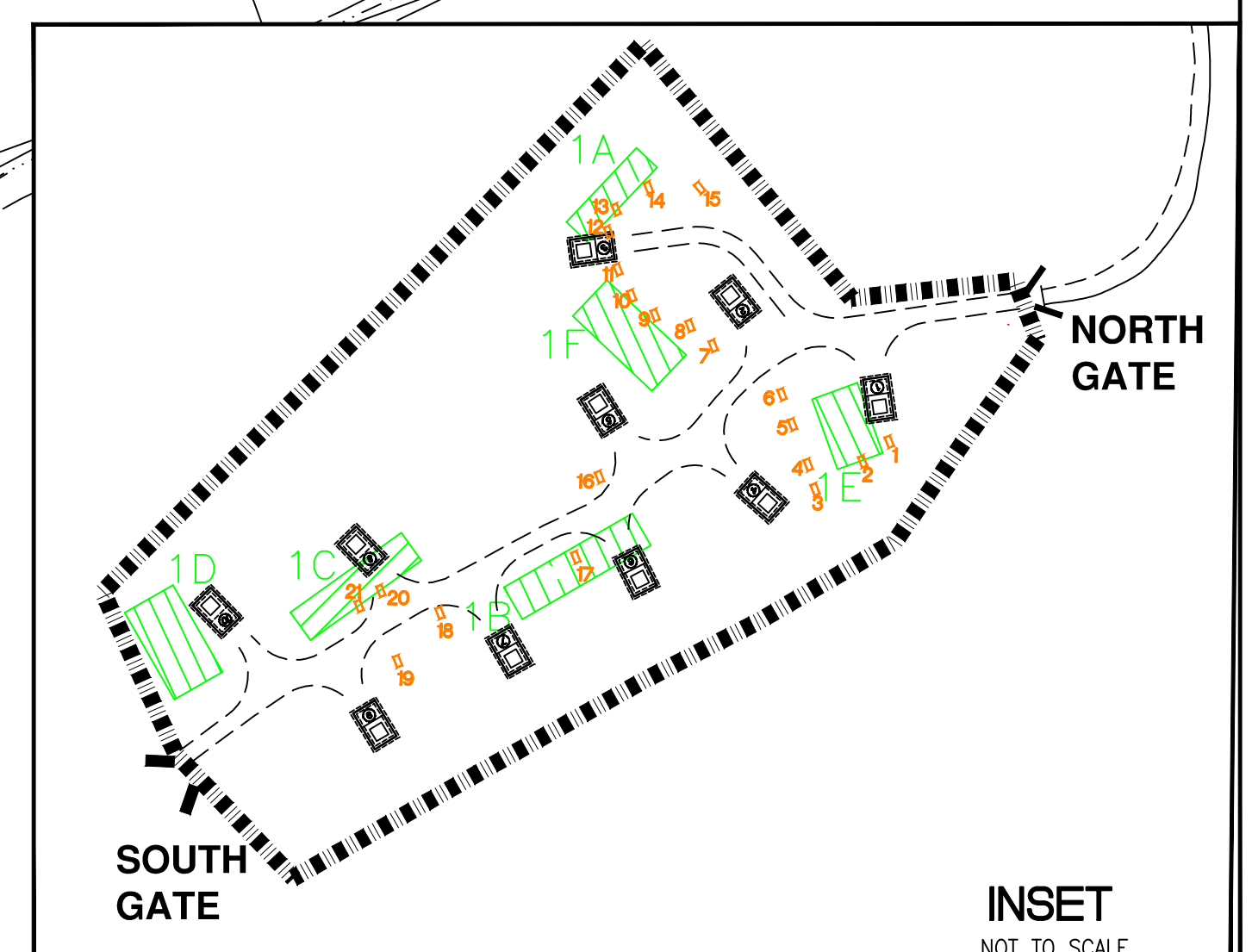
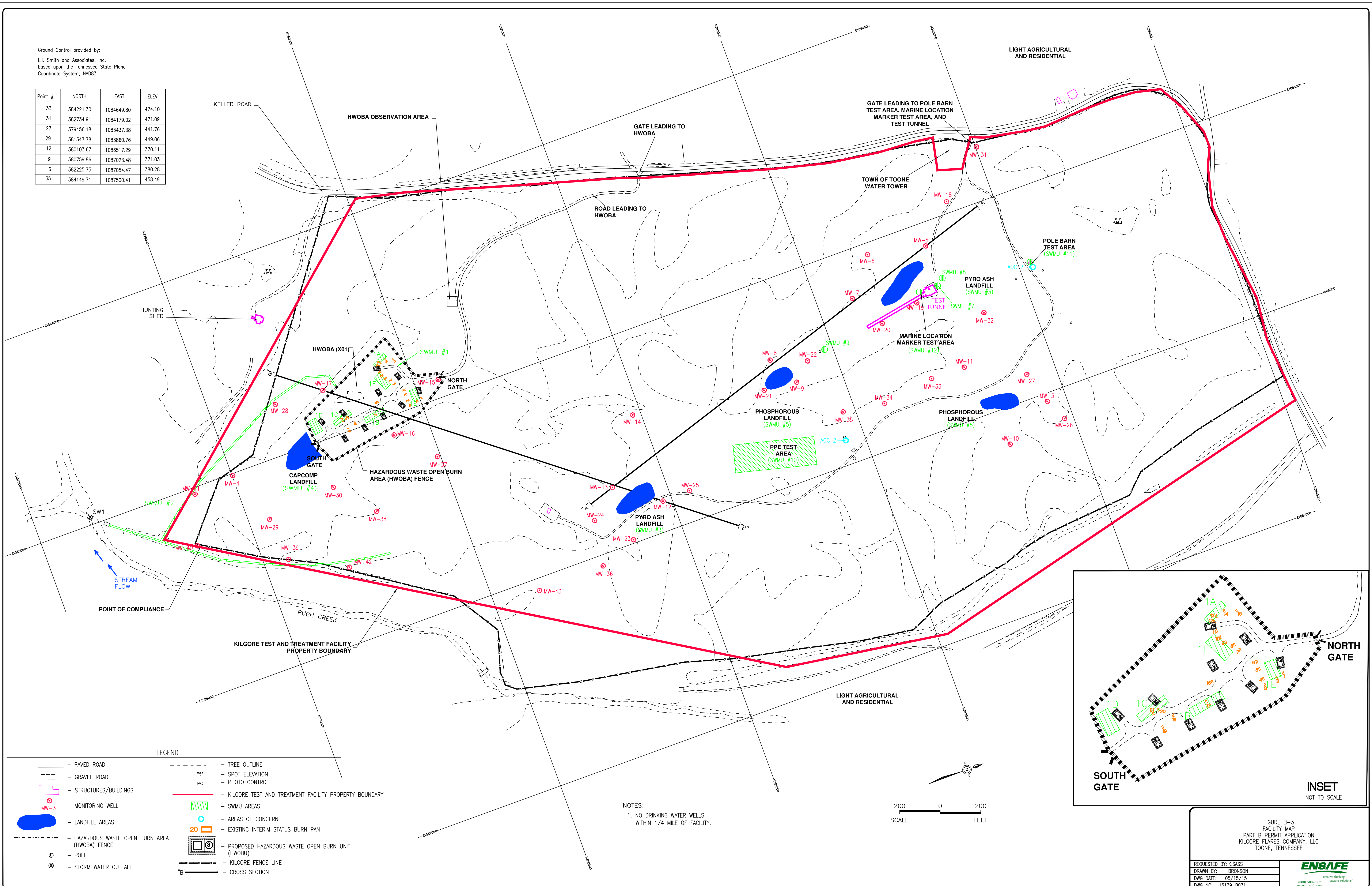
FIGURE B-2
AERIAL MAP
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: K.SASS	
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B069	

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Ground Control provided by:
 L.I. Smith and Associates, Inc.
 based upon the Tennessee State Plane
 Coordinate System, NAD83

Point #	NORTH	EAST	ELEV.
33	384221.30	1084649.80	474.10
31	382734.91	1084179.02	471.09
27	379456.18	1083437.38	441.76
29	381347.78	1083860.76	449.06
12	380103.67	1086517.29	370.11
9	380759.86	1087023.46	371.03
6	382225.75	1087054.47	380.28
35	384149.71	1087500.41	458.49



- LEGEND**
- PAVED ROAD
 - GRAVEL ROAD
 - STRUCTURES/BUILDINGS
 - MONITORING WELL (MW-3)
 - LANDFILL AREAS
 - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
 - POLE
 - STORM WATER OUTFALL
 - TREE OUTLINE
 - SPOT ELEVATION
 - PHOTO CONTROL
 - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
 - SWMU AREAS
 - AREAS OF CONCERN
 - EXISTING INTERIM STATUS BURN PAN
 - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
 - KILGORE FENCE LINE
 - CROSS SECTION

NOTES:
 1. NO DRINKING WATER WELLS WITHIN 1/4 MILE OF FACILITY.

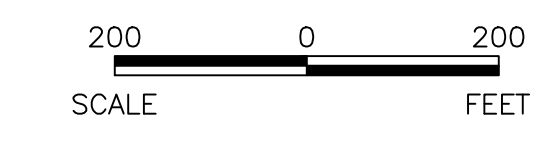


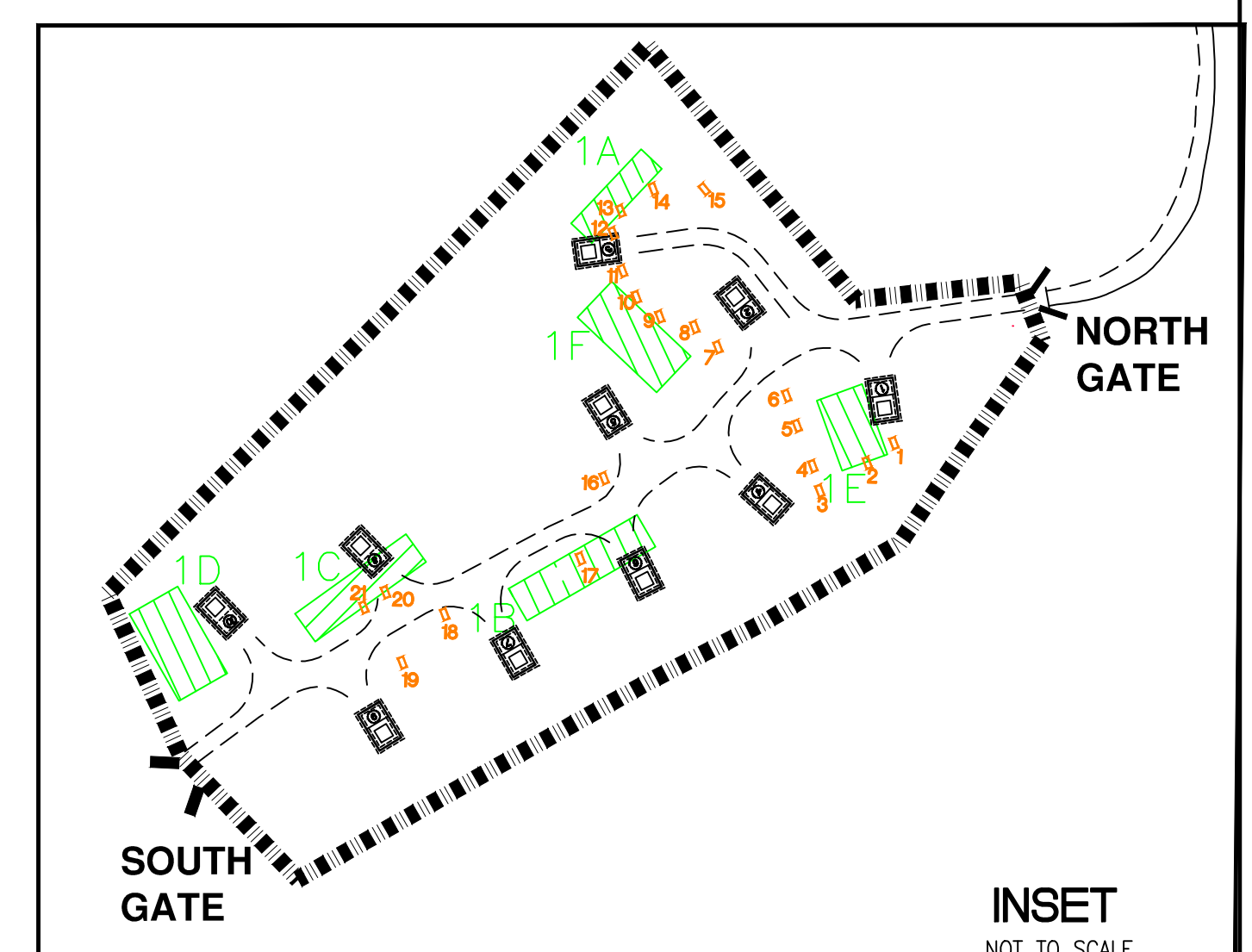
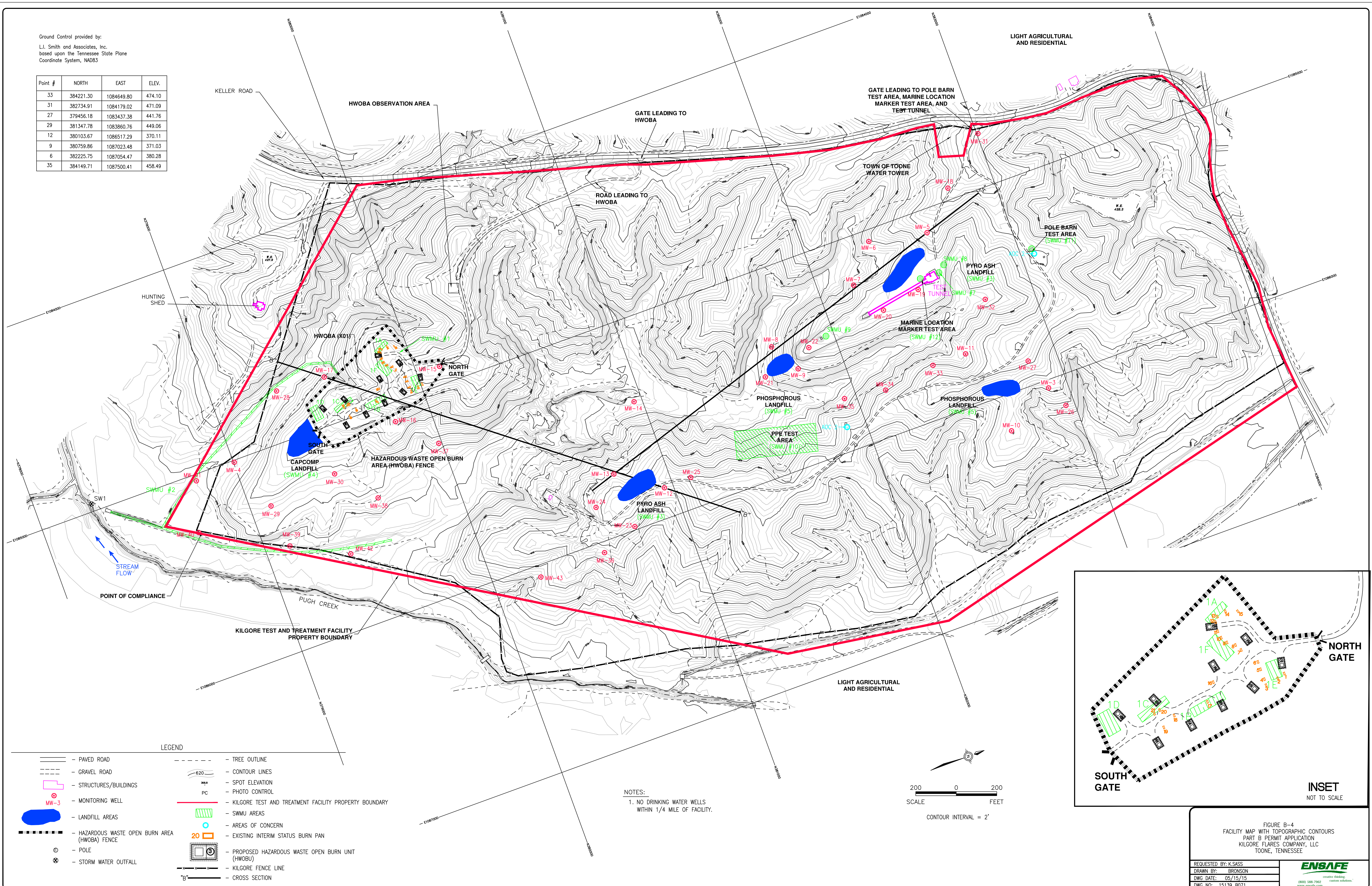
FIGURE B-3
 FACILITY MAP
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY: K.SASS
 DRAWN BY: BRONSON
 DWG DATE: 05/15/15
 DWG NO: 15139_B071

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 8000 5th Street, Suite 200
 Knoxville, TN 37912
 www.ensafe.com

Ground Control provided by:
L.I. Smith and Associates, Inc.
based upon the Tennessee State Plane
Coordinate System, NAD83

Point #	NORTH	EAST	ELEV.
33	384221.30	1084649.80	474.10
31	382734.91	1084179.02	471.09
27	379456.18	1083437.38	441.76
29	381347.78	1083860.76	449.06
12	380103.67	1086517.29	370.11
9	380759.86	1087023.48	371.03
6	382225.75	1087054.47	380.28
35	384149.71	1087500.41	458.49



- LEGEND**
- PAVED ROAD
 - GRAVEL ROAD
 - STRUCTURES/BUILDINGS
 - MONITORING WELL
 - LANDFILL AREAS
 - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
 - POLE
 - STORM WATER OUTFALL
 - TREE OUTLINE
 - CONTOUR LINES
 - SPOT ELEVATION
 - PHOTO CONTROL
 - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
 - SWMU AREAS
 - AREAS OF CONCERN
 - EXISTING INTERIM STATUS BURN PAN
 - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
 - KILGORE FENCE LINE
 - CROSS SECTION

NOTES:
1. NO DRINKING WATER WELLS WITHIN 1/4 MILE OF FACILITY.

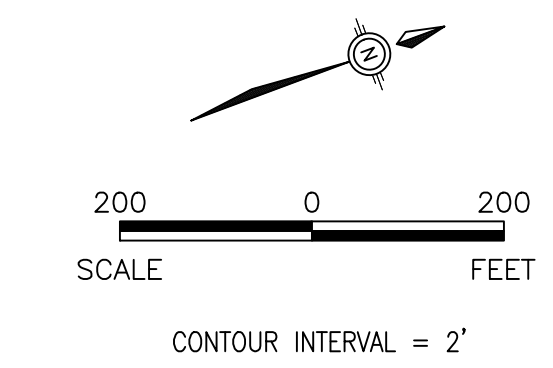
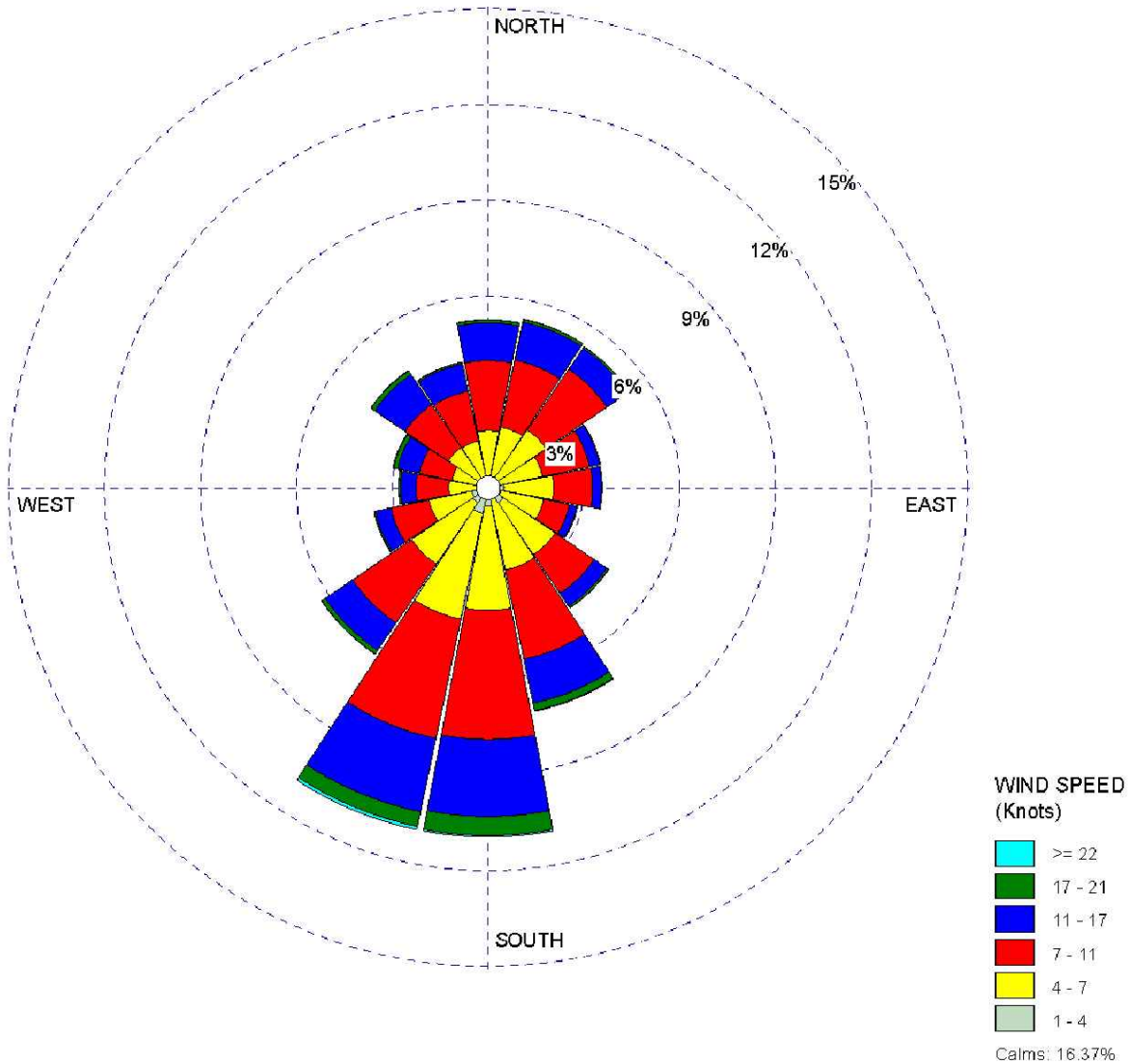


FIGURE B-4
FACILITY MAP WITH TOPOGRAPHIC CONTOURS
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: K.SASS
DRAWN BY: BRONSON
DWG DATE: 05/15/15
DWG NO: 15139_B071

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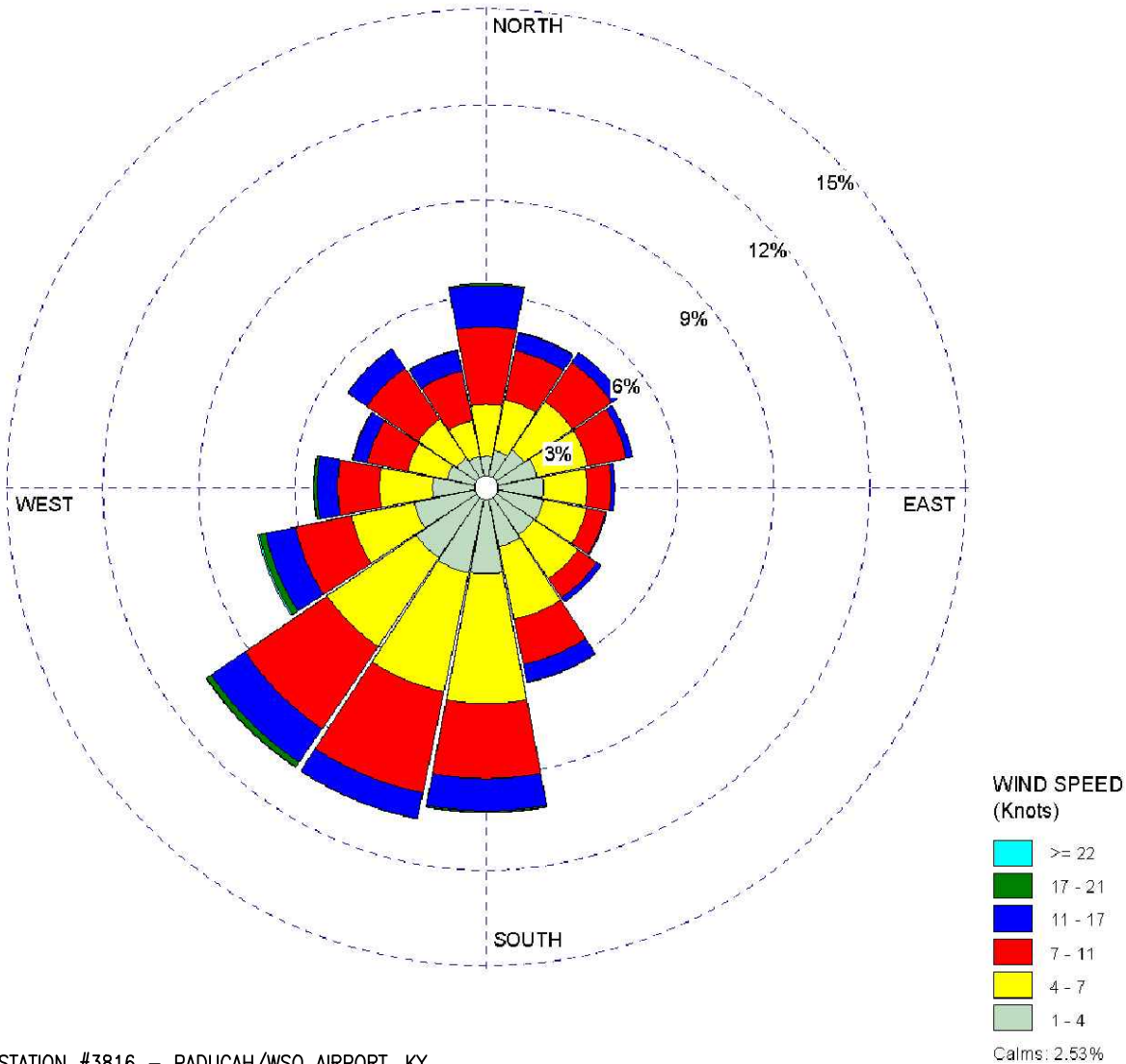
\\ESDATANET\CAD\PROJECTS\15139_KILGORE_TN\PLANS\15139_B052_MEMPHIS_WIND_ROSE_BASE_KILGORE_TOONE_TN.DWG



STATION #13893 – MEMPHIS INTERNATIONAL AIRPORT, TN
 DISPLAY: WIND SPEED DIRECTION (BLOWING FROM)

DATA PERIOD: 2008 2009 2010 2011 2012 Jan 1 - Dec 31 00:00 - 23:00		Kilgore Risk Assessment	
CALM WINDS: 16.37%		TOTAL COUNT: 43843 hrs.	
AVG. WIND SPEED: 6.63 Knots		DATE: 2/12/2014	
WRPLOT View - Lakes Environmental Software		Liesa R. Elliott Consulting Meteorologist	
REQUESTED BY: K.SASS DRAWN BY: BRONSON DWG DATE: 05/09/15 DWG NO: 15139_B052		FIGURE B-5 MEMPHIS WIND ROSE PART B PERMIT APPLICATION KILGORE FLARES COMPANY, LLC TOONE, TENNESSEE ENSAFE <small>creative thinking. custom solutions.®</small> (800) 588-7962 www.ensafe.com	

\\ESDATANET\CAD\CAD PROJECTS\15139_KILGORE_TN\PLANS\15139_B053_PADUCAH_WIND_ROSE_BASE_KILGORE_TOONE_TN.DWG



STATION #3816 – PADUCAH/WSO AIRPORT, KY
 DISPLAY: WIND SPEED DIRECTION (BLOWING FROM)

DATA PERIOD:
2008 2009 2010 2011 2012
Jan 1 - Dec 31
00:00 - 23:00

Kilgore Risk Assessment

Liesa R. Elliott
 Consulting Meteorologist

CALM WINDS:
2.53%

TOTAL COUNT:
43657 hrs.

AVG. WIND SPEED:
6.29 Knots

DATE:
2/12/2014

FIGURE B-6
 PADUCAH WIND ROSE
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

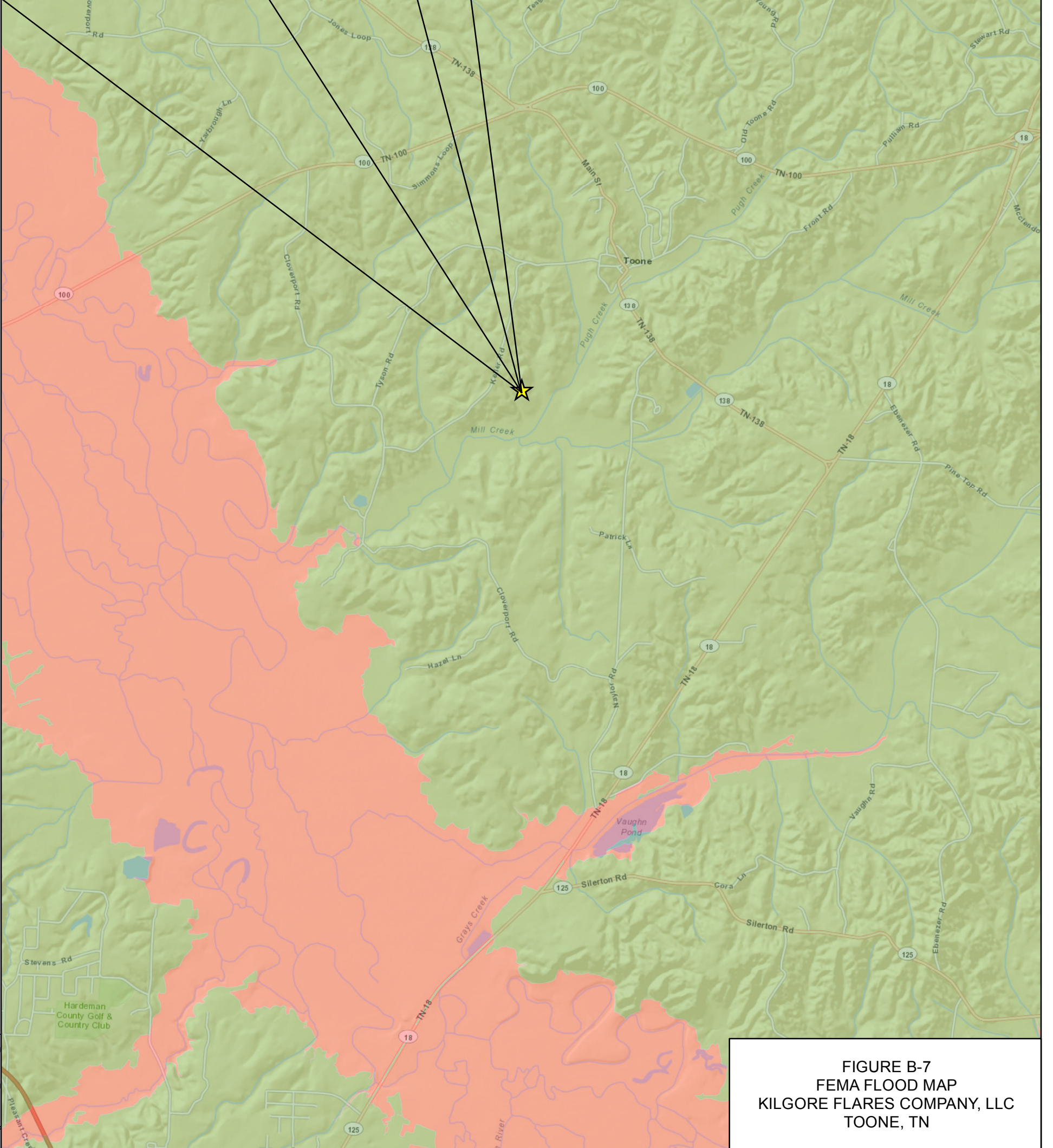
MRPLOT View - Lakes Environmental Software

REQUESTED BY: K.SASS
 DRAWN BY: BRONSON
 DWG DATE: 05/09/15
 DWG NO: 15139_B053

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0 300 600 Feet



Legend

- SITE LOCATION
- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
- 0.2 PCT ANNUAL CHANCE FLOOD HAZARD
- AREA OF MINIMAL FLOOD HAZARD

0 3,500 7,000 Feet

National Flood Hazard Layer is from the Federal Emergency Management Agency.

**FIGURE B-7
FEMA FLOOD MAP
KILGORE FLARES COMPANY, LLC
TOONE, TN**

REQUESTED BY: K. SASS
DRAWN BY: BLIPSCOMB
DATE: 3/25/2014
PROJECT NO: 0888814391



Document Path: D:\projects\kilgore\toone_fm\Flood_Map.mxd

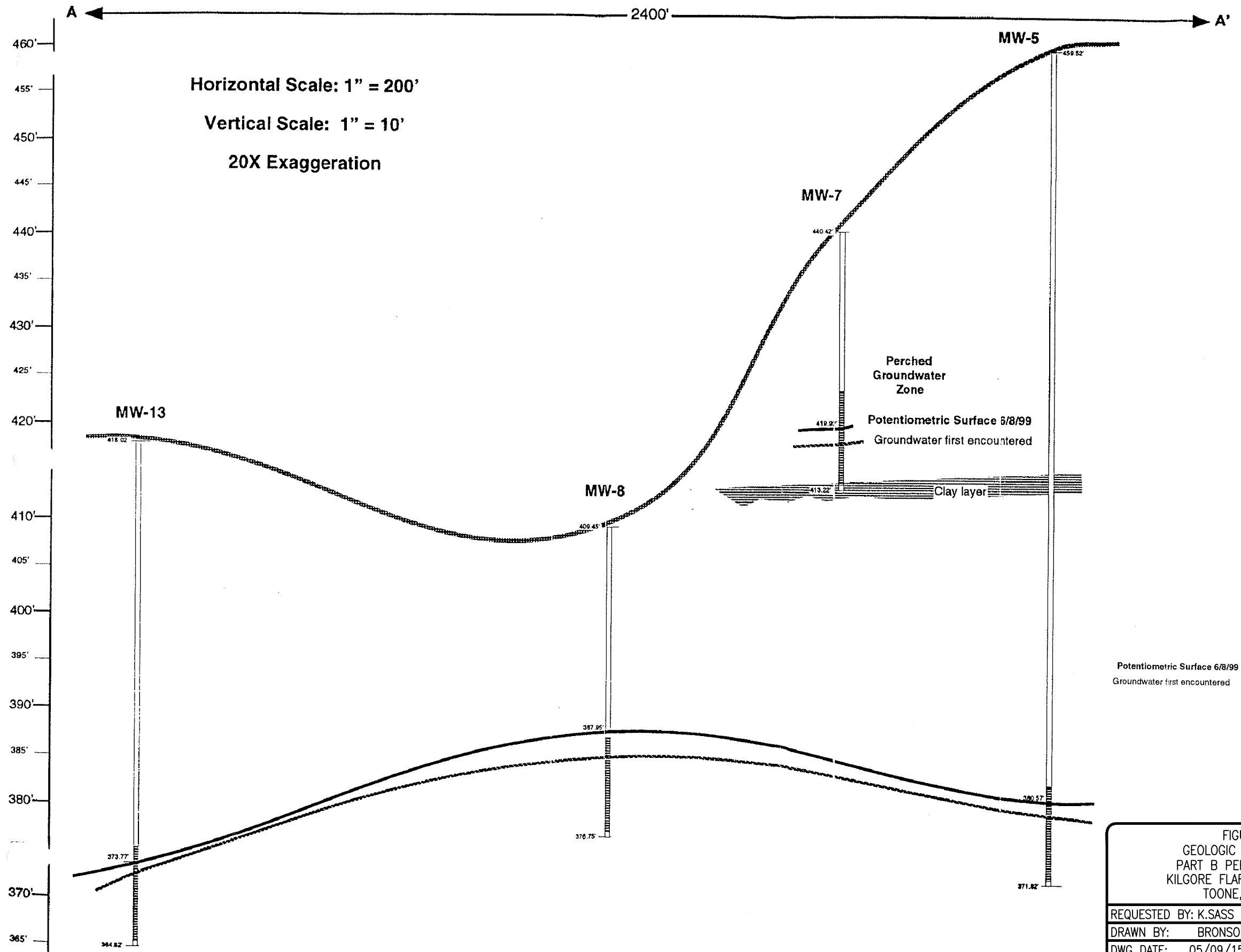


FIGURE B-8
 GEOLOGIC CROSS SECTION
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY: K.SASS	
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B054	

(800) 588-7962
 www.ensafe.com

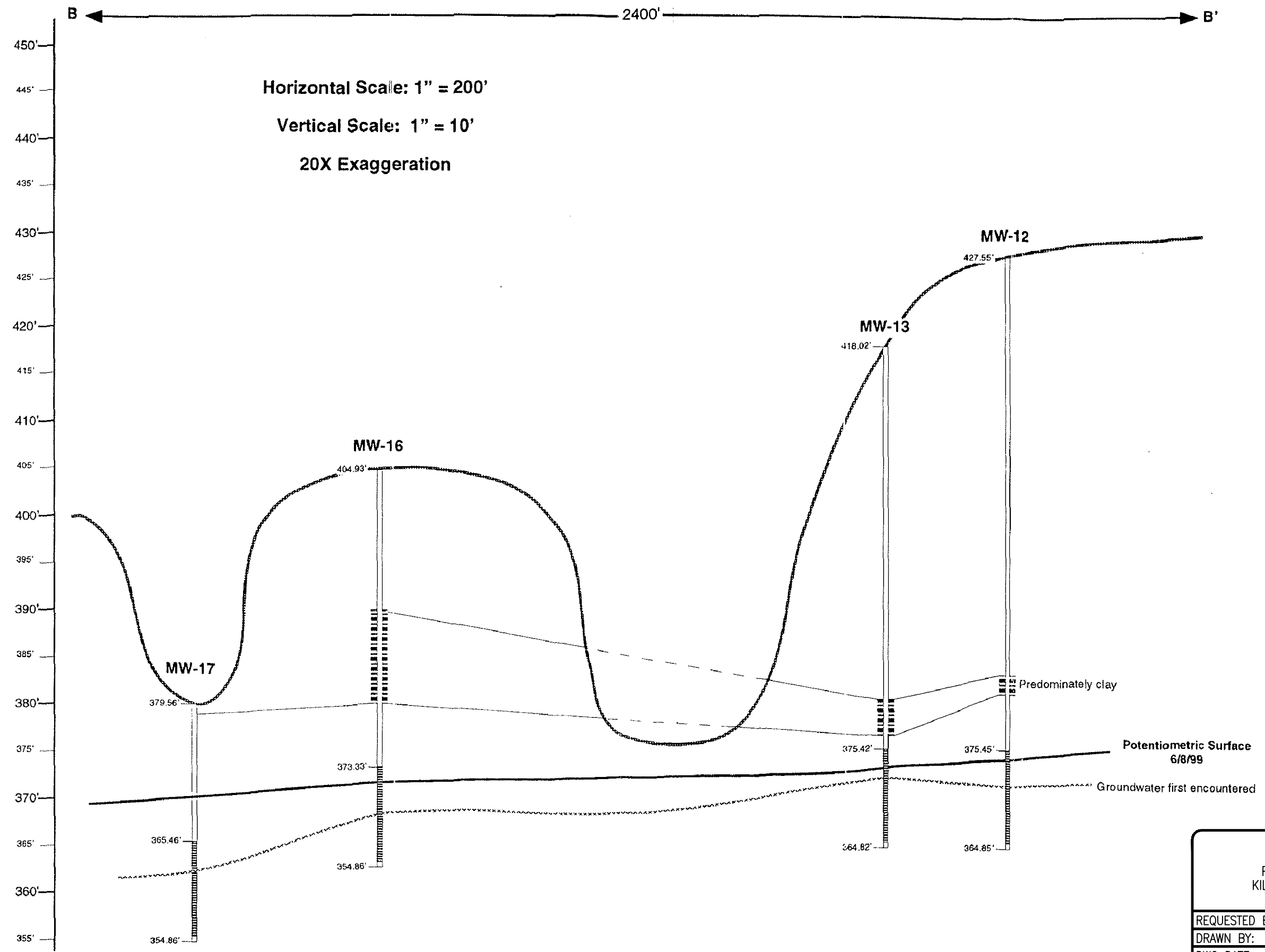
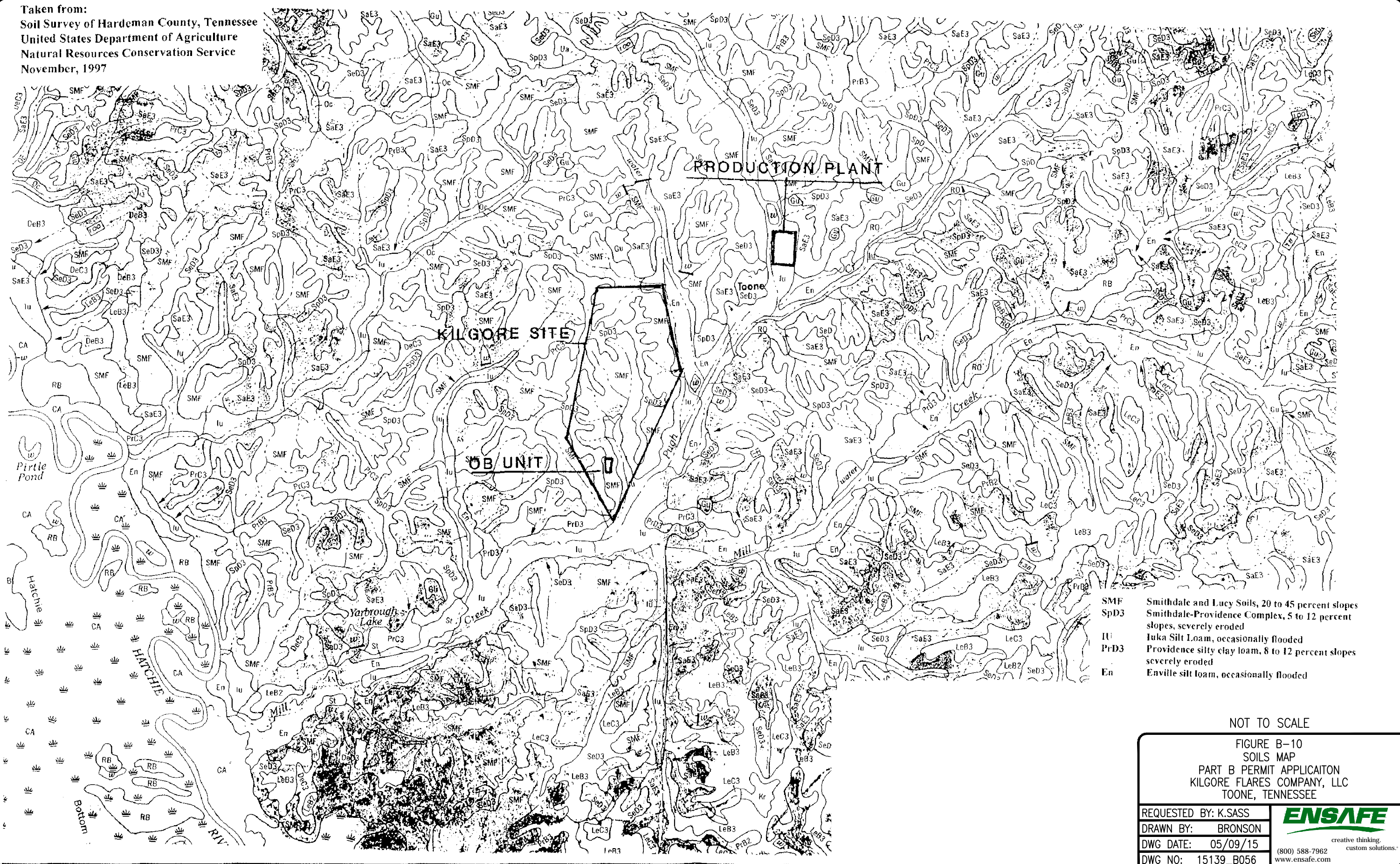


FIGURE B-9
 GEOLOGIC CROSS SECTION
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY: K.SASS	
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B055	

(800) 588-7962
 www.ensafe.com

Taken from:
 Soil Survey of Hardeman County, Tennessee
 United States Department of Agriculture
 Natural Resources Conservation Service
 November, 1997



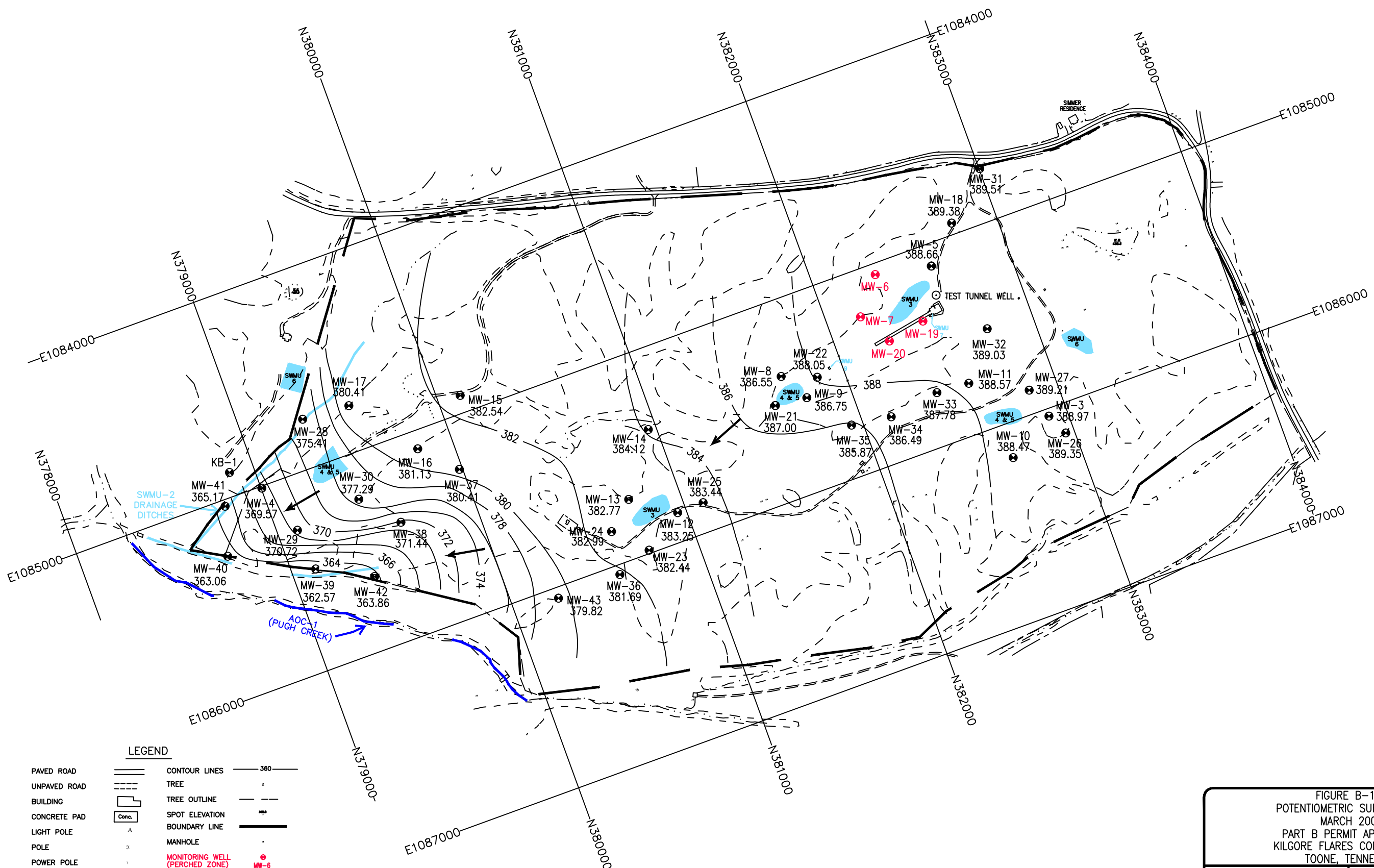
SMF Smithdale and Lucy Soils, 20 to 45 percent slopes
 SpD3 Smithdale-Providence Complex, 5 to 12 percent slopes, severely eroded
 IU Iuka Silt Loam, occasionally flooded
 PrD3 Providence silty clay loam, 8 to 12 percent slopes severely eroded
 En Enville silt loam, occasionally flooded

NOT TO SCALE

FIGURE B-10
 SOILS MAP
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY: K.SASS
 DRAWN BY: BRONSON
 DWG DATE: 05/09/15
 DWG NO: 15139_B056





LEGEND

- | | | | | |
|----------------|--|--------------------------------|--|------|
| PAVED ROAD | | CONTOUR LINES | | 360 |
| UNPAVED ROAD | | TREE | | 360 |
| BUILDING | | TREE OUTLINE | | 360 |
| CONCRETE PAD | | SPOT ELEVATION | | 360 |
| LIGHT POLE | | BOUNDARY LINE | | 360 |
| POLE | | MANHOLE | | 360 |
| POWER POLE | | MONITORING WELL (PERCHED ZONE) | | MW-6 |
| FENCE | | MONITORING WELL (COVER ZONE) | | MW-3 |
| SUSPECTED SWMU | | | | |

NOTE: MW-25 WAS NOT INCLUDED WITH THE OTHER CONTOURED WELLS.

CONTOUR INTERVAL = 2'
SOURCE: DEVELOPMENT & ENVIRONMENTAL PLANNING ASSOCIATES, INC.

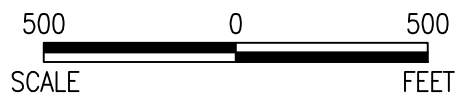


FIGURE B-11A POTENTIOMETRIC SURFACE MAP MARCH 2006 PART B PERMIT APPLICATION KILGORE FLARES COMPANY, LLC TOONE, TENNESSEE	
REQUESTED BY: K.SASS	 creative thinking. (800) 588-7962 www.ensafe.com
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B057	

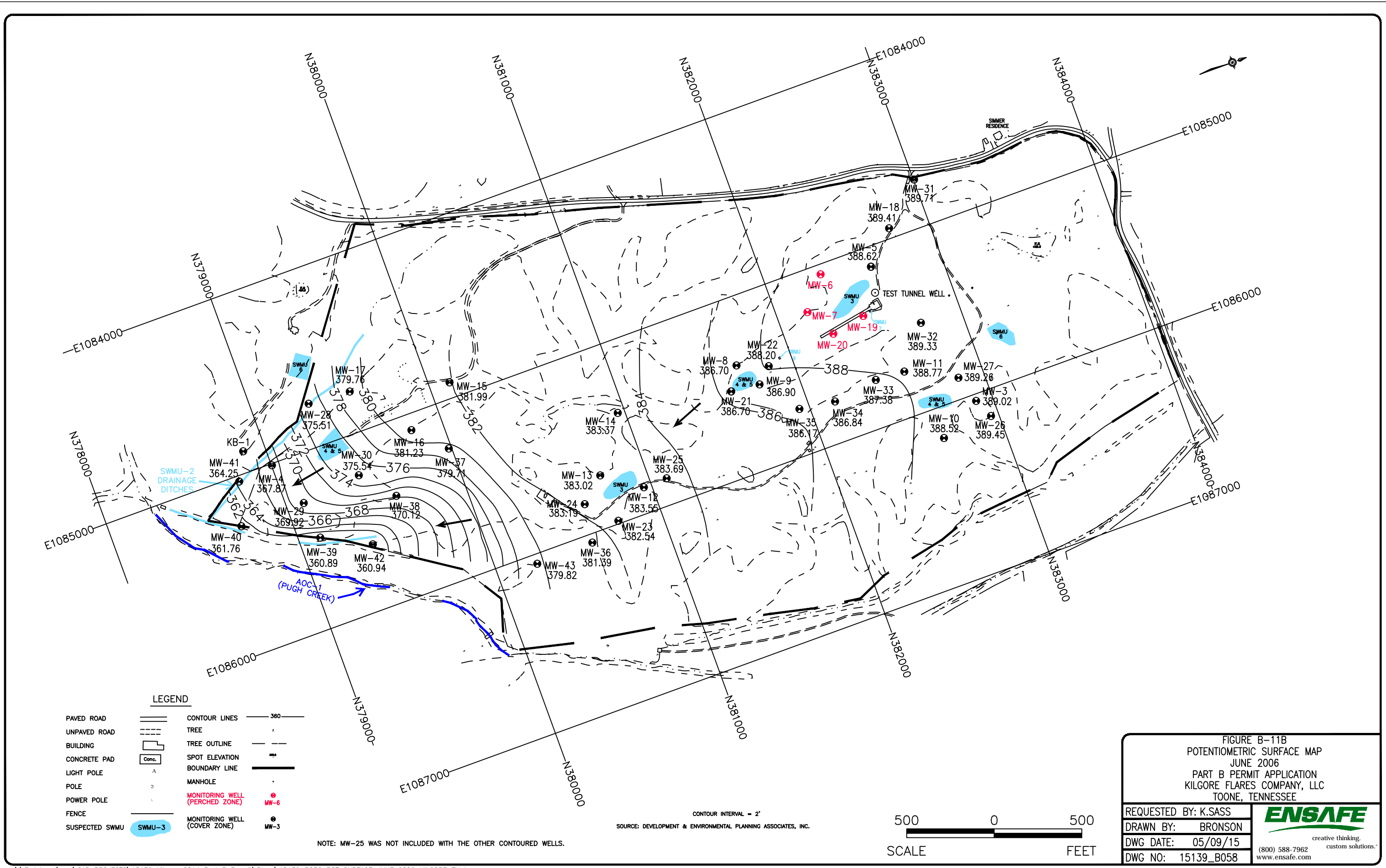

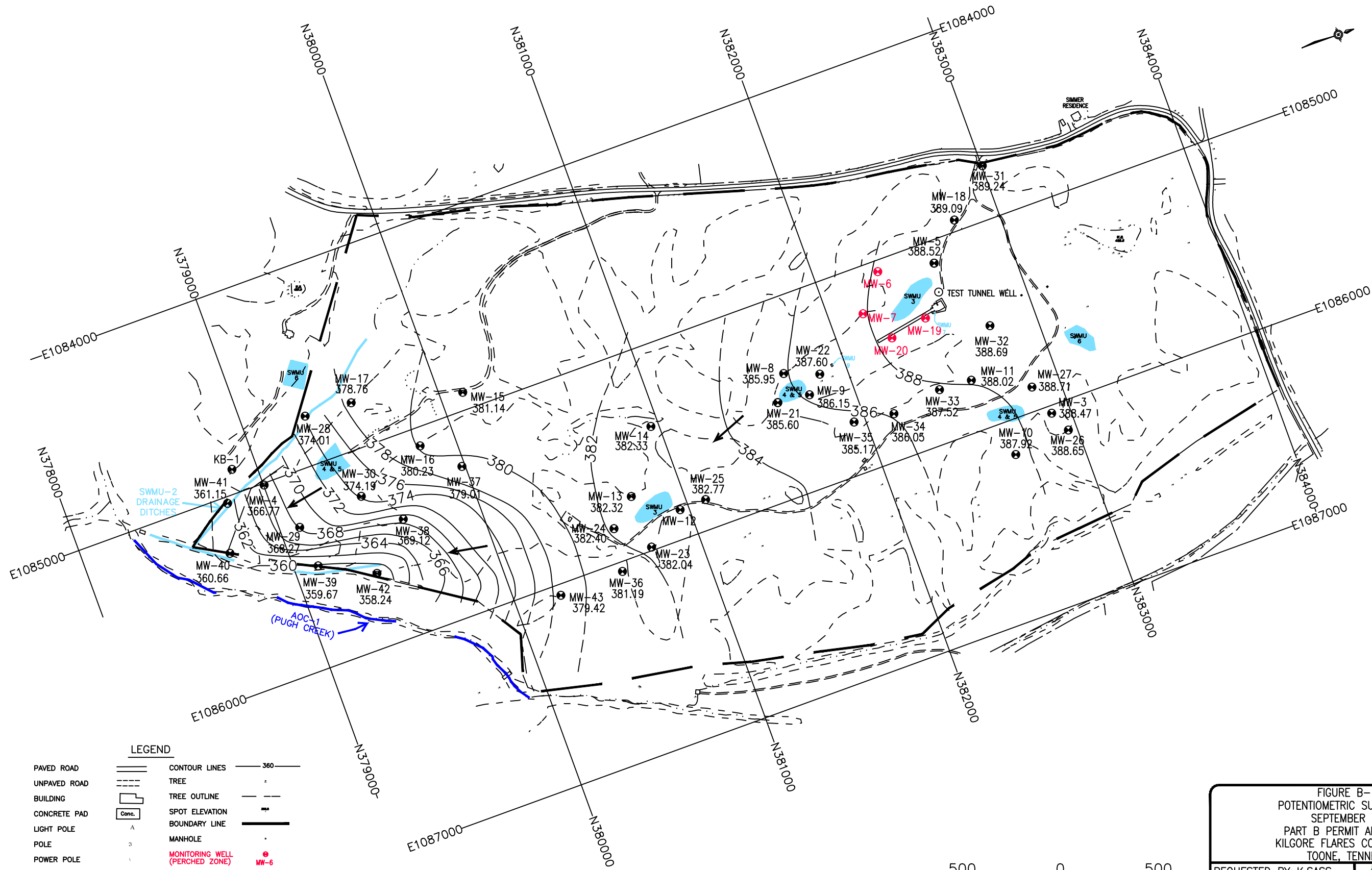


FIGURE B-11B
 POTENTIOMETRIC SURFACE MAP
 JUNE 2006
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY: K.SASS	 creative thinking. custom solutions. (800) 588-7962 www.ensafe.com
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B058	



LEGEND

PAVED ROAD	CONTOUR LINES	360
UNPAVED ROAD	TREE	*
BUILDING	TREE OUTLINE	- - -
CONCRETE PAD	SPOT ELEVATION	###
LIGHT POLE	BOUNDARY LINE	— — —
POLE	MANHOLE	.
POWER POLE	MONITORING WELL (PERCHED ZONE)	⊙ MW-6
FENCE	MONITORING WELL (COVER ZONE)	⊙ MW-3
SUSPECTED SWMU	SWMU-3	⊙

NOTE: MW-25 WAS NOT INCLUDED WITH THE OTHER CONTOURED WELLS.

CONTOUR INTERVAL = 2'
SOURCE: DEVELOPMENT & ENVIRONMENTAL PLANNING ASSOCIATES, INC.

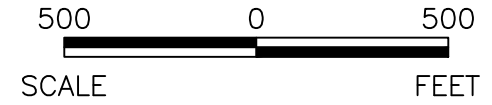
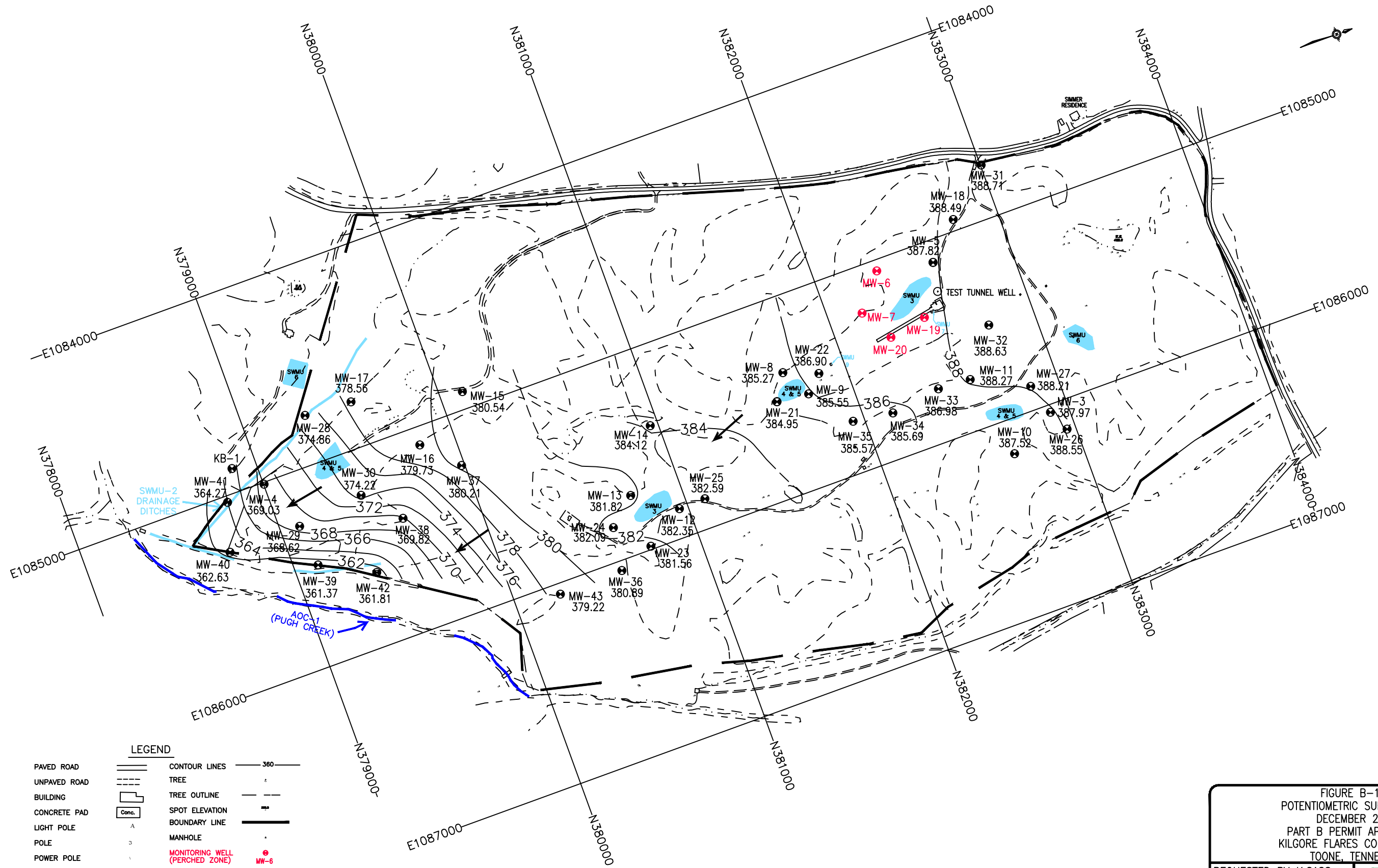


FIGURE B-11C
POTENTIOMETRIC SURFACE MAP
SEPTEMBER 2006
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: K.SASS	<p>creative thinking. custom solutions. (800) 588-7962 www.ensafe.com</p>
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B059	



LEGEND

PAVED ROAD	CONTOUR LINES	360
UNPAVED ROAD	TREE	+
BUILDING	TREE OUTLINE	- - -
CONCRETE PAD	SPOT ELEVATION	•
LIGHT POLE	BOUNDARY LINE	—
POLE	MANHOLE	•
POWER POLE	MONITORING WELL (PERCHED ZONE)	•
FENCE	MONITORING WELL (COVER ZONE)	•
SUSPECTED SWMU	SWMU-3	

NOTE: MW-25 WAS NOT INCLUDED WITH THE OTHER CONTOURED WELLS.

CONTOUR INTERVAL = 2'
SOURCE: DEVELOPMENT & ENVIRONMENTAL PLANNING ASSOCIATES, INC.

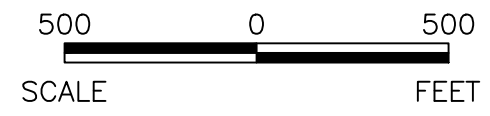
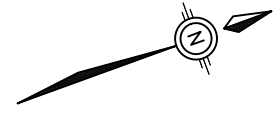
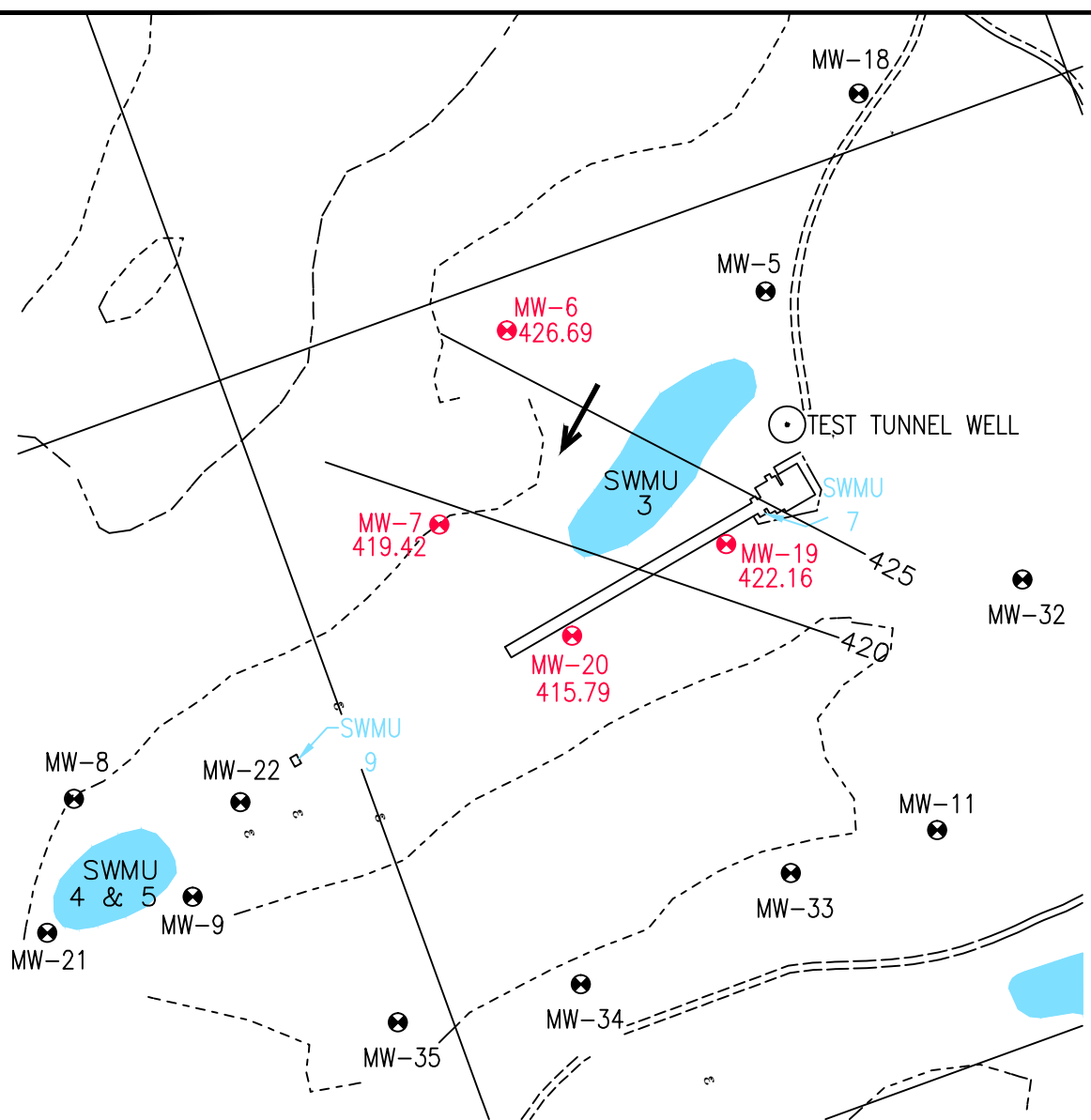


FIGURE B-11D
POTENTIOMETRIC SURFACE MAP
DECEMBER 2006
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: K.SASS	<p>creative thinking. custom solutions. (800) 588-7962 www.ensafe.com</p>
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B060	



LEGEND

UNPAVED ROAD	---	CONTOUR LINES	---
BUILDING	▭	TREE	•
POLE	⊥	TREE OUTLINE	- - - -
SUSPECTED SWMU	SWMU-3	SPOT ELEVATION	•
MONITORING WELL (COVER ZONE)	⊗ MW-3	MANHOLE	•
		MONITORING WELL (PERCHED ZONE)	⊗ MW-6

SOURCE: DEVELOPMENT & ENVIRONMENTAL PLANNING ASSOCIATES, INC.

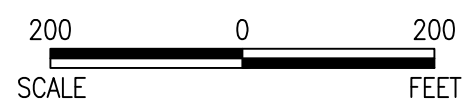
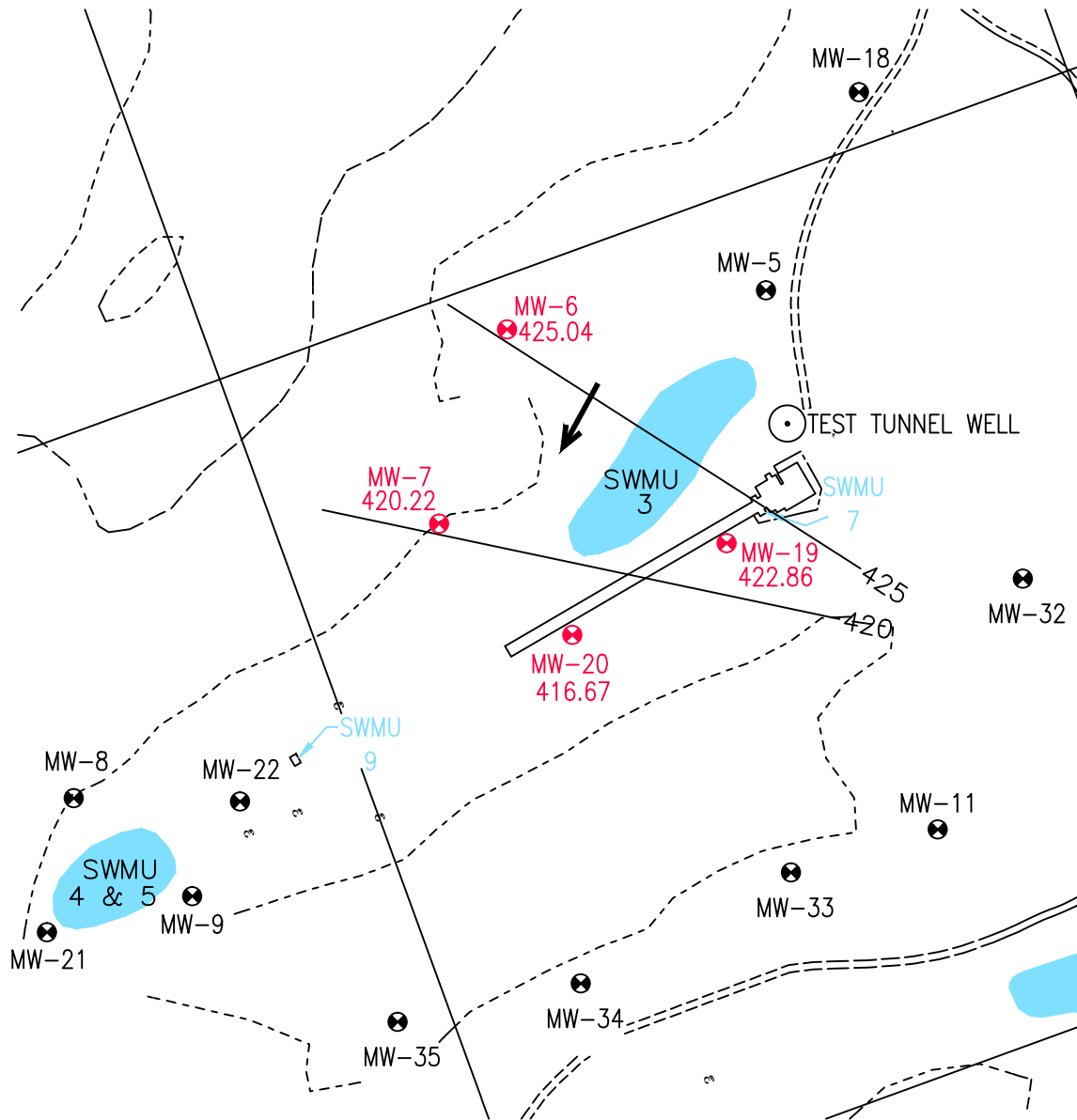
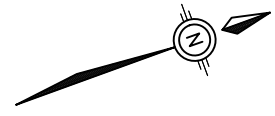


FIGURE B-12A
 POTENTIOMETRIC SURFACE MAP
 PERCHED ZONE - MARCH 2006
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY:	K.SASS
DRAWN BY:	BRONSON
DWG DATE:	05/09/15
DWG NO:	15139_B061

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LEGEND

UNPAVED ROAD		CONTOUR LINES	
BUILDING		TREE	
POLE		TREE OUTLINE	
SUSPECTED SWMU		SPOT ELEVATION	
	SWMU-3	MANHOLE	
MONITORING WELL (COVER ZONE)		MONITORING WELL (PERCHED ZONE)	
	MW-3		MW-6

SOURCE: DEVELOPMENT & ENVIRONMENTAL PLANNING ASSOCIATES, INC.

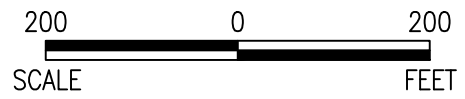
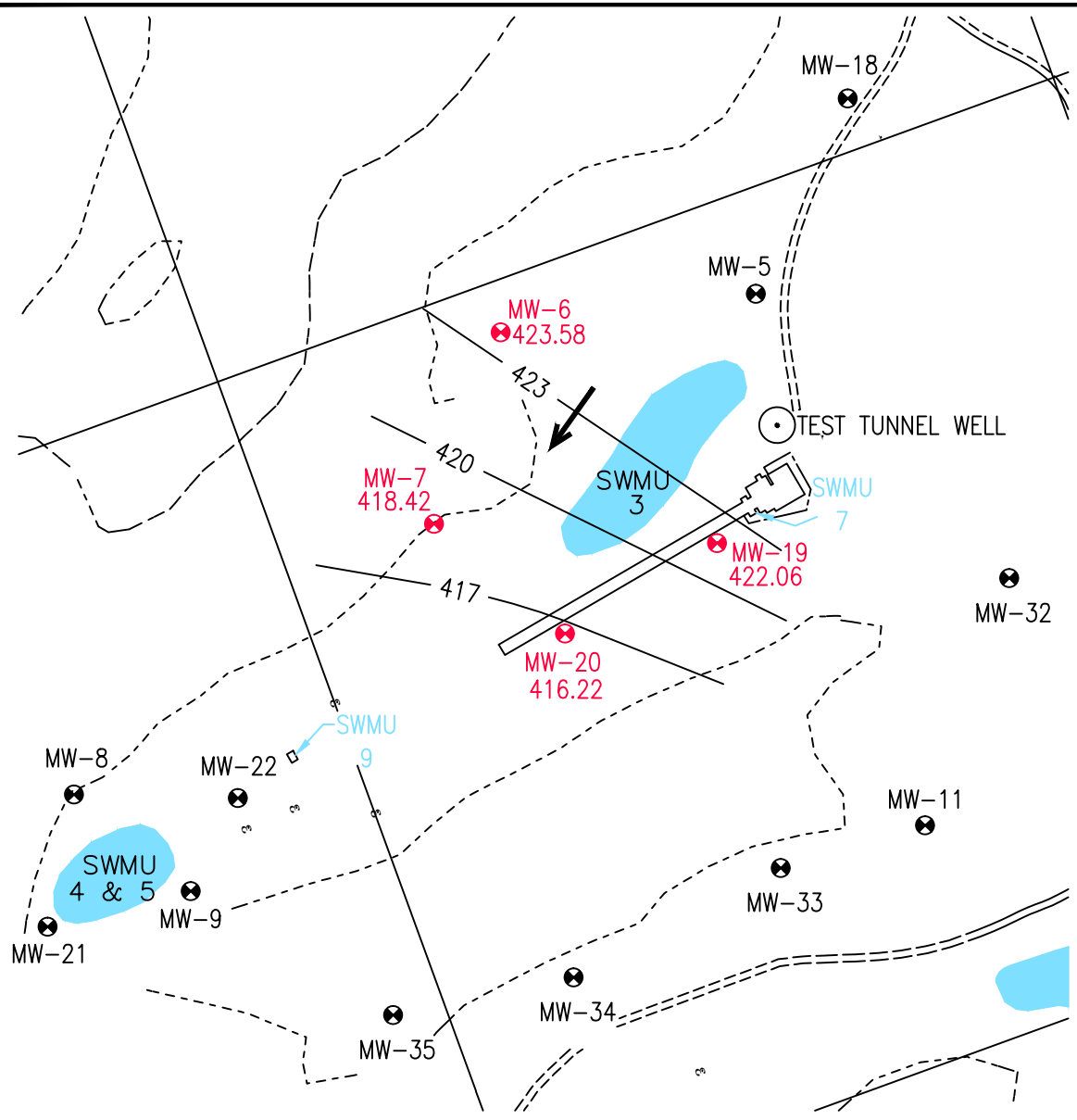
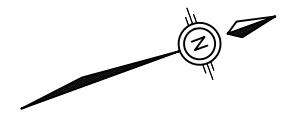


FIGURE B-12B
 POTENTIOMETRIC SURFACE MAP
 PERCHED ZONE - JUNE 2006
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY: K.SASS	
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B062	

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LEGEND

UNPAVED ROAD	---	CONTOUR LINES	---
BUILDING	▭	TREE	⊙
POLE	⊙	TREE OUTLINE	- - -
SUSPECTED SWMU	SWMU-3	SPOT ELEVATION	•••
MONITORING WELL (COVER ZONE)	⊙	MANHOLE	•
	MW-3	MONITORING WELL (PERCHED ZONE)	•
			MW-6

SOURCE: DEVELOPMENT & ENVIRONMENTAL PLANNING ASSOCIATES, INC.

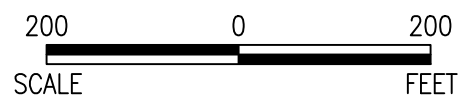
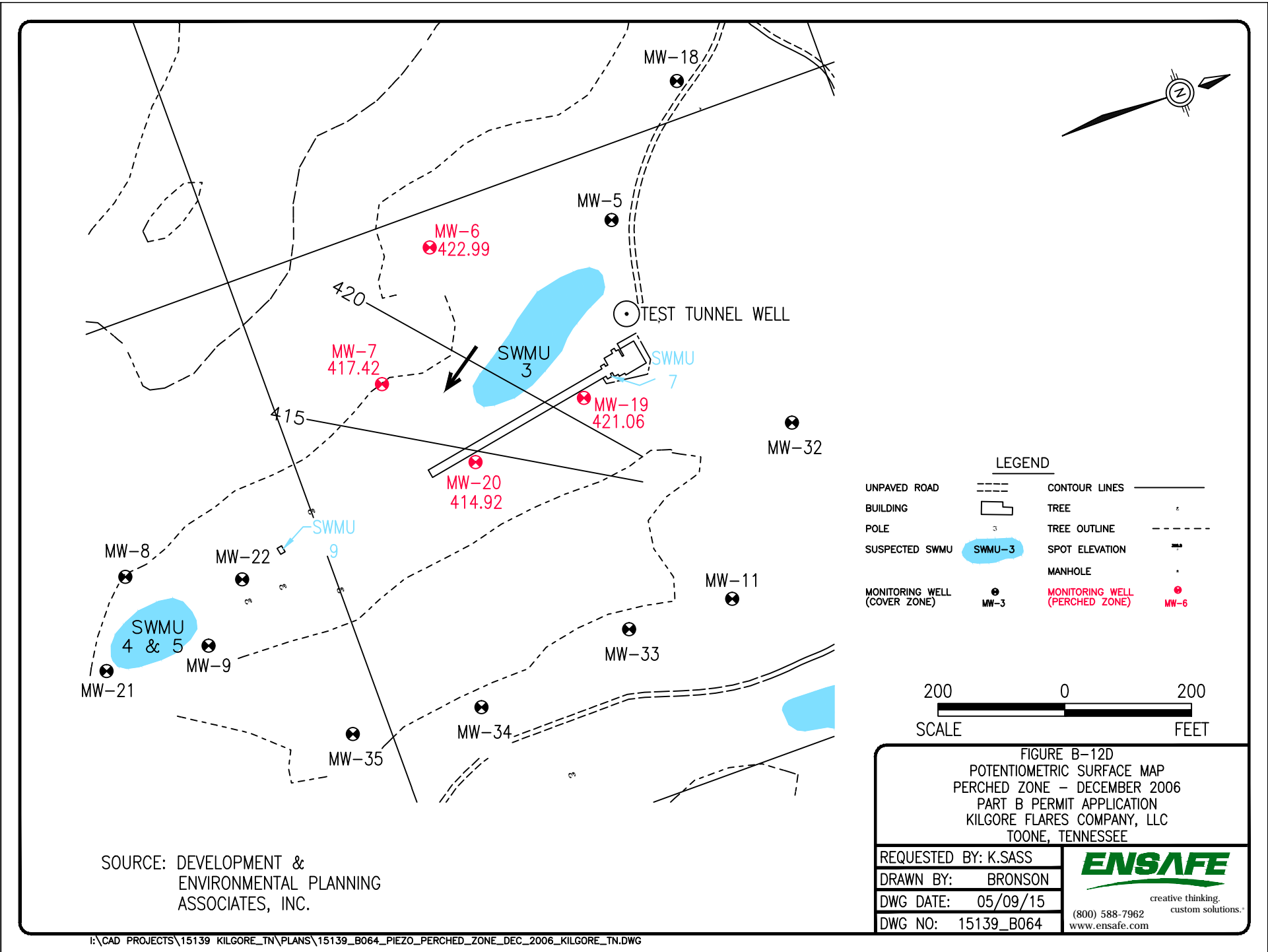


FIGURE B-12C
 POTENTIOMETRIC SURFACE MAP
 PERCHED ZONE - SEPTEMBER 2006
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE


REQUESTED BY:	K.SASS
DRAWN BY:	BRONSON
DWG DATE:	05/09/15
DWG NO:	15139_B063






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SOURCE: DEVELOPMENT & ENVIRONMENTAL PLANNING ASSOCIATES, INC.

FIGURE B-12D
 POTENTIOMETRIC SURFACE MAP
 PERCHED ZONE - DECEMBER 2006
 PART B PERMIT APPLICATION
 KILGORE FLARES COMPANY, LLC
 TOONE, TENNESSEE

REQUESTED BY: K.SASS	 creative thinking. custom solutions.™ (800) 588-7962 www.ensafe.com
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B064	

- LEGEND**
-  - DIRECTION OF ROUTE
 -  - STOP SIGN
 -  - HAZARDOUS WASTE OPEN BURN AREA (HWOPA) FENCE
 -  - ROAD
 -  - GRAVEL ROAD

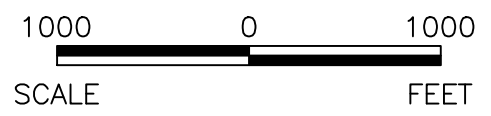
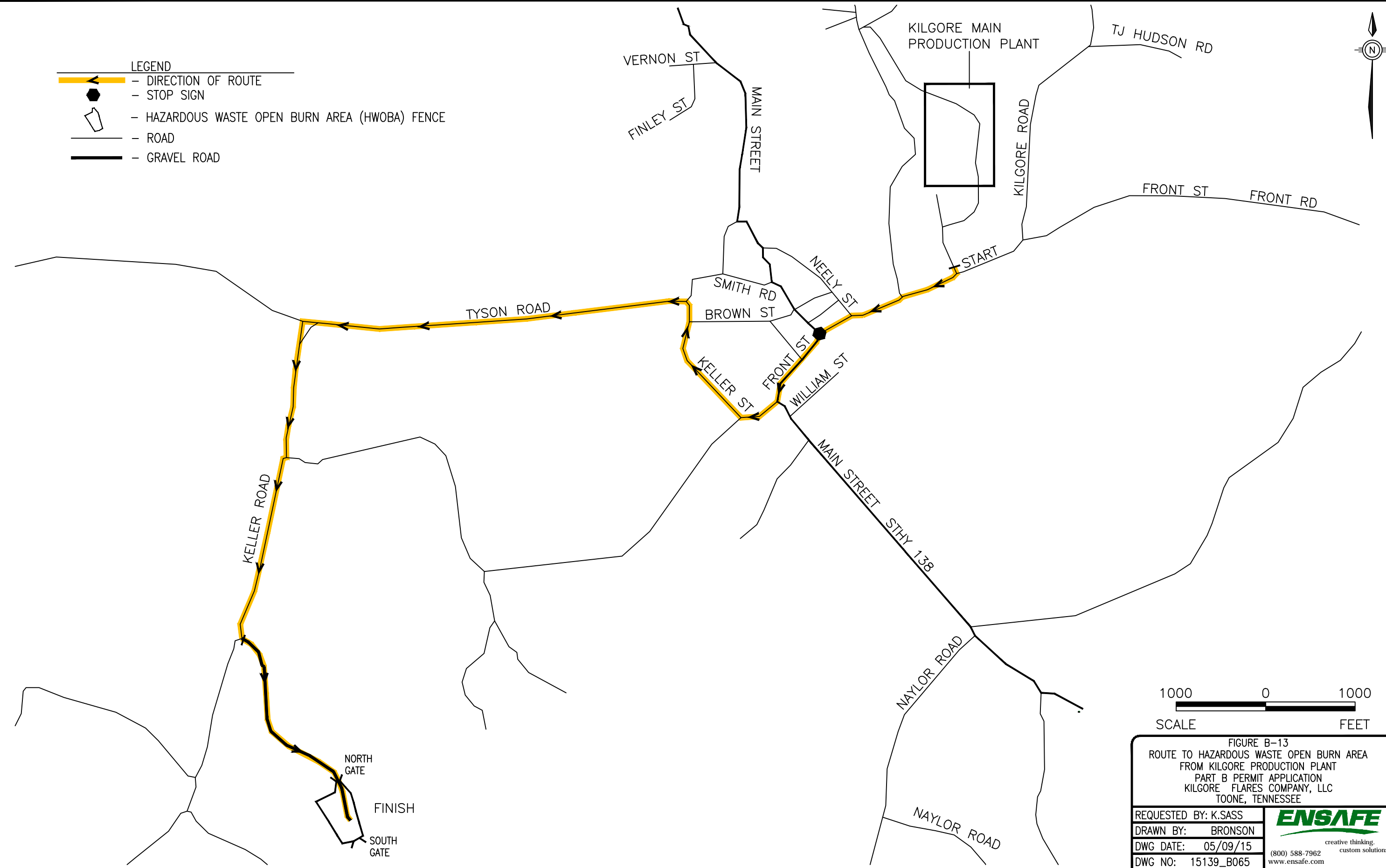
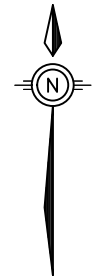



FIGURE B-13 ROUTE TO HAZARDOUS WASTE OPEN BURN AREA FROM KILGORE PRODUCTION PLANT PART B PERMIT APPLICATION KILGORE FLARES COMPANY, LLC TOONE, TENNESSEE	
REQUESTED BY: K.SASS	 creative thinking. custom solutions. (800) 588-7962 www.ensafe.com
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B065	

Appendix B-2
Hazardous Waste Transporter Permit



STATE OF TENNESSEE
 DEPARTMENT OF ENVIRONMENT AND CONSERVATION
 DIVISION OF SOLID WASTE MANAGEMENT
 HAZARDOUS WASTE MANAGEMENT PROGRAM

HAZARDOUS WASTE TRANSPORTER PERMIT

A HAZARDOUS WASTE TRANSPORTER PERMIT IS REQUIRED IN THE STATE OF TENNESSEE BY THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION FOR THE TRANSPORTATION OF HAZARDOUS WASTES THAT ORIGINATE IN THE STATE OF TENNESSEE AND / OR HAVE A TENNESSEE DESTINATION

THIS PERMIT IS NOT TRANSFERABLE

THIS PERMIT ISSUED TO:
KILGORE FLARES COMPANY LLC

**KILGORE DRIVE
 TOONE, TN USA**

PERMIT NUMBER	EFFECTIVE DATE	EXPIRATION DATE
TND007020159	January 23, 2015	January 31, 2016

PERMIT EFFECTIVE UNTIL THE ABOVE EXPIRATION DATE UNLESS SUSPENDED, REVOKED, OR VOLUNTARILY RESCINDED

T
N
D
0
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7
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2
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1
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9
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5
3
5
6

SPECIAL INSTRUCTIONS:

1. AN ORIGINAL OR PHOTOCOPY OF THIS PERMIT MUST BE KEPT IN EACH TRANSPORT VEHICLE.
2. GENERATORS OF HAZARDOUS WASTE IN THE STATE OF TENNESSEE ARE REQUIRED BEFORE SIGNING HAZARDOUS WASTE MANIFESTS, TO VERIFY THAT THE TRANSPORTERS TO WHOM THEY GIVE THEIR WASTE POSSESS A VALID TENNESSEE HAZARDOUS WASTE TRANSPORTER PERMIT. THE GENERATORS' VERIFICATION PROCESS ENSURES THAT:
 - (a) THE TRANSPORTER BUSINESS NAME ON THE PERMIT IS THE SAME AS THE MANIFEST'S ITEM 5, TRANSPORTER 1 COMPANY NAME;
 - (b) THE ASSIGNED PERMIT NUMBER IS THE SAME AS THE MANIFEST'S ITEM 6, U.S. EPA ID NUMBER;
 - (c) THE MANIFEST'S ITEM 16, GENERATOR'S CERTIFICATION, IS SIGNED BY THE GENERATOR ON OR AFTER THE EFFECTIVE DATE BUT NO LATER THAN THE EXPIRATION DATE.
3. THIS PERMIT SUPERCEDES ALL PREVIOUSLY ISSUED STATE OF TENNESSEE HAZARDOUS WASTE TRANSPORTER PERMITS INCLUDING ORIGINALS, FACSIMILES AND PHOTOCOPIES. DESTROY ALL PREVIOUSLY ISSUED PERMITS TO PREVENT ILLEGAL ACTIVITIES.
4. REPORT SPILLS WITHIN THE STATE OF TENNESSEE IMMEDIATELY TO 1-800-262-3300 (THE TENNESSEE EMERGENCY MANAGEMENT AGENCY - T.E.M.A.).

Patrick J. Flood 1/23/2015
 Patrick J. Flood, PE, Director

Division of Solid Waste Management

FOR MORE INFORMATION CONTACT:

STATE OF TENNESSEE
 DEPARTMENT OF ENVIRONMENT AND CONSERVATION
 DIVISION OF SOLID WASTE MANAGEMENT
 WASTE ACTIVITY AUDIT SECTION -- ATTENTION CONNIE JONES
 WILLIAM R. SNODGRASS TENNESSEE TOWER
 312 ROSA L. PARKS AVENUE, 14th FLOOR
 NASHVILLE, TN 37243
 PHONE: 615-532-0815 FAX: 615-532-0938 eMail: Connie.Jones@tn.gov



Appendix B-3
Summary of Solid Waste Management Units

**Appendix B-3
Summary of SWMUs and Areas of Concern**

Name of SWMU or AOC	Unit Description	Operational History and Current Status	Comments	Potentially Affected Media
SWMU-1	Hazardous Waste Open Burn Area (Pre RCRA)	1962 to present; RCRA-managed facility with permit application pending. On-going monitoring	Scrap magnesium & phosphorus pyrotechnics, lead, and barium compounds, diesel fuel, and chlorinated solvents.	Surface soil and groundwater
SWMU-1a	Burn pan area west; Sub-Unit 1	1970s to present; RCRA-managed facility with permit application pending. On-going monitoring	Scrap magnesium & phosphorus pyrotechnics, diesel fuel, and chlorinated solvents.	Surface soil and groundwater
SWMU-1b	Burn pan area southeast; Sub-Unit 2	1986 to present; RCRA- managed facility with permit application pending. On-going monitoring	Scrap magnesium pyrotechnics and diesel fuel, and chlorinated solvents.	Surface soil and groundwater
SWMU-1c	Burn pan area southwest; Sub-Unit 3	1986 to present; RCRA-managed facility with permit application pending. On-going monitoring	Scrap phosphorous pyrotechnics and chlorinated solvents.	Surface soil and groundwater
SWMU-1d	Burn pan area southeast; Sub-Unit 4	1990 to present; On-going monitoring	None	None
SWMU-1e	Pallet accumulation area	Since the 1970s; On-going monitoring	None	None
SWMU-1f	Burial pits	1970s through 1986; On-going monitoring	EPH (diesel fuel)	Surface soil and groundwater
SWMU-2	Drainage ditches	1962 to present; No further action required (8/14/2000)	None	None
SWMU-3	Pyro ash landfills	1963-1986; RCRA regulated facility; On-going monitoring	Scrap magnesium & phosphorus pyrotechnics, and chlorinated solvents.	Groundwater
SWMU-4	CapComp landfills	1965-1974; RCRA regulated facility; On-going monitoring	Scrap magnesium & phosphorus pyrotechnics, and chlorinated solvents.	Groundwater
SWMU-5	Phosphorous landfills	1963-1986; RCRA regulated facility; On-going monitoring	Scrap magnesium & phosphorus pyrotechnics, and chlorinated solvents.	Groundwater
SWMU-6	Paper landfills	1961-1967 (P-1) 1967-1983 (P-2 & P-3); On-going monitoring	None	None
SWMU-7	Test tunnel waste accumulation area	1989 to present; On-going monitoring	None	None
SWMU-8	Dumpster	1989 to present; On-going monitoring	None	None

**Appendix B-3
Summary of SWMUs and Areas of Concern**

Name of SWMU or AOC	Unit Description	Operational History and Current Status	Comments	Potentially Affected Media
SWMU-9	Test tunnel sand piles	1989 to present; On-going monitoring	None	None
SWMU-10	Personal Protective Equipment Area	2012; Background phosphorus soil sampling required by TDEC. Status is pending.	Soil sampling conducted in 2013; background soil sampling to be completed in mid-2014	Surface Soil
SWMU-11	Pole Barn Test Area	2012; no further action proposed	None	None
SWMU-12	Marine Location Marker Test Area	2012; Work plan approved by TDEC; Soil sampling completed on February 21, 2014. Status is pending.	Status is pending sampling results	Pending.
AOC-1	Pugh Creek	1962 to present; No further action required (8/14/2000)	None	None
AOC-2	Product testing area	1962 to present; On-going monitoring	None	None

Appendix B-4
Offsite Receptor Report



EDR - Offsite Receptor Report

Kilgore OB Unit
Keller Road
Toone, TN 38381

Inquiry Number: 0458655.2r

February 01, 2000

**The Source
For Environmental
Risk Management
Data**

3530 Post Road
Southport, Connecticut 06490

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

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Thank you for your business
Please contact EDR at 1-800-352-0050
with any questions or comments.

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The address of the subject property, for which the search was intended, is:

KILGORE OB UNIT
KELLER ROAD
TOONE, TN 38381

Distance Searched: 5.000 miles from subject property

RECEPTOR SUMMARY

An X indicates the presence of the receptor within the search radius.

Residential Population

Estimated population within search radius: 3657 persons.

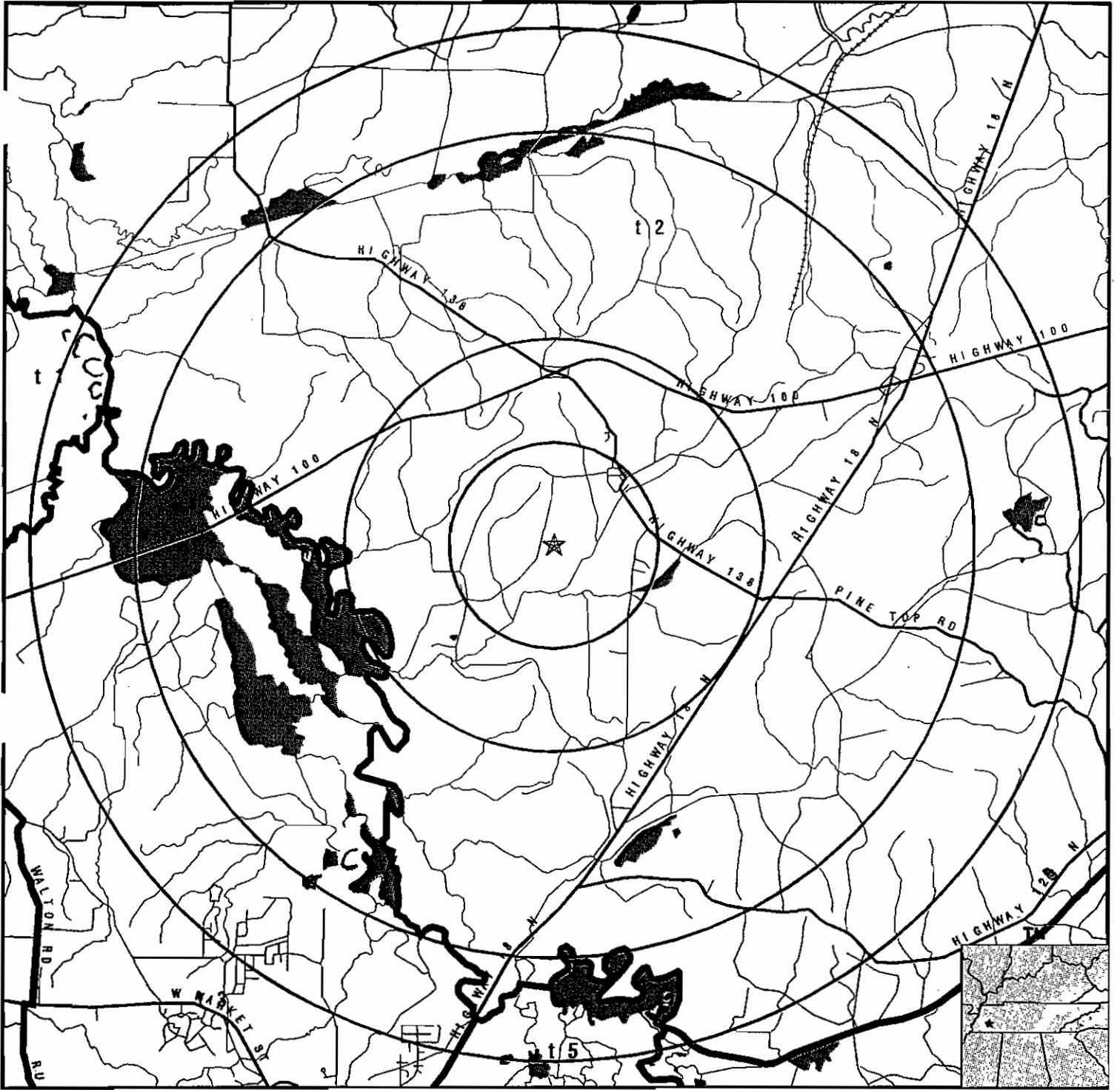
Other Public Receptors

Type	Within Search Radius	Sites Total
Day Care Centers:	<input checked="" type="checkbox"/>	2
Medical Centers:	<input type="checkbox"/>	
Nursing Homes:	<input type="checkbox"/>	
Schools:	<input checked="" type="checkbox"/>	2
Hospitals:	<input type="checkbox"/>	
Arena:	<input type="checkbox"/>	
Prison:	<input type="checkbox"/>	

Environmental Receptors

Type	Within Search Radius	Sites Total
Federal Land:	<input type="checkbox"/>	

CENSUS MAP - 0458655.2r



- ★ Target Property
- Roads
- Waterways
- Census Tracts

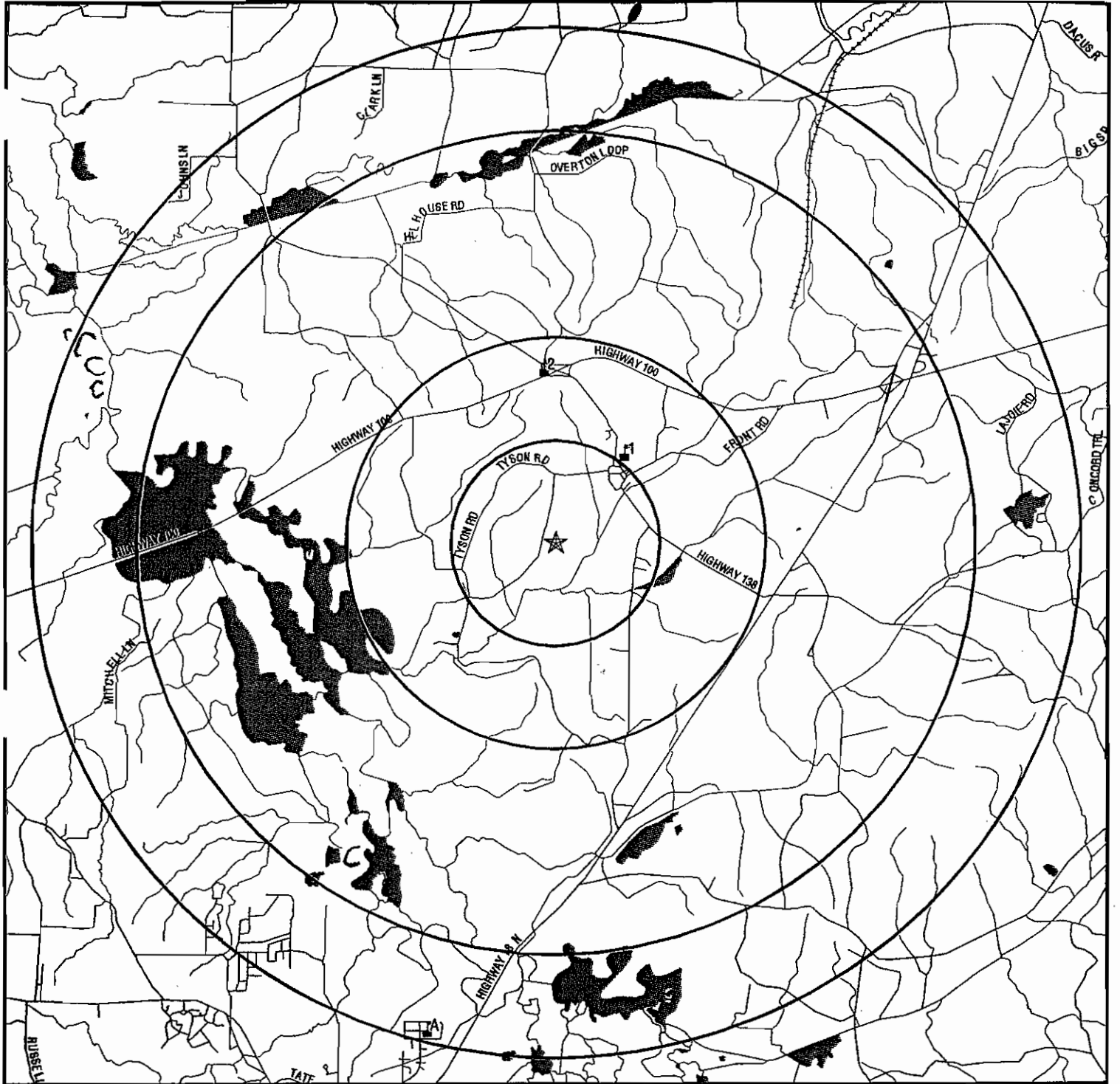


TARGET PROPERTY:	Kilgore OB Unit	CUSTOMER:	ENSAFE
ADDRESS:	Keller Road	CONTACT:	Holly P. Knack
CITY/STATE/ZIP:	Toone TN 38381	INQUIRY #:	0458655.2r
LAT/LONG:	35.3419 / 88.9639	DATE:	February 01, 2000 7:00 pm

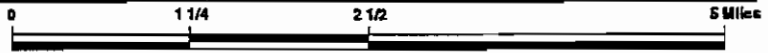
CENSUS FINDINGS

<u>Map ID</u>	<u>Tract Number</u>	<u>Total Population</u>	<u>Population in Radius</u>	<u>Total Area(sq.mi.)</u>	<u>Area in Radius(sq.mi.)</u>
T1	9502.00	3044	20.2	91.28	0.61
T2	9501.00	2333	1284.1	112.83	62.10
T3	9503.00	4315	2283.0	26.57	14.06
T4	9507.00	1265	0.6	73.35	0.04
T5	9504.00	5937	68.7	115.68	1.34

RECEPTOR MAP - 0458655.2r



- ★ Target Property
- Roads
- Waterways
- Environmental or Public Receptor
- Federal Lands Linear Features
- Federal Lands Area



TARGET PROPERTY:	Klgore OB Unit	CUSTOMER:	ENSAFE
ADDRESS:	Keller Road	CONTACT:	Holly P. Knack
CITY/STATE/ZIP:	Toone TN 38381	INQUIRY #:	0458655.2r
LAT/LONG:	35.3419 / 88.9639	DATE:	February 01, 2000 7:01 pm

MAP FINDINGS

Map ID Direction Distance Distance (ft.) Elevation	Site	EDR ID Database
1 NE 1-2 mi 5742 Higher	Name: Toone Elementary School ID: 1319783 Site Type: school Latitude: 35.35400 Longitude: -88.95000	GNS1363498 GNIS_SCH
2 North 1-2 mi 8933 Higher	Name: Toone School ID: 1272775 Site Type: school Latitude: 35.36600 Longitude: -88.97000	GNS1363499 GNIS_SCH
A3 SSW 4-6 mi 25324 Higher	Name: * CLEMENTINE YOUNG - REGISTERED HOME ID: 585468164 Site Type: Daycare ctr	DAY1064351 DAYCARE
A4 SSW 4-6 mi 26284 Higher	Name: MOUNT ZION DAY CARE CENTER ID: 585468175 Site Type: Daycare ctr	DAY1064352 DAYCARE

RECORDS SEARCHED/DATA CURRENCY TRACKING

CENSUS

Source: U.S. Census Bureau

Telephone: 301-457-4100

1990 U.S. Census data was used to estimate residential population following these EPA guidelines:

"Census data are presented by Census tract. If your circle covers only a portion of the tract, you should develop an estimate for that portion...Determine the population density per square mile (total population of the Census tract divided by the number of square miles in the tract) and apply that density figure to the number of square miles within your circle."

FED_LAND: Federal Lands

Source: USGS

Telephone: 703-648-5094

Federal lands data. Includes data from several Federal land management agencies, including Fish and Wildlife Service, Bureau of Land Management, National Park Service, and Forest Service. Includes National Parks, Forests, Monuments; Wildlife Sanctuaries, Preserves, Refuges; Federal Wilderness Areas.

Date of government version: 09/09/97.

HCFA: Provider of Services Listing

Source: The Health Care Financing Administration

Telephone: 410/786-3000

A listing of hospitals with Medicare provider number, produced by The Health Care Financing Administration (HCFA), a federal agency within the U.S. Department of Health and Human Services.

HCFA runs the Medicare and Medicaid programs.

Date of government version: 06/01/98.

CCD: Common Core of Data

Source: National Center for Education Statistics

555 New Jersey Avenue NW

Washington, DC 20208-5651

The Common Core of Data (CCD) is the National Center for Education Statistics' primary database on elementary and secondary public education in the United States. CCD is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Date of government version: 1995-96.

GNIS: Geographic Names Information System

Source: USGS

Telephone: 703-648-5094

The Geographic Names Information System (GNIS), developed by the USGS in cooperation with the U.S. Board on Geographic Names (BGN), contains information about almost 2 million physical and cultural geographic features in the United States. The GNIS is our Nation's official repository of domestic geographic names information.

Date of government version: 03/01/98.

PRV_SCH: Private Schools

EDR indicates the location of buildings and facilities - private schools - where individuals who are public receptors are likely to be located.

DAYCARE: Daycare Centers

EDR indicates the location of buildings and facilities - daycare centers - where individuals who are public receptors are likely to be located.

MEDCEN: Medical Centers

EDR indicates the location of buildings and facilities - medical centers - where individuals who are public receptors are likely to be located.

NURSING: Nursing Homes

EDR indicates the location of buildings and facilities - nursing homes - where individuals who are public receptors are likely to be located.

ARENA: Arenas

EDR indicates the location of buildings and facilities - arenas - where individuals who are public receptors are likely to be located.

PRISON: Prisons

EDR indicates the location of buildings and facilities - prisons - where individuals who are public receptors are likely to be located.

BOP: Bureau of Prisons Facilities

Source: Federal Bureau of Prisons

List of facilities operated by the Federal Bureau of Prisons.

Date of government version: 07/01/98.

Kilgore Test and Treatment Facility

1455 Keller Road

Toone, TN 38381

Inquiry Number: 3898504.1s

April 01, 2014

EDR Offsite Receptor Report

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The address of the subject property, for which the search was intended, is:

KILGORE TEST AND TREATMENT FACILITY
1455 KELLER ROAD
TOONE, TN 38381

Distance Searched: 0.500 miles from subject property

RECEPTOR SUMMARY

An X indicates the presence of the receptor within the search radius.

Residential Population

Estimated population within search radius: 17 persons.

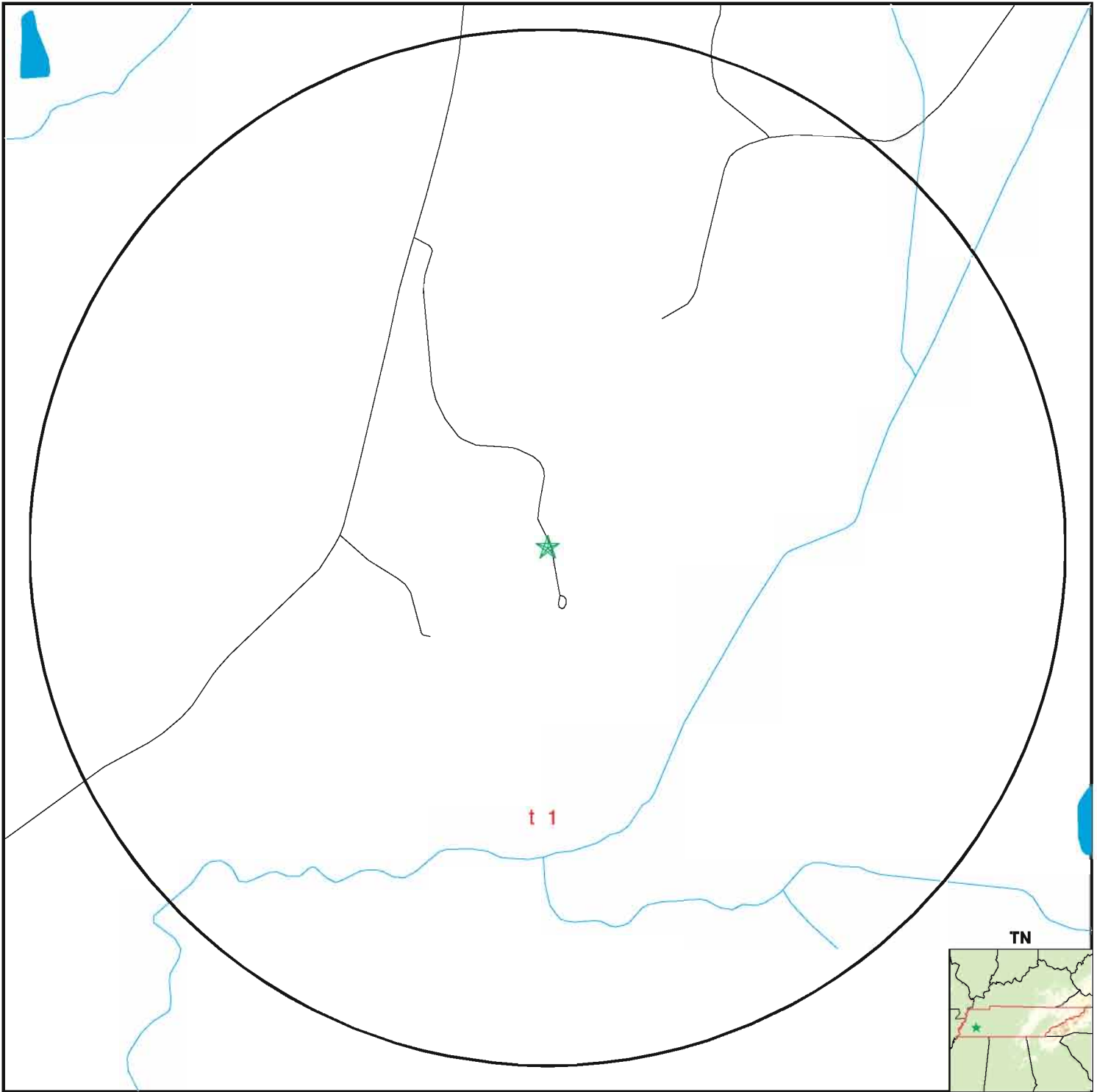
Other Public Receptors

Type	Within Search Radius	Sites Total
Day Care Centers:	<input type="checkbox"/>	
Medical Centers:	<input type="checkbox"/>	
Nursing Homes:	<input type="checkbox"/>	
Schools:	<input type="checkbox"/>	
Hospitals:	<input type="checkbox"/>	
Colleges:	<input type="checkbox"/>	
Arena:	<input type="checkbox"/>	
Prison:	<input type="checkbox"/>	

Environmental Receptors

Type	Within Search Radius	Sites Total
Federal Land:	<input type="checkbox"/>	

CENSUS MAP - 3898504.1s



- ★ Target Property
- ∩ Roads
- ∩ Waterways
- ∩ Census Tracts



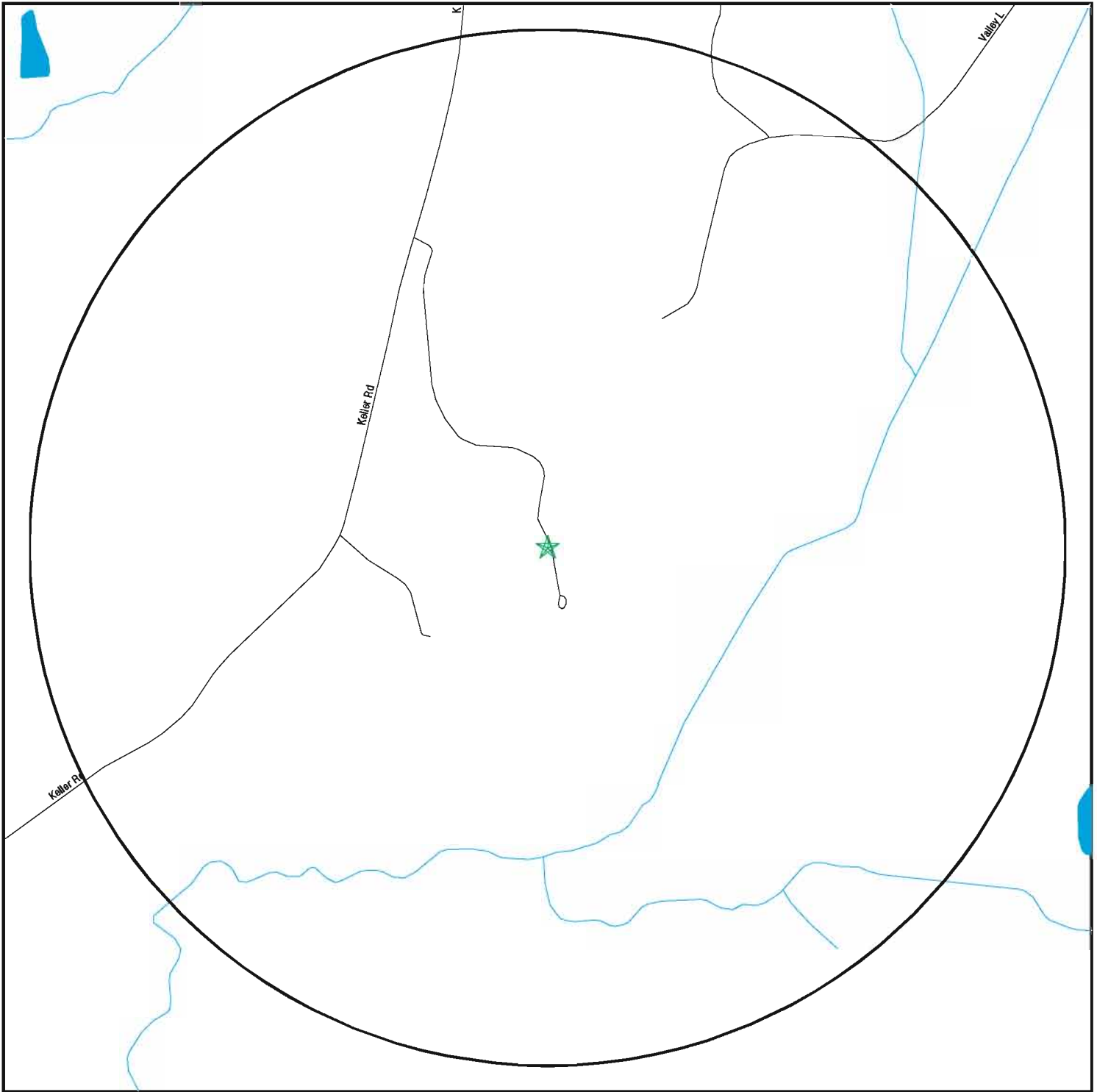
TARGET PROPERTY: Kilgore Test and Treatment Facility
ADDRESS: 1455 Keller Road
CITY/STATE/ZIP: Toone TN 38381
LAT/LONG: 35.3400 / 88.9630

CUSTOMER: ENSAFE
CONTACT: Holly Brauer
INQUIRY #: 3898504.1s
DATE: April 01, 2014 4:28 pm

CENSUS FINDINGS

<u>Map ID</u>	<u>Tract Number</u>	<u>Total Population</u>	<u>Population in Radius</u>	<u>Total Area(sq.mi.)</u>	<u>Area in Radius(sq.mi.)</u>
T1	9501.00	3959	16.8	184.16	0.78

RECEPTOR MAP - 3898504.1s



- ★ Target Property
- ∩ Roads
- ∩ Waterways
- ⊥ Environmental or Public Receptor
- ∩ Federal Lands Linear Features
- ∩ Federal Lands Area



TARGET PROPERTY: Kilgore Test and Treatment Facility	CUSTOMER: ENSAFE
ADDRESS: 1455 Keller Road	CONTACT: Holly Brauer
CITY/STATE/ZIP: Toone TN 38381	INQUIRY #: 3898504.1s
LAT/LONG: 35.3400 / 88.9630	DATE: April 01, 2014 4:29 pm

MAP FINDINGS

Map ID
Direction
Distance
Distance (ft.)
Elevation

Site

EDR ID
Database

No Sites Reported.

RECORDS SEARCHED/DATA CURRENCY TRACKING

Census

Source: U.S. Census Bureau

Telephone: 301-763-4636

2010 U.S. Census data was used to estimate residential population following these EPA guidelines:
"Census data are presented by Census tract. If your circle covers only a portion of the tract, you should develop an estimate for that portion...Determine the population density per square mile (total population of the Census tract divided by the number of square miles in the tract) and apply that density figure to the number of square miles within your circle."

FED_LAND: Federal Lands

Source: USGS

Telephone: 888-275-8747

Federal lands data. Includes data from several Federal land management agencies, including Fish and Wildlife Service, Bureau of Land Management, National Park Service, and Forest Service. Includes National Parks, Forests, Monuments; Wildlife Sanctuaries, Preserves, Refuges; Federal Wilderness Areas.

AHA Hospitals:

Source: American Hospital Association, Inc.

Telephone: 312-280-5991

The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing

Source: Centers for Medicare & Medicaid Services

Telephone: 410-786-3000

A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes

Source: National Institutes of Health

Telephone: 301-594-6248

Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools

Source: National Center for Education Statistics

Telephone: 202-502-7300

The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools

Source: National Center for Education Statistics

Telephone: 202-502-7300

The National Center for Education Statistics' primary database on private school locations in the United States.

Colleges - Integrated Postsecondary Education Data

Source: National Center for Education Statistics

Telephone: 202-502-7300

The National Center for Education Statistics' primary database on integrated postsecondary education in the United States.

Arenas

Source: Dunhill International

EDR indicates the location of buildings and facilities - arenas - where individuals who are public receptors are likely to be located.

Prisons: Bureau of Prisons Facilities

Source: Federal Bureau of Prisons

Telephone: 202-307-3198

List of facilities operated by the Federal Bureau of Prisons.

Daycare Centers: Child Care Listing

Source: Department Of Human Services

Telephone: 615-313-4778

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Appendix B-5
TDEC File Information
for Bolivar — Hardeman County Landfill

A.4.0 PUMPING TEST INTERPRETATION

A.4.1 GENERAL

- December 1983
Ref. No. 1722(38)
- prepared by: CRA

Water level data were collected during the pumping tests for two purposes. One was to evaluate the effect on the piezometric surface and show the development of the cone of depression. The second was to examine the drawdown at each of the observation wells in order to calculate aquifer hydraulic coefficient such as transmissivity and hydraulic conductivity. Drawdown analyses were performed using methods developed by Cooper and Jacob (1946), Hantush (1956) and Neuman (1975).

A.4.2 HYDROGEOLOGIC BACKGROUND

The hydrostratigraphic units at the Site consist of a sand and silty sand aquifer with minor clay beds and an underlying aquitard which is predominantly clay and is the lower boundary of the sand aquifer. The sand unit is present from the surface (400 to 500 feet ASL) to an approximate elevation of 245 feet ASL which is the elevation of the top of the clay unit known as the Porter's Creek Formation.

The aquifer hydrostratigraphic unit is comprised of two stratigraphic units: the Claiborne and Wilcox Formations. These formations were deposited during the Tertiary period and the sediments are characteristic of non marine fluvial or deltaic depositional environments. Lithologically, the formations are very similar and can be treated as one hydrostratigraphic unit. The hydrostratigraphic unit consists of fine sand to silty and clayey sand with occasional thin lenses of clay. The sediments are often thinly interbedded and individual beds or groups of beds do not persist laterally. Stratigraphic cross sections showing the EW-1 and EW-2 areas are shown on Figures A.4.1 and A.4.2. The cross section locations were previously shown on Figure A.2.1.

The stratigraphy of the EW-1 area is as follows:

0 - 32'	interbedded sand, clay and clayey sand
32' - 73'	silty to clayey sand with minor clay laminae
73' - 119'	fine to medium sand
119' - 145'	fine grained sand and silty sand with minor clay laminae
145' - 160'	fine sand
160'	clay (Porter's Creek Formation)

The water table is seven feet below the ground surface, so the full thickness of the aquifer is approximately 153 feet in the EW-1 area.

The stratigraphy of the EW-2 area is as follows:

0 - 20'	silty to clayey sand
20' - 75'	fine to medium sand
75' - 85'	sandy clay to clayey sand
85' - 117'	fine sand and silty sand with minor clay laminae
117' - 146'	clay

The water table is approximately 62 feet below the ground surface, so the aquifer is approximately 55 feet thick in the EW-2 area.

The aquifer is unconfined, however, locally, the presence of clay lenses may cause confined conditions. Aquifer recharge is primarily through the infiltration of precipitation. Groundwater flow is in a northerly direction from the landfill Site and discharge occurs in the Clover Creek flood plain and the lower reaches of Pugh Creek. The average hydraulic gradient is 0.004, however, in the area of EW-2 the horizontal gradient is approximately 0.006. Groundwater elevation contours are shown on Figure A.4.3.

A.4.3 EFFECTS ON WATER LEVELS

A.4.3.1 EW-1 Test

Groundwater water flow in the area of EW-1 is north-northwest with a horizontal hydraulic gradient of 0.004 ft/ft (see Figure A.4.3). The aquifer here is approximately 153 feet. The total drawdown at the completion of pumping in all wells monitored during the EW-1 test are summarized on Table A.4.1. Examination of this table shows that significant drawdowns were measured throughout the entire aquifer thickness. At GM9B (monitoring the shallowest position of the aquifer) at maximum drawdown of 0.35 feet was observed. At CRA-5A (monitoring the deepest portion of aquifer) had a maximum drawdown of 5.40 feet. Based on this information it is concluded that the extraction well can provide hydraulic containment over the entire aquifer thickness.

A plot of the maximum drawdown measured during the EW-1 pumping test is shown on Figure A.4.4. The lines of equal drawdown were contoured for the deep interval of the aquifer. Examination of this figure shows that the radius of influence extends well beyond 200 feet from the pumping well and the end of the test.

A.4.3.2 EW-2 Test

Groundwater flow in the vicinity of EW-2 is north-northwest with a horizontal gradient of 0.006 ft/ft. The aquifer thickness was taken as 55 feet, the distance from the water table to the top of the clay bed at the base of the well. A summary of the maximum drawdowns measured is shown on Table A.4.1. While the maximum drawdowns are illustrated on Figure A.4.5.

Observation well CRA-16, located 203 feet from EW-2, exhibited a drawdown of 0.37 feet even though this well is screened at the top of the aquifer. This response indicates that the aquifer behaves as a single

hydrostratigraphic unit and that the presence of clay beds do not prevent hydraulic containment over the entire aquifer thickness.

A.4.3.3 Summary

The water level responses observed during the EW-1 and EW-2 aquifer tests confirmed that the aquifer behaves as a single hydrostratigraphic unit. The presence of clay beds within the aquifer did not effect the achievement of hydraulic capture at each test extraction well location at any of the depth intervals measured in the observation wells even though the wells were partially penetrating into the aquifer. Therefore, partially penetrating extraction wells can be incorporated into the groundwater extraction system design to provide the required level of control.

A.4.4 TRANSMISSIVITY CALCULATIONS

A.4.4.1 EW-1 Test

Pumping well EW-1 and observation wells EW-1/OBS2, EW-1/OBS2, CRA-5A, CRA-5B, GM9A and GM9B provided drawdown and recovery data for aquifer analysis. The drawdown and recovery data for the observation wells was plotted and analyzed using groundwater graphics "Graphical Well Analysis Package" (GWAP). The pumping well was plotted and analyzed manually. The time-drawdown and recovery curves are presented in Attachment IV.

Observation wells EW-1/OBS1, EW-1/OBS2, GM9A and GM9B exhibited delayed yield in their response to pumping. As a result, the drawdown data were analyzed using the Neuman type-curve method. Observation wells CRA-5A and CRA-5B, which are completed in lower position of the aquifer below thin clay beds, responded as a typical leaky confined aquifer. As a result the wells were analyzed using the method on Hantush. The pumping well data were analyzed by the Cooper-Jacobs

method. Due to the fact that flow rate was adjusted during the test, only the data for the first 350 minutes were used in the aquifer parameter calculations.

A summary of the calculated transmissivity values is presented on Table A.4.2. The calculated average transmissivity ranged from 630 ft²/day (CRA-5A) to 2472 ft²/day (EW-1). The average transmissivity for all monitored wells is 1550 ft²/day. This values is representative of the entire aquifer thickness at EW-1. Using an aquifer thickness of 160 feet, the aquifer has an average hydraulic conductivity of 9.75 ft/day (3.6×10^{-3} cm/sec).

A.4.4.2 EW-2 Test

Pumping well EW-2 and observation wells EW-2/OBS1, EW-2/OBS2 and CRA-16 provided drawdown and recovery data for aquifer evaluations. The pumping rate fluctuation in the early part of the test made the drawdown data for EW-2 unanalyzable. However, the recovery data were plotted manually and analyzed using the Cooper-Jacobs method. The observation well data were plotted and analyzed using the CWAP package. All wells were analyzed using the Neuman type-curve method for delayed gravity response in unconfined aquifers. The time-drawdown and recovery curves are presented in Attachment IV.

A summary of the calculated transmissivities is also provided on Table A.4.2. Examination of this table shows that the transmissivity values for EW-2 (recovery) and CRA-16 are not consistent with the materials encountered. The calculated values for CRA-16 may be affected by partial penetration affects. As a result, only the analysis of EW-2/OBS1 and EW-2/OBS2 were used to calculate the average transmissivity of 534 ft²/day. Using a aquifer thickness of 55 feet an average hydraulic conductivity of 9.7 ft/day (3.5×10^{-3} cm/sec) is obtained.

ATTACHMENT I

**STRATIGRAPHIC AND INSTRUMENTATION LOGS
ENGINEERING DESIGN TASK WELLS**

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-99)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 125' EAST OF CRA-5

HOLE DESIGNATION: EW-1
 (Page 1 of 3)
 DATE COMPLETED: AUGUST 11, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	407.24 405.0				
- 5.0	SP-SAND, trace silt, dense, very fine grained, poorly graded, tan					
- 10.0						
- 15.0		397.0				
- 20.0	SC/CL-SAND and CLAY, trace silt, thin inter-bedded layers, stiff to very stiff, low to high plasticity, tan and reddish tan sand, white and tan clay			1SS		37
- 25.0		381.0		2SS		16
- 30.0				3SS		26
- 35.0				4SS		12
- 40.0				5SS		16
- 45.0		359.0		6SS		32
- 50.0	SM/CL-SAND and CLAY, some silt, dense to very stiff, low plasticity, poorly graded, tan, gray, and reddish tan			7SS		37
- 55.0				8SS		28
- 60.0				9SS		41
- 65.0				10SS		33

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

WATER FOUND

STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-99)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 125' EAST OF CRA-5

HOLE DESIGNATION: EW-1
 (Page 2 of 3)
 DATE COMPLETED: AUGUST 11, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0			BENTONITE GROUT	11SS	X	34
75.0			BENTONITE PELLET SEAL	12SS	X	26
80.0			6"Ø LOW CARBON STEEL CASING	13SS	X	51
85.0			12"Ø BOREHOLE	14SS	X	44
90.0				15SS	X	50
95.0	SP/SW-SAND, trace silt (occasional), dense to very dense, poor and well graded, tan	313.0		16SS	X	26
100.0				17SS	X	100/ 12"
105.0			SAND PACK	18SS	X	100/ 10"
110.0			STAINLESS STEEL WELL SCREEN	19SS	X	37
115.0				20SS	X	75
120.0	ML-SILT, some clay (layers), trace fine grained sand, low to medium plasticity, tan to gray	289.0		21SS	X	43
125.0				22SS	X	27
130.0	SC/CL-SAND and CLAY, some silt, dense, low plasticity, poorly graded, tan to gray	280.0		23SS	X	28

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○

WATER FOUND ∇

STATIC WATER LEVEL ▽

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-99)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 125' EAST OF CRA-5

HOLE DESIGNATION: EW-1
 (Page 3 of 3)
 DATE COMPLETED: AUGUST 11, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
-135.0			<p style="font-size: small;">STAINLESS STEEL WELL SCREEN</p> <p style="font-size: small;">SAND PACK</p> <p style="font-size: small;">12" BOREHOLE</p> <p style="font-size: small;">BACKFLUSH VALVE WITH CONCRETE PLUG</p>	24SS	X	30	
-140.0							
-145.0	SM-SAND, some silt, dense to very dense, very fine to fine grained, poorly graded, gray to tan	260.0			25SS	X	40
-150.0					26SS	X	50/ 4"
-155.0							
-160.0	CH-CLAY (Porters Creek Clay), very plastic, blue gray	245.0					
-165.0	END OF HOLE ● 165.0 FT. BGS	240.0					
-170.0							
-175.0							
-180.0							
-185.0							
-190.0							
-195.0							

SCREEN DETAILS:
 Screened Interval:
 86.0 to 157.4' BGS
 Length -71.4'
 Diameter -6.0"
 Slot # 20
 Material -Stainless Steel
 Sand pack interval:
 76.0 to 165.0' BGS
 Material -# 10-20 Mesh


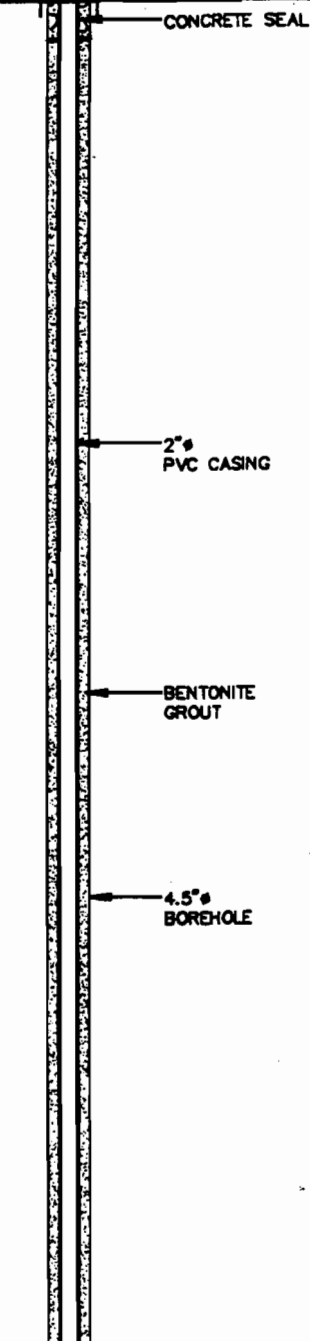
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L100)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 50' NORTH OF EW-1

HOLE DESIGNATION: EW-1 / OBS-1
 (Page 1 of 3)
 DATE COMPLETED: AUGUST 13, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUM REF	STATE	PLA V
	REFERENCE POINT (Top of Riser) GROUND SURFACE	405.84 404.1				
5.0	For stratigraphy from 0.0 to 20.0 ft BGS see CRA-5B	384.1				
10.0						
15.0						
20.0				SC/CL-SAND and CLAY, thin to medium beds, trace silt, dense, stiff to very stiff, fine to medium grained, plastic, poorly graded, white to tan and reddish tan	1SS	X
25.0						
30.0						
35.0						
40.0						
45.0						
50.0						
55.0						
60.0						
65.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L100)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 50' NORTH OF EW-1

HOLE DESIGNATION: EW-1 / OBS-1
 (Page 2 of 3)
 DATE COMPLETED: AUGUST 13, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0						
75.0	SP/SW-SAND, trace silt, dense to very dense, very fine to medium grained, interbedded poorly graded and well graded, white to tan	329.1	BENTONITE GROUT			
80.0		4.5" BOREHOLE				
85.0		BENTONITE PELLET SEAL				
90.0		SAND PACK		5SS	X	34
95.0						
100.0				7SS	X	50/ 5"
105.0						
110.0				8SS	X	50/ 6"
115.0			PVC WELL SCREEN			
120.0	ML/CL-SILT and CLAY, thin interbeds, trace sand, very stiff, low plasticity, white to tan	286.1		9SS	X	25
125.0						
130.0						

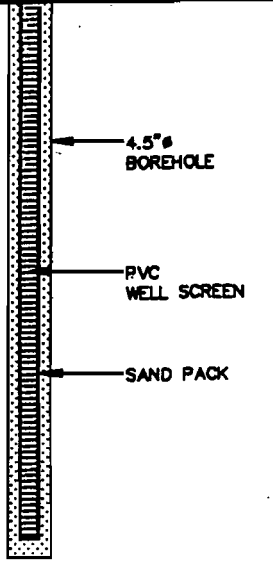
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L100)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 50' NORTH OF EW-1

HOLE DESIGNATION: EW-1 / OBS-1
 (Page 3 of 3)
 DATE COMPLETED: AUGUST 13, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
-135.0			 <p style="font-size: small;">4.5" BOREHOLE</p> <p style="font-size: small;">PVC WELL SCREEN</p> <p style="font-size: small;">SAND PACK</p> <p>SCREEN DETAILS: Screened Interval: 98.0 to 158.0' BGS Length -60.0' Diameter -2.0" Slot # 10 Material -PVC Sand pack interval: 93.0 to 159.0' BGS Material -# 10-20 Mesh</p>	10SS	<input checked="" type="checkbox"/>	25	
-140.0							
-145.0							
-150.0	SC-SAND, some clay, medium dense, fine to medium grained, poorly graded, low plasticity, reddish tan to red brown	254.7			11SS	<input checked="" type="checkbox"/>	25
-155.0							
-160.0	END OF HOLE ● 159.0 FT. BGS	245.7					
-165.0							
-170.0							
-175.0							
-180.0							
-185.0							
-190.0							
-195.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS
 WATER FOUND
 STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L101)

PROJECT NAME: HARDEMAN COUNTY LANDFILL

HOLE DESIGNATION: EW-1 / OBS-2

PROJECT NO.: 1722


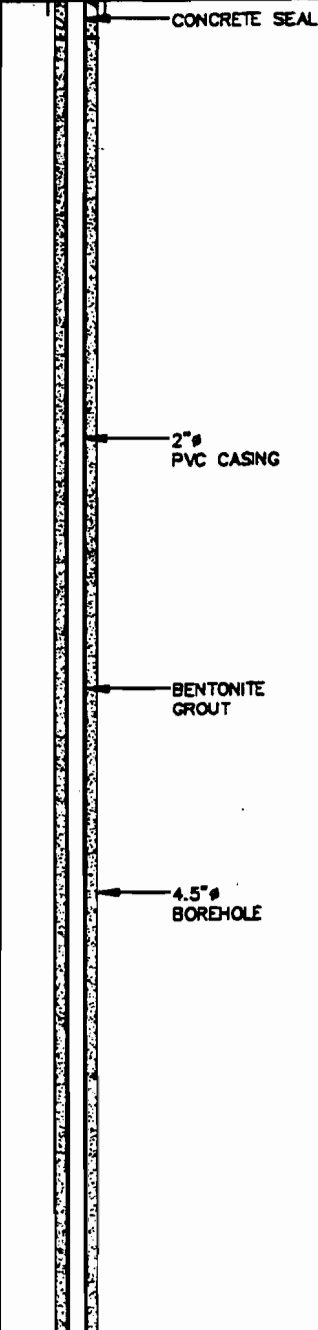
DATE COMPLETED: AUGUST 16, 1993
(Page 1 of 3)

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: WET ROTARY

LOCATION: 100' SOUTH OF EW-1

CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	407.77 405.7				
	For stratigraphy from 0.0 to 90.0 ft BGS see EW-1					
-5.0						
-10.0						
-15.0						
-20.0						
-25.0						
-30.0						
-35.0						
-40.0						
-45.0						
-50.0						
-55.0						
-60.0						
-65.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



WATER FOUND



STATIC WATER LEVEL



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L101)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 100' SOUTH OF EW-1

HOLE DESIGNATION: EW-1 / OBS-2
 (Page 2 of 3)
 DATE COMPLETED: AUGUST 16, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0						
75.0						
80.0						
85.0			BENTONITE GROUT			
90.0	SP/SC-SAND, thin interbeds of clay and sand, trace silt and mica, dense to very dense, fine to medium grained, light tan to pink	315.7		1SS	X	50/ 6"
95.0						
100.0			2" PVC CASING	2SS	X	42
105.0	CL/ML-CLAY and SILT, thin to medium beds, trace mica and sand, very stiff to hard, low to high plasticity, grayish tan	300.7	BENTONITE PELLET SEAL			
110.0			4.5" BOREHOLE	3SS	X	24
115.0						
120.0			SAND PACK	4SS	X	37
125.0						
130.0			PVC WELL SCREEN	5SS	X	29

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▽

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L101)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 100' SOUTH OF EW-1

HOLE DESIGNATION: EW-1 / OBS-2
 (Page 3 of 3)
 DATE COMPLETED: AUGUST 16, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
-135.0			<p style="font-size: small;">PVC WELL SCREEN</p> <p style="font-size: small;">SAND PACK</p> <p style="font-size: small;">4.5" BOREHOLE</p>				
-140.0							
-145.0							
-150.0	CH-CLAY (Porters Creek Clay), hard, plastic, black	255.7			7SS	X	46
-155.0							
-160.0							
-165.0	END OF HOLE @ 165.0 FT. BGS	240.7					
-170.0							
-175.0							
-180.0							
-185.0							
-190.0							
-195.0							

SCREEN DETAILS:
 Screened Interval:
 110.2 to 160.2' BGS
 Length - 50.0'
 Diameter - 2.0"
 Slot # 10
 Material - PVC
 Sand pack interval:
 105.0 to 165.0' BGS
 Material - # 10-20 Mesh

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L102)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 150' NORTHWEST OF CRA-16

HOLE DESIGNATION: EW-2
 (Page 1 of 3)
 DATE COMPLETED: AUGUST 10, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUM RMBM	STATE	N'V ECL FCL
	REFERENCE POINT (Top of Riser) GROUND SURFACE	450.49 447.8				
5.0	SP/SM-SAND, some silt (occasionally), medium dense, poorly graded, tan to reddish tan and white					
10.0						
15.0						
20.0						
25.0						
30.0						
35.0						
40.0						
45.0						
50.0	CL/SM-CLAY and SAND, some silt, very stiff, plastic, white and tan, mottled, moist	397.8 396.8		1SS	X	60
55.0	SW-SAND, trace silt, trace mica and sandstone, dense, fine to coarse grained, well graded, reddish tan and tan			2SS	X	101
60.0				3SS	X	100
65.0		392.8		4SS	X	43

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L102)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 150' NORTHWEST OF CRA-16

HOLE DESIGNATION: EW-2
 (Page 2 of 3)
 DATE COMPLETED: AUGUST 10, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0			BENTONITE PELLET SEAL	5SS	X	107
75.0	SC/CL-SAND and CLAY, some silt, dense, plastic, fine to coarse grained, well graded, reddish tan and white	372.8	8"Ø LOW CARBON STEEL CASING	6SS	X	47
80.0				7SS	X	39
85.0				SM-SAND, some silt, trace clay, very dense, fine grained, poorly graded, micaceous, gray to tan, wet	362.8	12"Ø BOREHOLE
90.0	9SS	X	56			
95.0	10SS	X	55			
100.0	11SS	X	68			
105.0	SP/SC-SAND thin interbeds of clay and sand, dense to very dense, poorly graded, tan to reddish tan	340.8	STAINLESS STEEL WELL SCREEN	12SS	X	70
110.0				13SS	X	90
115.0				14SS	X	90
120.0	CL-CLAY, laminated, trace silt, very stiff to very hard, plastic, tan to dark gray	329.8	SAND PACK	15SS	X	100
125.0	- thin lignite and black wood layers			16SS	X	65
130.0				BACKFLUSH VALVE WITH CONCRETE PLUG		

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○ WATER FOUND X STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L102)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 150' NORTHWEST OF CRA-16

HOLE DESIGNATION: EW-2
 (Page 3 of 3)
 DATE COMPLETED: AUGUST 10, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
-135.0						
-140.0						
-145.0		300.8				
-150.0	SM-SAND, some silt, trace clay, dense, fine grained, poorly graded, dark gray	295.8			17SS	X
-155.0	END OF HOLE ● 152.0 FT. BGS		<u>SCREEN DETAILS:</u> Screened Interval: 79.3 to 118.0' BGS Length - 38.7' Diameter - 6.0" Slot # 20 Material - Stainless Steel Sand pack interval: 69.0 to 152.0' BGS Material - # 10-20 Mesh			
-160.0						
-165.0						
-170.0						
-175.0						
-180.0						
-185.0						
-190.0						
-195.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE



CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L103)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 50' NORTH OF EW-2

HOLE DESIGNATION: EW-2 / OBS-1
 (Page 1 of 2)
 DATE COMPLETED: AUGUST 17, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				REFERENCE	STATE	FEDERAL
	REFERENCE POINT (Top of Riser) GROUND SURFACE	449.14 447.0				
5.0 10.0 15.0 20.0 25.0 30.0 35.0 40.0 45.0 50.0 55.0 60.0 65.0	For stratigraphy from 0.0 to 90.0 ft BGS see EW-1		 <p style="text-align: right; margin-right: 10px;">CONCRETE SEAL</p> <p style="text-align: right; margin-right: 10px;">2" PVC CASING</p> <p style="text-align: right; margin-right: 10px;">BENTONITE GROUT</p> <p style="text-align: right; margin-right: 10px;">4.5" BOREHOLE</p>			

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L103)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 50' NORTH OF EW-2

HOLE DESIGNATION: EW-2 / OBS-1
 (Page 2 of 2)
 DATE COMPLETED: AUGUST 17, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
70.0			<p style="font-size: small;">4.5" BOREHOLE CEMENT/BENTONITE GROUT BENTONITE PELLET SEAL 2" PVC CASING SAND PACK PVC WELL SCREEN</p>				
75.0							
80.0							
85.0							
90.0	SP-SAND, trace mica, dense, fine to medium grained, poorly graded, grayish tan	357.0			1SS	X	38
95.0							
100.0					2SS	X	46
105.0							
110.0	CL-CLAY, plastic, dark brown to black	336.0			3SS	X	52
115.0							
120.0	END OF HOLE ● 120.0 FT. BGS	327.0					
125.0							
130.0							

SCREEN DETAILS:
 Screened Interval:
 88.0 to 118.0' BGS
 Length - 30.0'
 Diameter - 2.0"
 Slot # 10
 Material - PVC
 Sand pack interval:
 83.0 to 120.0' BGS
 Material - # 10-20 Mesh

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE


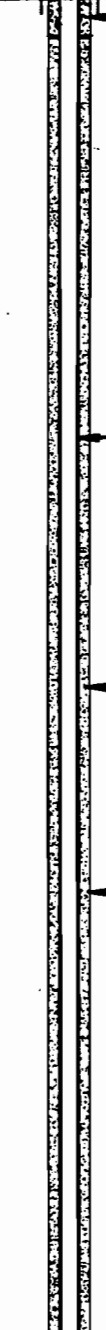
CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L104)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 100' NORTH OF EW-2

HOLE DESIGNATION: EW-2 / OBS-2
 (Page 1 of 2)
 DATE COMPLETED: AUGUST 18, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	448.25 446.1				
	For stratigraphy from 0.0 to 90.0 ft BGS see EW-2					
-5.0						
-10.0						
-15.0						
-20.0						
-25.0						
-30.0						
-35.0						
-40.0						
-45.0						
-50.0						
-55.0						
-60.0						
-65.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L104)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 100' NORTH OF EW-2

HOLE DESIGNATION: EW-2 / OBS-2
 (Page 2 of 2)
 DATE COMPLETED: AUGUST 18, 1993
 DRILLING METHOD: WET ROTARY
 CRA SUPERVISOR: M. REINHARDT

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
70.0			<p style="font-size: small; margin-top: 10px;"> SCREEN DETAILS: Screened Interval: 80.0 to 110.0' BGS Length -30.0' Diameter -2.0" Slot # 10 Material -PVC Sand pack interval: 75.0 to 112.0' BGS Material -# 10-20 Mesh </p>				
75.0							
80.0							
85.0							
90.0	SW-SAND, trace mica, dense, fine to coarse grained, well graded, tan	356.1			1SS	X	32
95.0							
100.0					2SS	X	53
105.0	CL-CLAY, trace sand and gravel, low plasticity, orange tan to reddish brown	341.1					
110.0	END OF HOLE ● 112.0 FT. BGS	334.1		3SS	X	51	
115.0							
120.0							
125.0							
130.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

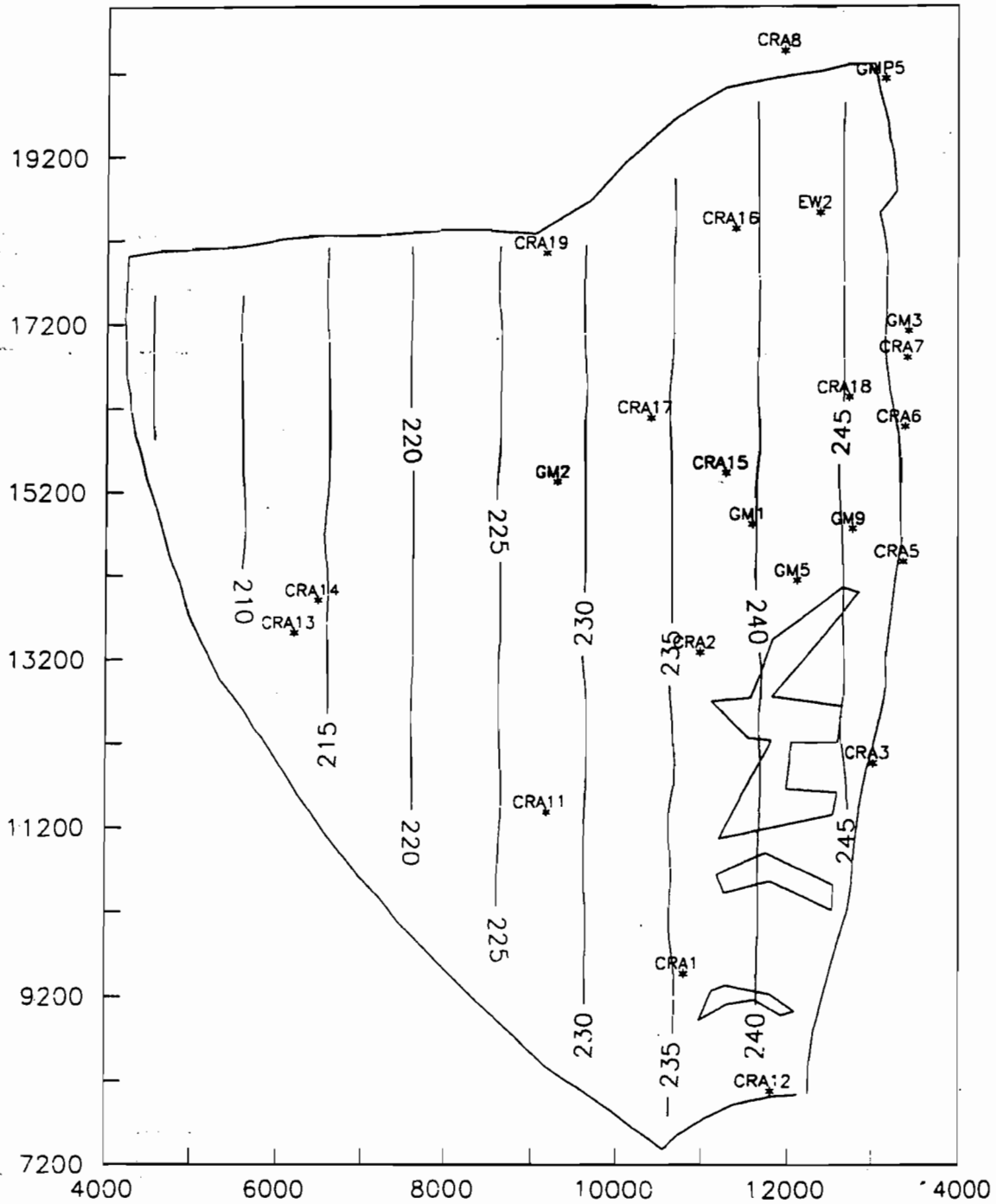


figure B.2.5

APPROXIMATE ELEVATION AT THE TOP
 PORTERS CREEK CLAY
 HARDEMAN COUNTY LANDFILL
 Hardeman County, Tennessee

CRA

- Remedial Investigation Report
Hardeman County Landfill
Volume II - Appendices
Hardeman County, TN
- April 1991
Ref. No. 1722(10)
- prepared by: CRA
- copied: Appendix F
Appendix G

APPENDIX F

BOREHOLE LOG

VELSICOL'S ON-SITE SUPPLY WELL

Name of well: Mc Mechanical Corp Address: street 1189 Kibler St phone 901-241-0441
 Date well was completed: 11/7/57
 Well Contractor: Thompson License No. 22 Driller in charge of rig: McMechanical
 Name of road: Boyle and approximately 2 miles
 Location: NE, E, SE, S, SW, W, NW (circle one) of Boyle (nearest town, school, store, etc.)
 County in which well is located: Shreveport

Water Information	Description of rock: Use field terms such as color of rock and type of rock material. Do not describe by geologic name.	From	To
↓		-Feet-	-Feet-
	Top Soil	0	5
	Red Sand	5	20
	Coarse Yellow sand	20	35
	Clay	35	40
	Sand	40	50
	White Clay	50	55
	Sand	55	115
	White Clay	115	135
	Blue Clay	135	150
	Rock	150	155
	Blue Clay	155	165
	Sand	165	170
	White Clay	170	190
	Rock	190	195
	White Clay	195	215
	Coarse Sand	215	228
	Sand + Clay mixed	228	235
	Yellow Clay	235	250
	Blue Clay	250	300

Log of Well
 Total Depth: 225 feet
 Depth to the water-bearing zones:
 (1) 215 feet
 (2) _____ feet
 (3) _____ feet
 Yield of water-bearing zones:
 (1) 10 gpm
 (2) _____ gpm
 (3) _____ gpm
 Drawdown _____ feet
 Water level: 120 feet below land surface.
 Diameter of well: 4 inches from 0 feet to 225 feet
 _____ inches from _____ feet to _____ feet
 _____ inches from _____ feet to _____ feet
 Casing used to 225 feet with 4 inch Plastic casing (type)
 _____ feet to 225 feet
 Screen diameter: 6 inches, set from 221 feet to 225 feet
 Type Screen: Fiberglass Slot size: _____
 Gravel pack from 200 feet to 225 feet
 Purpose of well: Industrial, Domestic, municipal, etc.
 Remarks: _____

Signed

2.8.78

CRA MONITORING WELL LOGS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-12)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: SW SIDE OF SITE

HOLE DESIGNATION: CRA-1A
 (Page 1 of 4)
 DATE COMPLETED: AUGUST 7, 1988
 DRILLING METHOD: HOLLOW STEM AUGER/
 WET ROTARY
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION		SAMPLE		
					NUMBER	STATE	VALUE
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	505.21 502.3					
5.0	(CL) CLAY, some silt, fine roots at surface, very stiff, brown, dry	498.3			1SS	X	28
		496.8			2SS	X	23
					3SS	X	72
					4SS	X	61
					5SS	X	35
10.0	(SC) SAND, fine grained, clayey, little silt, very dense, reddish brown, dry				6SS	X	34
	(SM) SAND, fine grained, silty to little silt, dense to very dense, reddish brown, moist	490.3			7SS	X	60
					8SS	X	78
15.0	(SP-SM) SAND, fine grained, trace silt, very dense, orange-brown, moist	487.3			9SS	X	52
	(SP) SAND, fine grained, dense, orange-brown, moist				10SS	X	32
					11SS	X	41
20.0		481.3			12SS	X	28
	(SM) SAND, medium grained, little silt, occasional lense of sand, trace gravel, dense, orange-brown, moist				13SS	X	46
25.0					14SS	X	36
					15SS	X	38
30.0	(SP) SAND, fine grained, dense, beige, moist	472.3	16SS	X	47		
35.0			17SS	X	45		
40.0			18SS	X	47		
45.0	(SM) SAND, fine grained, silty to little silt, occasional thin layer of white sandy clay, very dense, reddish brown, moist to wet	459.3	19SS	X	62		
50.0			20SS	X	48		
55.0	(SP) SAND, fine to medium grained, trace mica to micaceous, medium to extremely dense, moist to 87' then saturated	447.3	21SS	X	62		
60.0			22SS	X	28		
65.0			23SS	X	64		

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-12)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE

HOLE DESIGNATION: CRA-1A
(Page 2 of 4)

PROJECT NO.: 1722

DATE COMPLETED: AUGUST 7, 1988

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HOLLOW STEM AUGER/
WET ROTARY

LOCATION: SW SIDE OF SITE

CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	N VALUE
70.0	(SP) SAND, fine to medium grained, trace mica to micaceous, medium dense to extremely dense, moist to 87' then saturated			23SS	X	64
75.0				24SS	X	27
80.0	-occasional thin layer white sandy clay			25SS	X	26
85.0		420.0		26SS	X	31
90.0				27SS	X	33
95.0				28SS	X	50
100.0				29SS	X	27
105.0				30SS	X	21
110.0				31SS	X	65
115.0				32SS	X	99
120.0	-trace silt -Begin Mud Rotary -			33SS	X	99#
125.0				34SS	X	99
130.0	(SP) SAND, very fine to medium grained, little mica to micaceous, layers of sandy clay and clay from 180.5' to 181.5', 200' to 200.5', and 222.5' to 223', light gray, saturated	370.3		35WC	X	
				36WC	X	

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL (8/31/88)

**STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)**

(L-12)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: SW SIDE OF SITE

HOLE DESIGNATION: CRA-1A
 (Page 3 of 4)
 DATE COMPLETED: AUGUST 7, 1988
 DRILLING METHOD: HOLLOW STEM AUGER/
 WET ROTARY
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
135.0	(SP) SAND, very fine to medium grained, little mica to micaceous, layers of sandy clay and clay from 180.5' to 181.5', 200' to 200.5' and 222.5' to 223', light gray, saturated	370.3	<p>CEMENT/ BENTONITE GROUT 4.0" Ø BOREHOLE</p>	35WC		
140.0						
145.0			<p>2" Ø STAINLESS STEEL PIPE</p>	36WC		
150.0						
155.0				37WC		
160.0						
165.0						
170.0						
175.0						
180.0						
185.0						
190.0				38WC		
195.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-12)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: SW SIDE OF SITE

HOLE DESIGNATION: CRA-1A
 (Page 4 of 4)
 DATE COMPLETED: AUGUST 7, 1988
 DRILLING METHOD: HOLLOW STEM AUGER/
 WET ROTARY
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
200.0	(SP) SAND, very fine to medium grained, little mica to micaceous, layers of sandy clay and clay from 180.5' to 181.5', 200' to 200.5' and 222.5' to 223', light gray, saturated			38WC	X		
205.0				39WC	X		
210.0				287.3	(40WC)	X	
215.0					X		
220.0					X		
225.0	END OF HOLE @ 223.0 FT. BGS	279.3					
230.0	NOTES: 1. # FOC - CEC analysis		<p><u>SCREEN DETAILS:</u> Screened Interval: 294.0 to 289.0 AMSL Length - 5' Diameter - 2" Slot # 010 Material - S.S. Sand pack interval: 299.0 to 281.0 AMSL</p>				
235.0							
240.0							
245.0							
250.0							
255.0							
260.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-13)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE

WELL DESIGNATION: CRA-1B
(Page 1 of 2)

PROJECT NO.: 1722


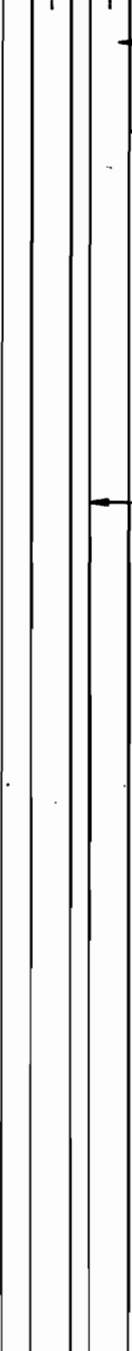
DATE COMPLETED: AUGUST 17, 1988

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HOLLOW STEM AUGER

LOCATION: SW CORNER OF SITE

CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION		SAMPLE		
					NUMBER	STATE	VALUE
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	505.12 502.3					
5.0	-Auger from surface to 100' BGS -See CRA-1A well log for stratigraphy						
10.0							
15.0							
20.0							
25.0							
30.0							
35.0							
40.0							
45.0							
50.0							
55.0							
60.0							
65.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-13)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: SW CORNER OF SITE

HOLE DESIGNATION: CRA-1B
 (Page 2 of 2)
 DATE COMPLETED: AUGUST 17, 1988
 DRILLING METHOD: HOLLOW STEM AUGER
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				N U M B E R	S T A T E	N V A L U E
70.0 75.0 80.0 85.0 90.0 95.0 100.0 105.0 110.0 115.0 120.0 125.0 130.0	-See CRA-1A well log for stratigraphy (SP) SAND, fine, micaceous, dense, tan to pinkish brown, saturated END OF HOLE @ 100.0 FEET BGS NOTES: 1. Natural sand pack	419.95 407.3 402.3	<p style="font-size: small;">SCREEN DETAILS: Screened Interval: 404.5 to 409.5 AMSL Length - 5' Diameter - 2" Slot # 010 Material - S.S Sand pack interval: 404.0 to 412.0 AMSL</p>	<div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: auto;">1SS</div>	<div style="border: 1px solid black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: auto;">X</div>	54


NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL (11/28/89)

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-14)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NW CORNER OF SITE

HOLE DESIGNATION: CRA-2A
 (Page 1 of 3)
 DATE COMPLETED: AUGUST 10, 1988
 DRILLING METHOD: HOLLOW STEM AUGER/
 WET ROTARY
 CRA SUPERVISOR: C. AHRENS, R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	509.07 506.2				
5.0	(ML) SILT, little to some clay, trace fine sand, very stiff to hard, light brown to reddish-brown, dry		← CEMENT/ BENTONITE GROUT	1SS		18
				2SS		64
				3SS		65
				4SS		47
			← 8.0" BOREHOLE	5SS		58
10.0	(SC-SM) SAND, fine grained, silty, trace to little clay, extremely dense, reddish-brown, dry	497.7		6SS		88
				7SS		87
				8SS		99
15.0	(SM) SAND, fine grained, silty, occasional thin layer of beige sand, dense, reddish brown, moist	494.2		9SS		34
				10SS		34
				11SS		32
20.0	(SP-SM) SAND, fine grained, trace silt, medium dense to dense, beige to orange-brown, moist	489.2		12SS		30
				13SS		31
				14SS		35
25.0				15SS		24
			← 2" STAINLESS STEEL PIPE			
30.0	(SP) SAND, fine grained, medium dense to dense, beige, moist	479.2		16SS		28
35.0				17SS		45
40.0				18SS		40
45.0				19SS		55
50.0	(SP-SM) SAND, fine grained, trace silt, interbedded with sand, dense to very dense, orange-brown, moist	460.4		20SS		38
55.0				21SS		52
60.0				22SS		58
65.0				23SS		75

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS  WATER FOUND  STATIC WATER LEVEL 

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-14)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NW CORNER OF SITE

HOLE DESIGNATION: CRA -2A
 (Page 2 of 3)
 DATE COMPLETED: AUGUST 10, 1988
 DRILLING METHOD: HOLLOW STEM AUGER/
 WET ROTARY
 CRA SUPERVISOR: C. AHRENS, R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0	(SP-SM) SAND, fine grained, trace silt, interbedded with sand, dense to very dense, orange-brown, moist	426.2	<p style="text-align: center;">← CEMENT/ BENTONITE GROUT</p> <p style="text-align: center;">← 8.0" Ø BOREHOLE</p>	23SS	X	75
75.0				24SS	X	45
80.0				25SS	X	57
85.0	(SM) SAND, trace to some silt, dense, light reddish brown, moist	411.2	<p style="text-align: center;">← 2" Ø STAINLESS STEEL PIPE</p>	26SS	X	40
90.0				27SS	X	59
95.0	(SP) SAND, very fine to medium grained, trace mica to micaceous, occasional thin (1") layer of white sandy clay, light pinkish gray to tan, moist to 102' then saturated	406.18	<p style="text-align: center;">← 4.0" Ø BOREHOLE</p> <p style="text-align: center;">▼ STATIC WATER LEVEL</p>	28SS	X	48
100.0				29SS	X	42
105.0				30SS	X	80
110.0				31SS	X	55
115.0	-Begin Mud Rotary -			32SS	X	52
120.0				33SS	X	52
125.0				34SS	X	24
130.0	(SP) SAND, fine to medium grained, light gray, saturated			35SS#	X	94
				36WC		

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ∩ STATIC WATER LEVEL ▼ (8/31/88)

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-14)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NW CORNER OF SITE

HOLE DESIGNATION: CRA-2A
 (Page 3 of 3)
 DATE COMPLETED: AUGUST 10, 1988
 DRILLING METHOD: HOLLOW STEM AUGER/
 WET ROTARY
 CRA SUPERVISOR: C. AHRENS, R. FIELD

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
135.0	(SP) SAND, fine to medium grained, light gray, saturated		CEMENT/ BENTONITE GROUT				
140.0			4.0" Ø BOREHOLE				
145.0							
150.0				BENTONITE SEAL	36WC		
155.0				SAND PACK			
160.0			2" Ø STAINLESS STEEL PIPE				
165.0							
170.0			WELL SCREEN				
175.0				(37WC)	X		
180.0	(SP-SM) SAND and SILTY SAND, light gray, interbedded with (CL-SC) CLAY and CLAYEY SAND, brown and white, layers are 3" to 2' thick	326.2		(38WC)	X		
185.0	(CL) CLAY, some silt, hard, light gray, interbedded with (SC) SAND, CLAYEY, fine grained, white, layers are 2" to 8" thick	319.2		39WC	X		
190.0	(CL) CLAY, some silt, trace fine sand, hard, light gray to gray, moist to wet	314.2	BENTONITE SEAL	(40CS)	X	#	
195.0	END OF HOLE @ 194.0 FT. BGS	312.2		41SS	X	99	
	NOTES: 1. Installed bentonite pellets from 194.0' to 188.0'. 2. # - FOC-COC analysis. 3. Natural backfill		SCREEN DETAILS: Screened Interval: 170.0 to 175.0' BGS Slot # 010 Length - 5' Material - S.S. Diameter - 2" Sand pack interval: 150.0 to 188.0' BGS				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-15)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE

HOLE DESIGNATION: CRA-2B
(Page 1 of 2)

PROJECT NO.: 1722


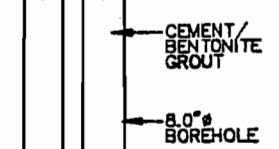

DATE COMPLETED: JULY 25, 1988

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HOLLOW STEM AUGER

LOCATION: NW CORNER OF SITE

CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION		SAMPLE		
					N U M B E R	S T A T E	V A L U E
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	509.29 506.2					
5.0	-Auger from surface to 112' BGS -See CRA-2A well log for stratigraphy						
10.0							
15.0							
20.0							
25.0							
30.0							
35.0							
40.0							
45.0							
50.0							
55.0							
60.0							
65.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-15)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NW CORNER OF SITE

HOLE DESIGNATION: CRA--2B
 (Page 2 of 2)
 DATE COMPLETED: JULY 25, 1988
 DRILLING METHOD: HOLLOW STEM AUGER
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	--See CRA-2A well log for stratigraphy					
70.0			CEMENT/ BENTONITE GROUT			
75.0			8.0" Ø BOREHOLE			
80.0			2" Ø STAINLESS STEEL PIPE			
85.0						
90.0						
95.0			BENTONITE SEAL			
100.0		406.04	SAND PACK			
105.0						
110.0			WELL SCREEN			
115.0	(SP) SAND, fine to medium grained, dense, beige, saturated	394.2		(1SS)	X	30
115.0	END OF HOLE @ 115 FEET BGS NOTES: 1. Natural sand pack.	391.2				
120.0						
125.0						
130.0						

SCREEN DETAILS:
 Screened interval:
 396.0 to 391.0 AMSL
 Length - 5'
 Diameter - 2"
 Slot # 010
 Material - S.S. Type 304
 Sand pack interval:
 409.5 to 390.0 AMSL


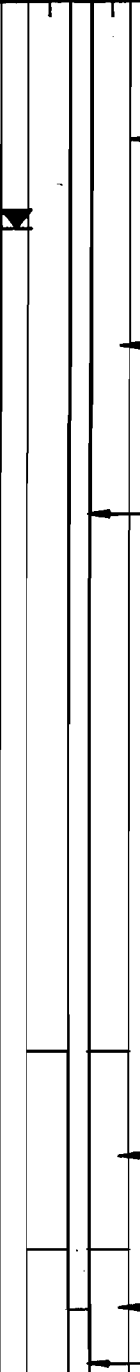
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼ (8/31/88)

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-58)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NEAR EAST-CENTRAL BOUNDARY

HOLE DESIGNATION: CRA-3A
 (Page 1 of 2)
 DATE COMPLETED: JUNE 21, 1989
 DRILLING METHOD: HSA 4-1/4" ID
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION		SAMPLE		
					NUMBER	STATE	N'V VALUE
	REFERENCE POINT(Top Of Casing) GROUND SURFACE	426.45 424.5					
5.0	SC(SAND), fine grained, clayey, medium dense red-brown, moist	422.0			1SS	X	20
	SM(SAND), fine grained, silty, trace clay, occasional layer of sandy clay, medium dense, red-brown to light brown-gray, moist				2SS	X	70
10.0		413.0			3SS	X	17
					4SS	X	29
					5SS	X	13
					6SS	X	23
					7SS	X	15
15.0	SC(SAND), fine grained, clayey, medium dense red-brown to yellow-brown, moist	410.5			8SS	X	10
					9SS	X	15
					10SS	X	9
20.0	SP-SM(SAND), fine grained, trace silt, dense yellow-brown, saturated	404.5			11SS	X	35
					12SS	X	26
25.0		398.5			13SS	X	34
					14SS	X	23
30.0	SM-CL(SAND/CLAY), fine grained, silty, yellow-brown, interbedded with clay, sandy, gray, medium dense, saturated				15SS	X	30
		390.5			16SS	X	11
35.0	SP(SAND), fine to medium grained, mica flakes, trace silt below 48 ft. BGS, medium dense, light gray to red-brown, saturated				17SS	X	25
40.0					18SS#	X	25
45.0					19SS	X	21
50.0					20SS	X	29
55.0				21SS	X	25	
60.0							
65.0	SM-SC(SAND), fine grained, some silt, little clay, occasional thin layer of clay, medium dense, light gray, saturated	359.5					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-58)

PROJECT NAME: HARDEMAN COUNTY LANDFILL

HOLE DESIGNATION: CRA-3A
(Page 2 of 2)

PROJECT NO.: 1722

DATE COMPLETED: JUNE 21, 1989

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HSA 4-1/4" ID

LOCATION: NEAR EAST-CENTRAL BOUNDARY

CRA SUPERVISOR: C. AHRENS

DEPTH ft.-BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0	SM-SC(SAND), fine grained, some silt, little clay, occasional thin layer of clay, medium dense, light gray, saturated			21SS	X	25
	Augers encountered hard clay (according to driller)	352.5		22SS	X	15
75.0	SHALE, slightly weathered, brownish-red	349.5		23SS	X	99
	MILTSTONE and fine SANDSTONE, thinly inter-bedded, light gray and light yellow-brown	348.8 348.3		24DB#+	X	
80.0	CL(CLAY), silty, little very fine sand, mica flakes, trace pyrite mineralization, gray, moist	344.5				
85.0	END OF HOLE @ 80 FT. BGS NOTES: 1. # - FOC-CEC analysis. 2. + - Chemical analysis.					
90.0						
95.0						
100.0						
105.0						
110.0						
115.0						
120.0						
125.0						
130.0						

SCREEN DETAILS:
 Screened Interval:
 66.0' to 71.0' BGS
 Length -5.0'
 Diameter -2"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 63.0' to 80.0' BGS
 Material - #4 Sand


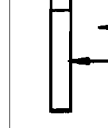
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

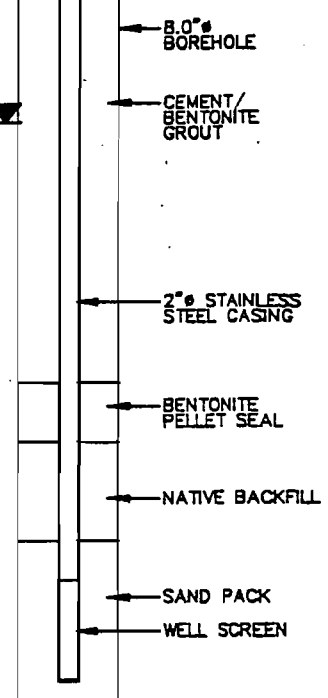
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-59)




PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NEAR EAST-CENTRAL BOUNDARY

HOLE DESIGNATION: CRA-3B
 DATE COMPLETED: JUNE 21, 1989
 DRILLING METHOD: HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	427.37 424.5				
	Auger from surface to 41.0 ft. BGS					
5.0						
10.0						
15.0						
20.0						
25.0						
30.0						
35.0						
40.0						
45.0	END OF HOLE @ 41.0 FT. BGS NOTES: 1. Stratigraphy and interval information taken from well CRA-3A.	383.5				
50.0						
55.0						
60.0						
65.0						



SCREEN DETAILS:
 Screened Interval:
 35.0' to 40.0' BGS
 Length - 5.0'
 Diameter - 2"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 33.0 to 41.0' BGS
 Material - #4 Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS  WATER FOUND  STATIC WATER LEVEL 

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-60)

PROJECT NAME: HARDEMAN COUNTY LANDFILL

HOLE DESIGNATION: CRA-4A
(Page 1 of 2)

PROJECT NO.: 1722


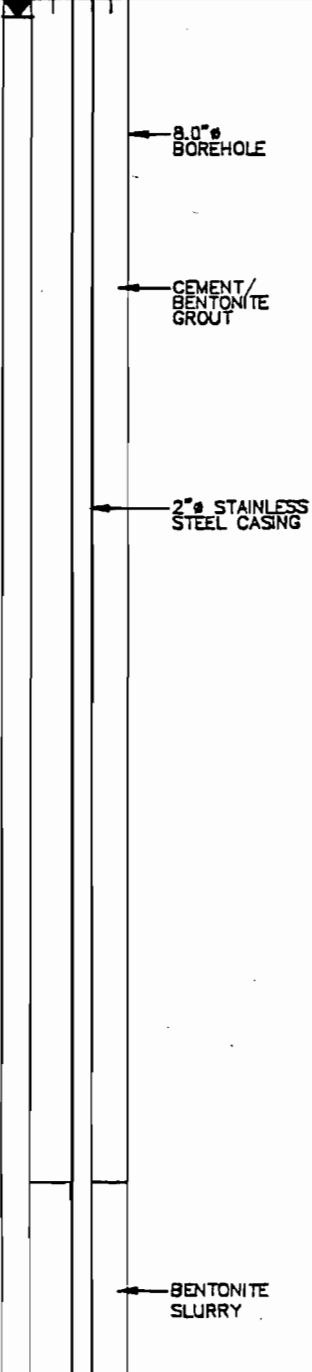
DATE COMPLETED: JULY 23, 1989

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HSA 4-1/4" ID

LOCATION: EAST SIDE OF PUGH CREEK

CRA SUPERVISOR: R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing) GROUND SURFACE	423.97 421.4				
5.0	CL(CLAY), silty, grading to clayey sand with depth, stiff, red-brown, moist to wet	420.44		1SS	X	14
				2SS	X	14
				3SS	X	14
				4SS	X	13
				5SS	X	26
				6SS	X	18
				7SS	X	17
				8SS	X	25
				9SS	X	30
				10SS	X	14
				11SS	X	12
				12SS	X	16
				13SS	X	21
				14SS	X	25
				15SS	X	25
				16SS	X	29
				17SS	X	25
				18SS	X	45
				19SS	X	60
				20SS	X	25
65.0	SP-SM(SAND), fine grained, little silt, dense, light gray, saturated	356.4			21SS	X

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-80)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: EAST SIDE OF PUGH CREEK

HOLE DESIGNATION: CRA-4A
 (Page 2 of 2)
 DATE COMPLETED: JULY 23, 1989
 DRILLING METHOD: HSA 4-1/4" ID
 CRA SUPERVISOR: R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0	SP-SM(SAND), fine grained, little silt, dense, light gray, saturated		<p style="font-size: small;">BENTONITE SLURRY</p> <p style="font-size: small;">SAND PACK</p> <p style="font-size: small;">2" STAINLESS STEEL CASING</p> <p style="font-size: small;">WELL SCREEN</p>	21SS	X	62
75.0				22SS	X	33
80.0	23SS	X		49		
85.0	24SS	X		29		
90.0	25SS	X		57		
92.0	26SS	X		51		
95.0	SM(SAND), fine grained, little to some silt, dense, light brown, saturated END OF HOLE @ 92.0 FT. BGS NOTE: 1. Sample 14 - no recovery.	336.4	<p>SCREEN DETAILS: Screened Interval: 80.0' to 85.0' BGS Length - 5.0' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 70.0' to 90.0' BGS</p>			
100.0		329.4				
105.0						
110.0						
115.0						
120.0						
125.0						
130.0						


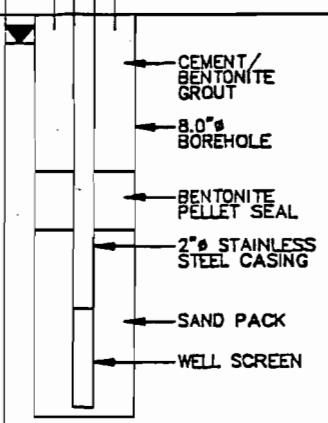
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND X STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-61)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: EAST SIDE OF PUGH CREEK

HOLE DESIGNATION: CRA-4B
 DATE COMPLETED: JULY 24, 1989
 DRILLING METHOD: HSA 4-1/4" ID
 CRA SUPERVISOR: R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				N U M B E R	S T A T E	V A L U E	
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	423.99 421.4					
5.0	Auger from surface to 20.5 ft. BGS	419.96	 <p style="font-size: small;"> CEMENT/ BENTONITE GROUT 8.0" Ø BOREHOLE BENTONITE PELLET SEAL 2" Ø STAINLESS STEEL CASING SAND PACK WELL SCREEN </p>				
10.0							
15.0							
20.0				401.4			
25.0		END OF HOLE @ 20.5 FT. BGS NOTES: 1. Stratigraphy and interval information taken from well CRA-4A.					
30.0							
35.0							
40.0							
45.0							
50.0							
55.0							
60.0							
65.0							

SCREEN DETAILS:
 Screened Interval:
 15.0' to 20.0' BGS
 Length - 5.0'
 Diameter - 2"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 11.0' to 20.5' BGS

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-62)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 12' EAST OF GM-9

HOLE DESIGNATION: CRA-5
 (Page 1 of 2)
 DATE COMPLETED: JUNE 18, 1989
 DRILLING METHOD: HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing) GROUND SURFACE	406.83 405.0				
5.0	ML(SILT), trace clay, little sand, firm, brown, wet	402.61	← CEMENT/BENTONITE GROUT	1SS	X	2
				2SS	X	6
				3SS	X	4
			← 8.0" BOREHOLE	4SS	X	20
				5SS	X	8
10.0	SC(SAND), fine grained, clayey, medium dense, orange-brown, wet	398.0		6SS	X	9
	Slight chemical odor at 13 ft.			7SS	X	17
15.0	SP-SM(SAND), medium grained, trace silt, slight chemical odor, medium dense, yellow-brown, saturated	391.0		8SS	X	17
				9SS	X	25
20.0				10SS	X	34
				11SS	X	12
25.0	SC(SAND), fine to medium grained, clayey, slight chemical odor, medium dense, light pink-gray, saturated	384.0		12SS	X	10
			← 2" STAINLESS STEEL CASING	13SS	X	23
30.0	CL(CLAY), occasional thin layer of fine sand, slight chemical odor, very stiff, white, moist	376.0		14SS	X	22
		373.0		15SS	X	9
35.0	SC(SAND), fine grained, clayey, occasional layers of clay, sandy clay and silty sand, medium dense, beige, saturated			16SS	X	10
40.0				17SS	X	12
45.0				18SS	X	7
50.0				19SS	X	18
55.0				20SS	X	17
60.0				21SS	X	9
65.0	One foot thick layer of clay at 69 ft.			22SS	X	11

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-62)

PROJECT NAME: HARDEMAN COUNTY LANDFILL

HOLE DESIGNATION: CRA-5
(Page 2 of 2)

PROJECT NO.: 1722

DATE COMPLETED: JUNE 18, 1989

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HSA

LOCATION: 12' EAST OF GM-9

CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0	One foot thick layer of clay at 69 ft.	332.0		22SS	☒	11
75.0	SP(SAND), fine to medium grained, occasional thin layer of white clay, slight chemical odor, medium dense to very dense, light pink-gray to yellow-brown with depth, saturated			23SS	☒	18
80.0				24SS	☒	12
85.0				25SS#	☒	40
90.0				26SS	☒	36
95.0				27SS	☒	30
100.0				28SS	☒	40
105.0				29SS	☒	65
110.0				30SS	☒	37
115.0				31SS	○	32
120.0	ML(SILT), some very fine sand (finer with depth), very hard, yellow-brown, wet	286.0	SCREEN DETAILS: Screened Interval: 111.5' to 116.5' BGS Length -5.0' Diameter -2" Slot # 10 Material - Stainless Steel Sand pack interval: 101.0' to 120.0' BGS	32SS	☒	99
125.0	END OF HOLE @ 120 FT. BGS NOTES: 1. # - FOC-CEC analysis. 2. Sample 22 - no recovery.	285.0		33ST	☒	
130.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ☒ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-63)

PROJECT NAME: HARDEMAN COUNTY LANDFILL

HOLE DESIGNATION: CRA-6A

(Page 1 of 3)

PROJECT NO.: 1722

DATE COMPLETED: AUGUST 4, 1989

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HSA/WR

LOCATION: 0.3 MILE NORTH OF SITE BOUNDARY

CRA SUPERVISOR: R. FIELD/C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing) GROUND SURFACE	399.44 392.4	<p style="text-align: center;">8.0" BOREHOLE</p> <p style="text-align: center;">2" STAINLESS STEEL CASING</p>			
5.0	ML(SILT), little sand, trace clay, thin sand layers at depth, stiff, brown to gray, moist to saturated at depth			1SS	X	10
				2SS	X	12
				3SS	X	12
				4SS	X	14
10.0				5SS	X	8
		380.4		6SS	X	10
15.0	SM(SAND), fine grained, some silt, thin layers of gray clay, medium dense, brown, saturated			7SS	X	9
				8SS	X	5
		374.4		9SS	X	11
20.0	CL(CLAY), little silt, little fine sand, firm, dark brown to gray, moist			10SS	X	3
				11SS	X	7
				12SS	X	4
25.0	SM(SAND), fine grained, little silt, occasional thin layers of gray silt, dense, light gray, saturated	367.4		13SS	○	18
30.0				14SS	X	50
35.0				15SS	X	22
40.0	Silt layer			16SS	X	50
45.0				17SS	X	34
50.0	Silt layer			18SS	X	50
55.0				19SS	X	25
60.0				20SS	X	25
65.0			21SS	X	41	

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○

WATER FOUND ▽

STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-63)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 0.3 MILE NORTH OF SITE BOUNDARY

HOLE DESIGNATION: CRA-6A
 (Page 2 of 3)
 DATE COMPLETED: AUGUST 4, 1989
 DRILLING METHOD: HSA/WR
 CRA SUPERVISOR: R. FIELD/C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0			← CEMENT/ BENTONITE GROUT	21SS	☒	41
			← 8.0" Ø BOREHOLE	22SS	☒	45
75.0	ML(SILT), sandy to trace sand at depth, occasional thin layer of clay, hard, light grayish brown, wet to saturated	317.4		23SS	☒	26
80.0				24SS	☒	55
85.0				25SS	☒	35
90.0				26SS	☒	39
	SM(SAND), fine grained, little silt, very dense, light brown, saturated	302.4	← 2" Ø STAINLESS STEEL CASING	27SS	☒	65
95.0				28SS	☒	60
100.0				29SS	☒	60
105.0				30SS	☒	58
110.0				31SS	☒	70
115.0				32SS	☒	85
120.0				33SS	☒	54
125.0					← BENTONITE SLURRY	
130.0	Sandy clay (129.0 to 131.0 ft. BGS)					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-63)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 0.3 MILE NORTH OF SITE BOUNDARY

HOLE DESIGNATION: CRA-6A
 (Page 3 of 3)
 DATE COMPLETED: AUGUST 4, 1989
 DRILLING METHOD: HSA/WR
 CRA SUPERVISOR: R. FIELD/C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
			PVC PIPE				
135.0			<p style="font-size: small;">2" STAINLESS STEEL CASING</p> <p style="font-size: small;">WELL SCREEN</p> <p style="font-size: small;">SAND PACK</p>	34SS	X	95	
140.0				35SS	X	99	
145.0		247.4			37DB	X	
150.0	CL(CLAY), little fine sand, occasional layer of fine sand (1/4" to 6" thick), less sand layers with depth, very hard, gray-brown, moist				36SS	X	79
155.0					38SS	X	99
155.0	END OF HOLE @ 155.0 FT. BGS NOTE: 1. Sample 37 - no recovery.	237.4			39DB+	X	
160.0			SCREEN DETAILS: Screened Interval: 137.5' to 142.5' BGS Length -5.0' Diameter -2" Slot # 10 Material - Stainless Steel Sand pack interval: 132.0' to 155.0' BGS				
165.0							
170.0							
175.0							
180.0							
185.0							
190.0							
195.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND X STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-64)

PROJECT NAME: HARDEMAN COUNTY LANDFILL

HOLE DESIGNATION: CRA-6B

PROJECT NO.: 1722


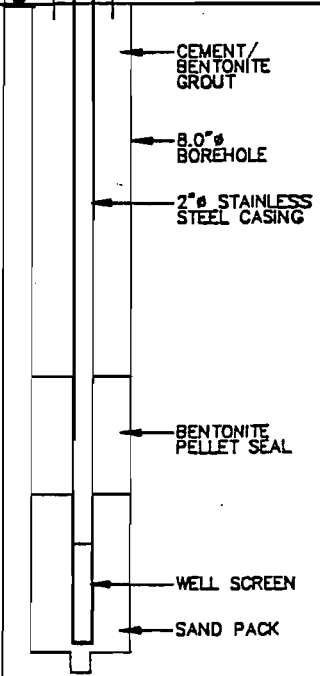
DATE COMPLETED: AUGUST 4, 1989

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HSA

LOCATION: 0.3 MILE NORTH OF SITE BOUNDARY

CRA SUPERVISOR: R. FIELD/C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	395.54 392.4				
5.0 10.0 15.0 20.0 25.0 30.0	Auger from surface to 34.0 ft. BGS	392.24	 <p style="font-size: small;"> CEMENT/ BENTONITE GROUT 8.0" Ø BOREHOLE 2" Ø STAINLESS STEEL CASING BENTONITE PELLET SEAL WELL SCREEN SAND PACK </p>			
35.0 40.0 45.0 50.0 55.0 60.0 65.0	END OF HOLE @ 34.0 FT. BGS NOTES: 1. Stratigraphy and interval information taken from well CRA-6A.	358.4	SCREEN DETAILS: Screened Interval: 27.5' to 32.5' BGS Length - 5.0' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 25.0' to 34.0' BGS			

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS 

WATER FOUND 

STATIC WATER LEVEL 

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-65)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 30 FT. WEST OF GM-3

HOLE DESIGNATION: CRA-7
 (Page 2 of 2)
 DATE COMPLETED: AUGUST 7, 1987
 DRILLING METHOD: WR
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0	Layer of limonitic sandstone and limonite concretions (69.0 to 70.0 ft. BGS)		← NATURAL BACKFILL	21SS		99
75.0	SHALE, slightly weathered, brownish red	326.3	← 2" BOREHOLE	22DB		
	SILTSTONE and very fine SANDSTONE, thinly interbedded	326.0		23DB		
80.0	CLAYSTONE, silty, slightly fissile, dark gray	325.3		24DB		
	CL(CLAY), little fine sand, little silt, very hard, dark gray, moist	324.3				
85.0	END OF HOLE @ 80.0 FT. BGS NOTE: 1. + - Chemical analysis.	320.3				
90.0						
95.0						
100.0						
105.0						
110.0						
115.0						
120.0						
125.0						
130.0						

SCREEN DETAILS:
 Screened Interval:
 60.0' to 65.0' BGS
 Length - 5.0'
 Diameter - 2"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 56.0' to 65.5' BGS

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-65)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 30 FT. WEST OF GM-3

HOLE DESIGNATION: CRA-7
 (Page 1 of 2)
 DATE COMPLETED: AUGUST 7, 1989
 DRILLING METHOD: WR
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing)	403.10				
	GROUND SURFACE	400.3				
5.0	ML(SILT), trace fine sand, stiff, brown, moist	397.8		1SS	X	16
	SM(SAND), fine grained, silty, medium dense, light red-brown, moist			2SS	X	25
				3SS	X	20
				4SS	X	18
10.0		390.6		5SS	X	23
				6SS	X	26
				7SS	X	26
15.0				8SS	X	36
	SP-SM(SAND), fine grained, trace silt, some fine mica flakes, medium dense, light red-brown, saturated	384.3		9SS	X	21
20.0				10SS	X	25
				11SS	X	27
25.0	Occasional thin (1" to 6") layer of white sandy clay below 25 ft.			12SS	X	25
30.0			13ST	/		
35.0			14ST	/		
40.0			15ST	/		
45.0			16ST	/		
50.0	Thin limonite layer		17ST	/		
55.0			18ST	/		
60.0	Increased clay (55.0 to 65.0 ft. BGS)		19ST	/		
65.0	Layer of limonitic sandstone and limonite concretions (69.0 to 70.0 ft. BGS)		20ST	/		
			21SS	○	99	
			22DB	/		

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND X STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-66)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NEAR CONFLUENCE OF PUGH AND CLOVER CREEKS

HOLE DESIGNATION: CRA-8A
 (Page 1 of 2)
 DATE COMPLETED: JUNE 30, 1989
 DRILLING METHOD: HSA
 CRA SUPERVISOR: R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing) GROUND SURFACE	372.02 369.7				
5.0	ML(SILT), little clay, trace sand, firm, brown (mottled with depth), wet	364.7	8.0" BOREHOLE CEMENT/BENTONITE GROUT 2" STAINLESS STEEL CASING BENTONITE PELLET SEAL WELL SCREEN SAND PACK	1SS	X	3
				2SS	X	6
				3SS	X	13
				4SS	X	13
				5SS	X	7
				6SS	X	6
				7SS#	X	9
				8SS	X	6
				9SS	X	6
				10SS	X	10
				11SS	X	5
				12SS	X	8
				13SS	X	11
25.0	SP(SAND), fine grained, occasional layers of limonitic sandstone, dense, tan to gray, some iron staining, saturated	344.7		20DB	X	
30.0				14SS	X	15
35.0				15SS	X	22
40.0				16SS#	X	34
45.0				17SS	X	65
50.0	Silty			18SS	X	99
50.0	SANDSTONE, fine grained, thinly interbedded with shale, iron stained No recovery (50.5' to 64.5' ft. BGS) probable sand	321.7		19DB	X	
55.0						
60.0						
65.0	Auger refusal	305.2				
	SM(SAND), fine grained, some silt, trace gravel, brown, saturated	301.2		21DB	X	
	ML(SILT), some clay, interbedded with thin					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ∩ STATIC WATER LEVEL ▼

**STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)**

(L-66)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NEAR CONFLUENCE OF PUGH AND CLOVER CREEKS

HOLE DESIGNATION: CRA-8A
 (Page 2 of 2)
 DATE COMPLETED: JUNE 30, 1989
 DRILLING METHOD: HSA
 CRA SUPERVISOR: R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0	SM(SAND), fine grained, some silt, trace gravel, brown, saturated	301.2		21DB	X	
70.0	ML(SILT), some clay, interbedded with thin lenses of fine silty sand, hard, gray, moist			22DB	X	
75.0	END OF HOLE @ 74.5 FT. BGS NOTE: 1.* - Grain size analysis.	295.2				
80.0						
85.0						
90.0						
95.0						
100.0						
105.0						
110.0						
115.0						
120.0						
125.0						
130.0						

SCREEN DETAILS:
 Screened Interval:
 42.5 to 47.5' BGS
 Length -5.0'
 Diameter -2"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 40.5 to 74.5' BGS

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

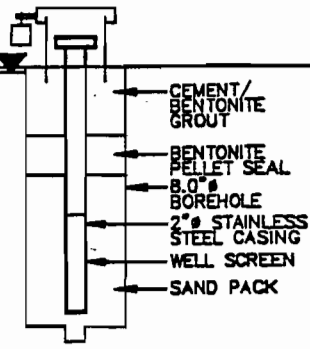
GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-67)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NEAR CONFLUENCE OF PUGH AND CLOVER CREEKS

HOLE DESIGNATION: CRA-8B
 DATE COMPLETED: JUNE 30, 1989
 DRILLING METHOD: HSA
 CRA SUPERVISOR: R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing)	372.15				
	GROUND SURFACE	369.7				
5.0	Auger from surface to 14.0 ft. BGS	369.36	<p style="font-size: small;"> CEMENT/ BENTONITE GROUT BENTONITE PELLET SEAL 8.0" Ø BOREHOLE 2" Ø STAINLESS STEEL CASING WELL SCREEN SAND PACK </p>			
10.0						
15.0	END OF HOLE ● 14.0 FT. BGS NOTES: 1.Stratigraphy and interval information taken from well CRA-8A.	355.7	<p style="font-size: small;"> SCREEN DETAILS: Screened Interval: 7.5 to 12.5' BGS Length - 5.0' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 5.5' to 13.2' BGS </p>			
20.0						
25.0						
30.0						
35.0						
40.0						
45.0						
50.0						
55.0						
60.0						
65.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-58)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 20' SOUTH OF GM-4

HOLE DESIGNATION: CRA-9
 (Page 1 of 2)
 DATE COMPLETED: JULY 13, 1989
 DRILLING METHOD: HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION		SAMPLE		
					NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing) GROUND SURFACE	378.93 376.9					
5.0	ML(SILT), clayey, trace sand to sandy with depth, very stiff, brown to gray with mottling at depth, moist	371.25					1SS
10.0	SP-SM(SAND), fine grained, trace silt, occasional layer of silty sand, medium dense light brown, moist to 12.0 ft. BGS becoming saturated	367.9			2SS	X	10
15.0	SM(SAND), medium to coarse grained, little to some silt, occasional thin layer of white clay, medium dense, beige, saturated	362.9			3SS	X	14
20.0					4SS	X	24
25.0					5SS	X	13
30.0	CL(CLAY), trace sand to sandy, occasional layers of silty and clayey sand, very stiff, light pinkish gray, moist to wet	350.9			6SS	X	16
35.0					7SS	X	14
40.0	SM(SAND), fine grained, trace silt to silty, medium to very dense, beige, saturated	339.9			8SS	X	17
45.0					9SS	X	18
50.0					10SS	X	16
55.0					11SS	X	15
60.0					12SS	X	21
65.0					13SS	X	15
					14SS	X	7
					15SS	X	15
					16SS	X	75
					17SS	X	36
					18SS	X	14
					19SS	X	66

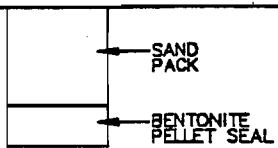


NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-68)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 20' SOUTH OF GM-4

HOLE DESIGNATION: CRA-9
 (Page 2 of 2)
 DATE COMPLETED: JULY 13, 198.
 DRILLING METHOD: HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
70.0	CL(CLAY), little silt, occasional thin layer of sandy clay, hard, gray to brown, moist	310.9	 <p style="font-size: small; margin-top: 5px;">← SAND PACK ← BENTONITE PELLET SEAL</p>	19SS 20ST+ 21ST	 	66
75.0	END OF HOLE ⊕ 72.0 FT. BGS NOTE: 1.+ - Chemical analysis.	304.9	<p>SCREEN DETAILS: Screened Interval: 51.0 to 56.0' BGS Length -5.0' Diameter -2" Slot # 10 Material - Stainless Steel Sand pack interval: 49.5 to 57.0' BGS 59.0 to 70.0' BGS</p>			
80.0						
85.0						
90.0						
95.0						
100.0						
105.0						
110.0						
115.0						
120.0						
125.0						
130.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS  WATER FOUND  STATIC WATER LEVEL 

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-69)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 50' SOUTH OF CLOVER CREEK

HOLE DESIGNATION: CRA-10A
 DATE COMPLETED: JUNE 27, 1989
 DRILLING METHOD: HSA
 CRA SUPERVISOR: R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing) GROUND SURFACE	375.29 372.9	<p style="font-size: small;"> CEMENT/BENTONITE GROUT 8.0" BOREHOLE 2" STAINLESS STEEL CASING BENTONITE PELLET SEAL SAND PACK WELL SCREEN </p>			
5.0	SM(SAND), fine grained, trace to little silt occasional thin layers of silt, loose, tan, saturated	371.40		1SS	X	6
				2SS	X	6
		366.9		3SS	X	6
				4SS	X	5
10.0	SP(SAND), fine grained, trace silt, occasional layer of silt or clay, loose to medium dense, tan to light brown-orange, saturated			5SS	X	8
				6SS	X	12
		358.9		7SS	X	11
15.0	CL(CLAY), little silt, stiff, gray, moist			8SS	X	13
				9SS	X	8
20.0				10SS#	X	4
		350.9		11SS	X	7
25.0	SP(SAND), fine grained, medium dense, tan, saturated			12SS#	X	15
30.0				13SS	X	18
	CL(CLAY), trace silt, pink-white, moist	341.9		14SS+	X	
	SM(SAND), fine grained, some silt, dense, white, saturated	339.9	15SS	X	41	
35.0	END OF HOLE @ 35.0 FT. BGS NOTES: 1. # - FOC-CEC analysis. 2. + - Chemical analysis.	337.9				
40.0						
45.0						
50.0						
55.0						
60.0						
65.0						

SCREEN DETAILS:
 Screened Interval:
 25.0 to 30.0' BGS
 Length - 5.0'
 Diameter - 2"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 23.0 to 36.0' BGS

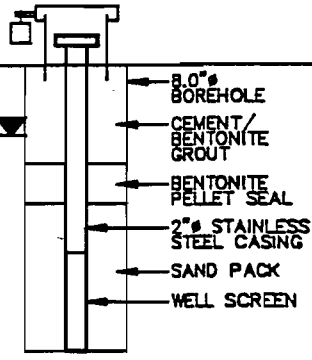
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∩ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-70)

PROJECT NAME: HARDEMAN COUNTY LANDFILL
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: 50' SOUTH OF CLOVER CREEK

HOLE DESIGNATION: CRA-10B
 DATE COMPLETED: JUNE 27, 1984
 DRILLING METHOD: HSA
 CRA SUPERVISOR: R. FIELD

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	376.64 373.7				
	Auger from surface to 14.5 ft. BGS	370.13				
5.0						
10.0						
15.0	END OF HOLE @ 14.5 FT. BGS NOTES: 1. Stratigraphic and interval information taken from well CRA-10A.	359.2				
20.0						
25.0						
30.0						
35.0						
40.0						
45.0						
50.0						
55.0						
60.0						
65.0						

SCREEN DETAILS:
 Screened interval:
 9.5 to 14.5' BGS
 Length - 5.0'
 Diameter - 2"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 7.0 to 14.5' BGS



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)




(L-73)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENN
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: WEST OF SITE

HOLE DESIGNATION: CRA-11A
 (Page 1 of 2)
 DATE COMPLETED: NOVEMBER 14, 1990
 DRILLING METHOD: 4 1/4" ID HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
	REFERENCE POINT (Top of Riser) GROUND SURFACE	421.06 419.3					
- 5.0	See CRA-11B for stratigraphy from the surface to 45.0 ft. BGS						
- 10.0							
- 15.0							
- 20.0							
- 25.0			8" BOREHOLE				
- 30.0			CEMENT/ BENTONITE GROUT				
- 35.0							
- 40.0							
- 45.0	SC-SAND, fine to medium grained, trace clay to clayey, occasional 1" to 6" layers of clay, hard, light gray, wet	374.3	2" STEEL CASING	1SS	X	46	
- 50.0		SP-SAND, fine grained, trace lamonite, very dense, yellow-brown, saturated	368.3		2SS	X	84
- 55.0				3SS	X	>100	
- 60.0	Same, except light brown				4SS	X	>100
- 65.0			BENTONITE GEL SLURRY SEAL	5SS	X	>100	
			SAND PACK				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE. REFER TO CURRENT ELEVATION TABLE

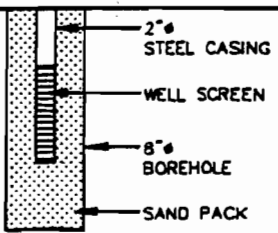
GRAIN SIZE ANALYSIS  WATER FOUND  STATIC WATER LEVEL 

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-73)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENN
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: WEST OF SITE

HOLE DESIGNATION: CRA-11A
 (Page 2 of 2)
 DATE COMPLETED: NOVEMBER 14, 1990
 DRILLING METHOD: 4 1/4" ID HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
70.0			 <p style="font-size: small;">2" STEEL CASING WELL SCREEN 8" BOREHOLE SAND PACK</p>	6SS	X	>100	
75.0	Same, except gray END OF HOLE @ 76.5 FT. BGS	342.8			7SS	X	>100
80.0			<p><u>SCREEN DETAILS:</u> Screened Interval: 68.0 to 73.0' BGS Length -5.0' Diameter -2.0" Slot # 10 Material -Stainless Steel Sand pack interval: 66.0 to 76.5' BGS Material -# 30 Sand</p>				
85.0							
90.0							
95.0							
100.0							
105.0							
110.0							
115.0							
120.0							
125.0							
130.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE. REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS  WATER FOUND  STATIC WATER LEVEL 

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-71)

PROJECT NAME: HARDEMAN COUNTY LANDFILL

HOLE DESIGNATION: CRA-11B

PROJECT NO.: 1722

DATE COMPLETED: JULY 8, 1989

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: HSA

LOCATION: 1/3 MILE WEST OF THE SITE

CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT(Top Of Casing) GROUND SURFACE	421.89 420.2	<p style="font-size: small;"> CEMENT / BENTONITE GROUT 8.0" BOREHOLE 2" STAINLESS STEEL CASING BENTONITE PELLET SEAL SAND PACK WELL SCREEN BENTONITE PELLET SEAL </p>			
5.0	ML(SILT), trace clay, trace sand, firm, brown, moist	416.7		1SS	X	4
	SP-SM(SAND), fine to medium grained, trace silt, medium dense, brown, saturated			2SS	X	7
				3SS	X	10
10.0	SC(SAND), fine grained, clayey, some silt, occasional thin layers of sandy clay, light brown, moist to saturated	412.2		4SS	X	9
	SP(SAND), fine to medium grained, medium dense to dense, brown-red, saturated	409.84		5SS	X	6
15.0		408.2		6SS	X	13
				7SS	X	20
20.0				8SS	X	21
				9SS	X	28
25.0				10SS	X	20
				11SS	X	38
30.0				12SS#	X	22
				13SS		33
35.0	SM-SC(SAND), fine grained, some silt, trace clay, occasional thin layer of white clay, medium dense, light brown, saturated	386.2		14SS	X	9
40.0	ML(SILT), sandy, little clay, stiff, light gray, saturated	381.2				
	CL(CLAY), some silt, little fine sand, gray, moist	379.2	15SS#	X	15	
45.0	END OF HOLE @ 43.0 FT. BGS NOTES: 1. # - FOC-CEC analysis.	377.2	16ST	X		
50.0						
55.0						
60.0						
65.0						

SCREEN DETAILS:
 Screened Interval:
 33.5 to 38.5' BGS
 Length - 5.0'
 Diameter - 2"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 29.0 to 39.0' BGS
 Material - Medium Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE. REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-16)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NEAR SE CORNER OF SITE

HOLE DESIGNATION: CRA-12A
 (Page 1 of 2)
 DATE COMPLETED: AUGUST 21, 1988
 DRILLING METHOD: HOLLOW STEM AUGER/
 WET ROTARY
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION		SAMPLE		
					NUMBER	STATE	VALUE
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	458.87 456.7					
5.0	(ML) SILT, little very fine sand, trace clay, roots near surface, stiff to hard, brown, moist	449.7			15SS	X	12
					25SS	X	42
					35SS	X	33
					45SS	X	18
					55SS	X	25
10.0	(SM) SAND, fine grained, silty, trace clay, medium dense, brown, moist	446.7			65SS	X	29
	(SC-SM) SAND, fine grained, silty, clayey to little clay, loose to medium dense, brown, moist	439.7			75SS	X	12
15.0					85SS	X	21
					95SS	X	32
					105SS	X	21
					115SS	X	20
20.0	(SM) SAND, fine to medium grained, silty, medium dense to dense, brown, moist	436.2			125SS	X	32
	(SP-SM) SAND, fine to medium grained, trace silt, micaceous to little mica, loose to dense, light orange-brown, moist to 35' then saturated				135SS	X	31
25.0					145SS	X	38
					155SS	X	43
30.0		425.47	165SS	X	48		
35.0			175SS	X	47		
40.0			185SS	X	39		
45.0			195SS	X	21		
50.0			205SS	X	8		
55.0	(SP) SAND, very fine to fine grained, micaceous, occasional 1" to 2" layer of white sandy clay, layer of white silty, sandy clay from 71.5' to 73', dense to extremely dense, beige, saturated	404.7	215SS	X	25		
60.0			225SS	X	41		
65.0			235SS	X	48		

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼ (8/31/88)

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-18)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NEAR SE CORNER OF SITE

HOLE DESIGNATION: CRA-12A
 (Page 2 of 2)
 DATE COMPLETED: AUGUST 21, 1988
 DRILLING METHOD: HOLLOW STEM AUGER/
 WET ROTARY
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	VALUE	
70.0	(SP) SAND, very fine to fine grained, micaceous, occasional 1" to 2" layer of white sandy clay, layer of white silty, sandy clay from 71.5' to 73', dense to extremely dense, beige, saturated.			23SS	X	48	
75.0		24SS		X	36		
80.0		25SS #		X	92		
85.0		26SS		X	38		
90.0	(CL) CLAY, silty, sandy, white, moist	468.7			27AC #	X	-
95.0	(SP) SAND, fine grained, trace limonite gravel, little mica, dense, saturated	465.7			28ST	X	-
					29SS	X	47
	(CL) CLAY, silty, little very fine sand, occasional thin layer of silt, hard, white to gray, moist	459.7					
100.0	END OF HOLE @ 101.0 FEET BGS NOTE: 1. # - FOC-CEC analysis.	455.7			30SS	X	99
105.0					31SS	X	99
110.0							
115.0							
120.0							
125.0							
130.0							

SCREEN DETAILS:
 Screened Interval:
 372.0 to 367.0 AMSL
 Length -5'
 Diameter -2"
 Slot # 010
 Material-S.S. Type 304
 Sand pack interval:
 377.0 to 366.0 AMSL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE




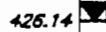
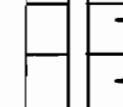
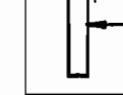
GRAIN SIZE ANALYSIS WATER FOUND X STATIC WATER LEVEL ▼




STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-17)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENNESSEE
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: NEAR SE CORNER OF SITE

HOLE DESIGNATION: CRA-12B
 DATE COMPLETED: AUGUST 22, 1988
 DRILLING METHOD: HOLLOW STEM AUGER
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top Of Casing) GROUND SURFACE	458.52 456.7				
	-Auger from ground surface to 45' BGS					
5.0						
10.0						
15.0						
20.0						
25.0						
30.0		426.14				
35.0						
40.0						
45.0	(SP-SM) SAND, fine to medium grained, trace silt, 1" layer of white sandy clay, dense, light orange-brown, saturated			(1SS)	X	33
50.0	END OF HOLE @ 49.0 FEET BGS					
55.0	NOTES: 1. Natural sand pack. 2. Stratigraphy and interval information taken from well CRA-12A.		<p>SCREEN DETAILS: Screened Interval: 411.0 to 406.0 AMSL Length -5' Diameter -2" Slot # 010 Material-S.S. Type 304 Sand pack interval: 414.5 to 405.0 AMSL</p>			
60.0						
65.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
 GRAIN SIZE ANALYSIS  WATER FOUND  STATIC WATER LEVEL  (8/31/88)

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-74)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENN
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: WEST OF SITE

HOLE DESIGNATION: CRA-13A
 DATE COMPLETED: NOVEMBER 07, 1990
 DRILLING METHOD: 4 1/4" ID HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	394.45 391.8				
	TOPSOIL, silt and sand, dark brown, moist	391.3		1SS	X	11
	SM-SAND, fine, silty, medium dense, brown, moist	390.6		2SS	X	20
5.0	ML-SILT, trace fine sand, stiff, brown, moist			3SS	X	18
	Same, except sandy, brown-gray			4SS	X	21
	Wet			5SS	X	11
10.0	SP-SAND, fine to medium grained, trace fine gravel, medium dense, brown, saturated	382.3		6SS	X	15
15.0	ML-SILT, wood fragments, stiff, gray, wet	376.8		7SS	X	15
20.0	SP/SM SAND, fine to medium grained, trace silt, medium dense, orange-tan, saturated	373.3		8SS	X	32
25.0				9SS	X	11
30.0				10SS	X	46
35.0	Same, except fine grained, trace gravel, brown-red, micaceous			11SS	X	41
40.0	Same, except fine to medium grained, beige			12SS	X	19
45.0	CL-CLAY, silty, hard, gray, moist	347.8		13SS	X	29
	END OF HOLE @ 46.8 FT. BGS	345.0		14SS	X	34
50.0			15SS	X	43	

SCREEN DETAILS:
 Screened Interval:
 39.5 to 44.5' BGS
 Length - 5.0'
 Diameter - 2.0"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 37.0 to 46.8' BGS
 Material - # 30 Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-75)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENN

HOLE DESIGNATION: CRA-13B

PROJECT NO.: 1722

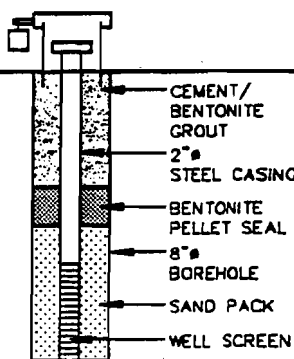
DATE COMPLETED: NOVEMBER 07, 1990

CLIENT: MEMPHIS ENVIRONMENTAL CENTER

DRILLING METHOD: 4 1/4" ID HSA

LOCATION: WEST OF SITE

CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	394.02 391.8				
	For stratigraphy see CRA-13A					
- 5.0						
- 10.0						
- 15.0	END OF HOLE @ 15.0 FT. BGS	376.8				
- 20.0						
- 25.0						
- 30.0						
- 35.0						
- 40.0						
- 45.0						
- 50.0						
- 55.0						
- 60.0						
- 65.0						

SCREEN DETAILS:
 Screened Interval:
 10.0 to 15.0' BGS
 Length - 5.0'
 Diameter - 2.0"
 Slot # 10
 Material - Stainless Steel
 Sand pack interval:
 8.0 to 15.0' BGS
 Material - # 30 Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE. REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS



WATER FOUND



STATIC WATER LEVEL





STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-76)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENN
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: WEST OF SITE

HOLE DESIGNATION: CRA-14A
 DATE COMPLETED: NOVEMBER 07, 1990
 DRILLING METHOD: 4 1/4" ID HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	394.06 392.3				
5.0	ML-SILT, trace fine sand, trace clay, topsoil to 6", stiff, brown, moist	387.3	 <p style="text-align: center;">8" BOREHOLE</p> <p style="text-align: center;">CEMENT/ BENTONITE GROUT</p> <p style="text-align: center;">2" STEEL CASING</p> <p style="text-align: center;">BENTONITE PELLET SEAL</p> <p style="text-align: center;">WELL SCREEN</p> <p style="text-align: center;">SAND PACK</p> <p>SCREEN DETAILS: Screened Interval: 48.0 to 53.0' BGS Length - 5.0' Diameter - 2.0" Slot # 10 Material - Stainless Steel Sand pack interval: 46.0 to 57.0' BGS Material - # 30 Sand</p>	1SS	X	13
				2SS	X	15
				3SS	X	18
				4SS	X	23
10.0	SP-SAND, fine grained, medium dense, gray, saturated	383.8 381.8		5SS	X	11
	SM-SAND, fine grained, little to some silt, medium dense, gray, saturated			6SS	X	15
15.0		375.8		7SS	X	26
20.0	SP/SM-SAND, fine to medium grained, trace silt, dense, orange-beige, saturated			8SS	X	24
	- same, except trace fine gravel, orange-brown			9SS	X	48
25.0	SM-SAND, very fine grained, some silt, micaceous, dense, yellow-beige, saturated	369.8		10SS	X	37
				11SS	X	22
30.0				12SS	X	47
35.0	SP/SM-SAND, fine to medium grained, trace silt, dense, yellow-beige, saturated.	359.3		13SS	X	40
40.0				14SS	X	46
45.0				15SS	X	46
50.0	Same, except fine grained, micaceous			16SS	X	35
55.0	CL-CLAY, silty, trace to little fine sand, hard, light gray to gray, moist	338.3	17SS	X	56	
60.0	END OF HOLE @ 57.0 FT. BGS	335.3				
65.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

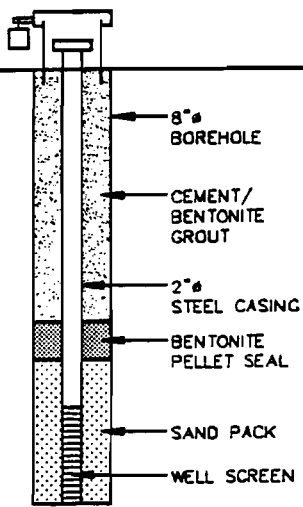
GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-77)

PROJECT NAME: HARDEMAN COUNTY LANDFILL, TENN
 PROJECT NO.: 1722
 CLIENT: MEMPHIS ENVIRONMENTAL CENTER
 LOCATION: WEST OF SITE

HOLE DESIGNATION: CRA-14B
 DATE COMPLETED: NOVEMBER 13, 1990
 DRILLING METHOD: 4 1/4" ID HSA
 CRA SUPERVISOR: C. AHRENS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	394.35 392.4				
	For stratigraphy see CRA-14B					
5.0						
10.0						
15.0						
20.0						
25.0	END OF HOLE @ 22.5 FT. BGS	369.9	<p>SCREEN DETAILS: Screened Interval: 17.5 to 22.5' BGS Length - 5.0' Diameter - 2.0" Slot # 10 Material - Stainless Steel Sand pack interval: 15.0 to 22.5' BGS Material - # 30 Sand</p>			
30.0						
35.0						
40.0						
45.0						
50.0						
55.0						
60.0						
65.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ∇ STATIC WATER LEVEL ▼

G & M MONITORING WELLS

Measuring point elevation 424.87
top of casing 1.5' above land surface

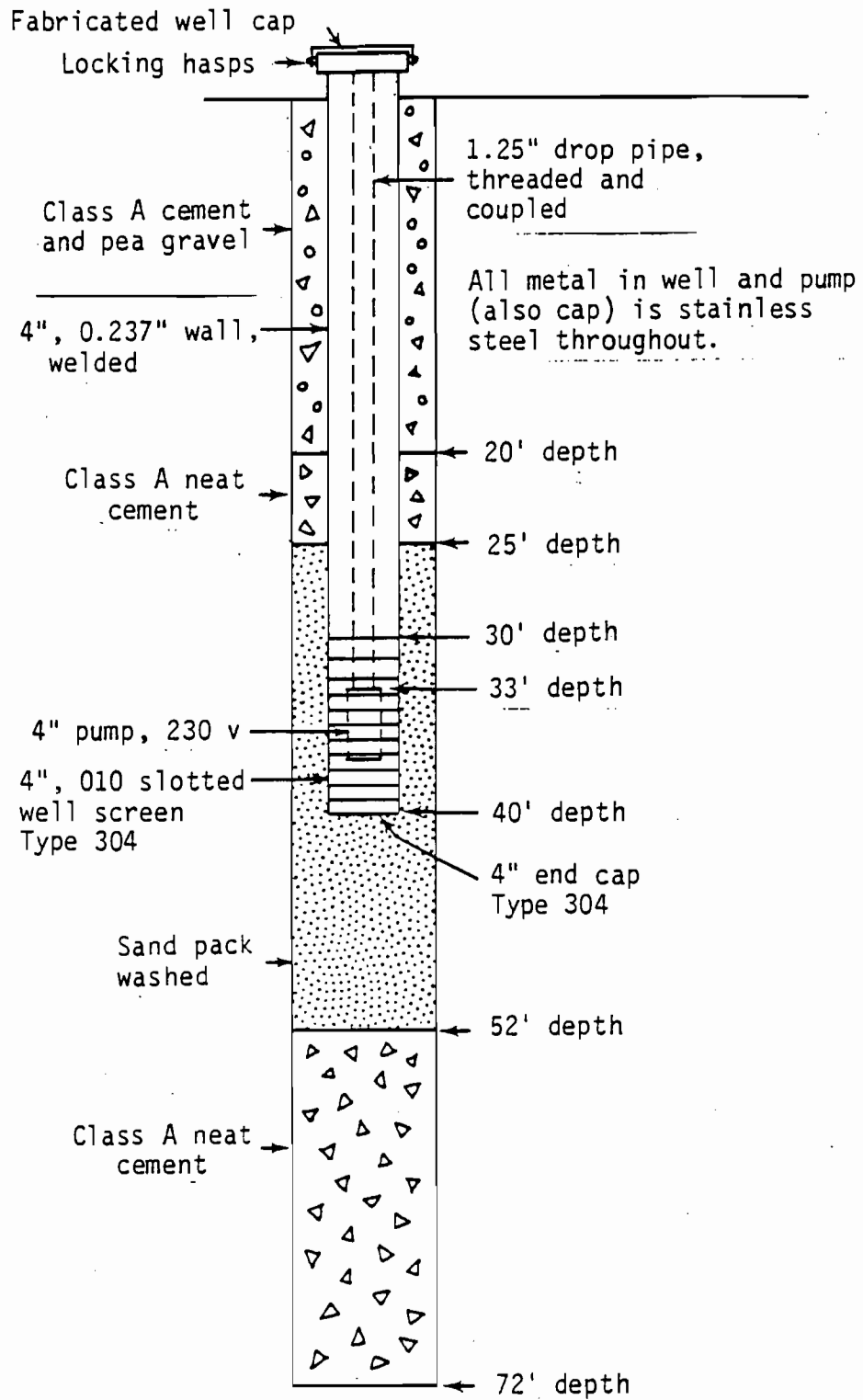


Figure 6. Completed well construction diagram -- GM-1

GM - 1

<u>Earth material description</u>	<u>Depth below land surface</u>	
	(in feet)	
	From	To
silty sand, dark brown	0	13
sand clay, hard	13	14
silty sand, dark brown	14	22
sand, clayey, varigated, orange to white, traces of mica flakes	22	25
clayey sand, light brown, interbedded with very fine subangular sand	25	29
silty sand, fine to coarse, orange to brown, cavey	29	47
silty sand, red to brown, with stringers of fine sand	47	67
clay, white, with some fine sand, thin layers of fine orange sand near bottom	67	72

Geologic Log of Well GM - 2

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, brown-red; silty.....	0 - 6.5	6.5
Sandy clay, brown-red.....	6.5 - 8.5	2.0
Silty sand, fine-grained, brown-red to red; with blebs of clay.....	8.5 - 12	2.5
Sand, fine to medium-grained, red.....	12 - 15	3.0
Sand, fine-grained, red.....	15 - 20	5.0
Sand, fine to medium-grained, red.....	20 - 30	10.0
Sand, medium to coarse-grained, red; with a few blebs of dark brown clay.....	30 - 35	5.0
Sand, medium to coarse-grained, red, white and clear; a few red, gray and brown clay blebs.....	35 - 40	5.0
Sand, fine to medium-grained, trace of coarse grains present, red and white; a few blebs of red, gray, and brown clay and Kaolinitic clay.....	40 - 45	5.0
Sand, fine to medium-grained, red and white; few Kaolinite blebs.....	45 - 50	5.0
Sand, fine to medium-grained, red and white; many blebs of Kaolinite.....	50 - 55	5.0
Sand, fine to medium-grained, red and white; many blebs of red and yellow clay and Kaolinite.....	55 - 60	5.0
Sand, fine to medium-grained, red; no clay blebs; trace Kaolinite.....	60 - 65	5.0
Sand, fine-grained, red; many blebs of red and brown-yellow clay with some Kaolinite blebs.....	65 - 70	5.0
Sand, fine to coarse grained, red and white; Kaolinite and brown clay blebs.....	70 - 75	5.0

Geologic Log of Well GM - 2 (Continued)

Description	Depth (ft)	Thickness (ft)
Sand, fine to medium-grained, red.....	75 - 80	5.0
Sand, fine to medium-grained with a trace of coarse grains present; Kaolinite and some clay blebs.....	80 - 85	5.0
Sand, medium to coarse-grained, clear, white and red; few small Kaolinitic blebs.....	85 - 90	5.0
Sand, fine to medium-grained, red and white; small blebs of gray, brown, and red clay, and Kaolinite.....	90 - 95	5.0
As above with some slightly coarser sand and abundant Kaolinite.....	95 - 100	5.0
Sand, fine to coarse-grained, white, clear and red; a few red clay blebs.....	100 - 105	5.0
Sand, fine to medium-grained, white and red; trace of red clay.....	105 - 110	5.0
Sand, fine to medium-grained, but predominantly fine-grained, red and white.....	110 - 115	5.0
Sand, fine to medium-grained, white, tan and red.....	115 - 120	5.0
Sand, fine to medium-grained, white, tan and red.....	120 - 125	5.0
Sand, fine to medium-grained, becoming predominantly fine at 130', white and tan.....	125 - 130	5.0
Fine sand as above; becomes fine to medium at 132-135' with a few red clay blebs and Kaolinite.....	130 - 135	5.0
Sand, very fine to medium-grained; with abundant Kaolinite blebs and some red clay blebs.....	135 - 140	5.0
Sand, fine to medium-grained, white, tan, and red; abundant Kaolinite; a few yellow, brown, and red clay blebs.....	140 - 150	10.0

Geologic Log of Well GM - 2 (Continued)

Description	Depth (ft)	Thickness (ft)
Sand, very fine to fine-grained with some medium grains present, white and tan; some Kaolinite blebs.....	150 - 160	10.0
Sand, very fine to fine-grained, white and tan; a trace of small blebs of red, slightly clayey sand.....	160 - 165	5.0
Sand, very fine to fine-grained, tan; a few small tan, yellow, red and brown slightly clayey sand blebs.....	165 - 170	5.0
Sand, very fine to fine-grained, tan; a few small tan, yellow, red and brown slightly clayey sand blebs, Kaolinitic flakes.....	170 - 175	5.0
Sand, very fine to medium-grained, tan; a few blebs of red, brown, and yellow clay; abundant Kaolinitic flakes.....	175 - 180	5.0
Sand, very fine to medium-grained, tan; abundant Kaolinitic flakes; a few red and brown clay blebs; overall texture is silty-clayey.....	180 - 185	5.0
Sand, very fine to medium-grained, tan; a few blebs of brown, red and yellow clay; also Kaolinite present.....	185 - 190	5.0
Sand, very fine to medium-grained, tan; brown, red and yellow clay; abundant Kaolinite.....	190 - 195	5.0
Sand, very fine to medium-grained, some clay; a decrease in Kaolinite; generally overall silty-clayey texture.....	195 - 200	5.0

Geologic Log of Well GM - 3

Description	Depth (ft)	Thickness (ft)
Sand, very fine to medium-grained, red and light brown; slightly silty.....	0 - 5	5.0
Sand, very fine to medium, becoming coarser with depth, red with some white and black grains.....	5 - 10	5.0
Sand, fine to medium-grained, some coarse grains, brown-red with white and black grains.....	10 - 15	5.0
Sand, very fine to fine-grained, with some medium grains present, brown-red to light tan, with grains of clear, black and white sand; also trace mica.....	15 - 20	5.0
Sand, very fine to medium, light tan with black, clear and white grains; mica content slightly higher.....	20 - 25	5.0
Sand, very fine to medium, with a trace of of coarse grains present, light tan with red oxidized grains, also black, white and clear grains; mica as above; trace Kaolinite blebs, very small diameter, fine-grained in size.....	25 - 30	5.0
Sand, very fine to medium, with a trace of coarse grains present, light tan with red oxidized grains, also black, white, and clear grains; mica content slightly higher; trace Kaolinite blebs, very small diameter, fine-grained in size.....	30 - 35	5.0
Sand, very fine to fine-grained, with a few medium grains present, tan with white and black grains; trace mica; trace very fine-grained Kaolinite blebs.....	35 - 40	5.0
Sand, very fine to fine-grained, few medium grains present, tan with white and black grains; trace mica; trace very fine-grained Kaolinite blebs.....	40 - 45	5.0

Geologic Log of Well GM - 4

Description	Depth (ft)	Thickness (ft)
Clay, slightly sandy, tan, yellow and white.....	0 - 2	2
Sand, very fine to fine-grained, fairly well sorted, tan; also contains tan clay.....	2 - 5	3
Sand, very fine to fine-grained with a trace of medium grains, tan; trace manganese grains.....	5 - 10	5
Sand, very fine to medium-grained, poorly sorted, tan and white; black manganese grains; trace Kaolinite blebs.....	10 - 15	5
Sand, very fine to medium-grained with a few coarse grains present, but predominantly medium-grained, poorly sorted, tan and white; white Kaolinite blebs; trace black manganese grains.....	15 - 20	5
Sand, very fine to medium-grained with a few coarse grains present, but predominantly medium-grained, poorly sorted, tan and white; white Kaolinite blebs; trace black manganese grains; trace mica.....	20 - 25	5
Sand, very fine to medium-grained with a few coarse grains present, but predominantly medium-grained, poorly sorted, tan, white and pink; white Kaolinite blebs; trace black manganese grains; trace mica, trace brown clay.....	25 - 30	5
Silty sand, medium-grained, very well sorted, tan and white; white Kaolinite blebs.....	30 - 35	5
Sand, very fine-grained with a few fine grains present, very well sorted, clean, white; trace white Kaolinite blebs; trace brown clay blebs; trace mica.....	35 - 40	5
Sand, very fine-grained with a few fine to medium grains present, but predominantly very fine-grained, well sorted, clean, white; white Kaolinite blebs; brown clay blebs; trace mica; trace manganese grains.....	40 - 45	5

Geologic Log of Borehole GM - 9

Description	Depth (ft)	Thickness (ft)
Clay, light brown to dark brown; trace fine to medium-grained sand; sample is moist. Note: No chemical odor.....	0.5 - 2.0	1.5
Clay, light brown to dark brown; trace fine to medium-grained sand; sample is moist. Note: No odor.....	2.0 - 4.0	2.0
Clay, slightly sandy, very fine to medium-grained, light orange and brown; sample is moist. Note: No odor.....	4.0 - 5.5	1.5
Clay, sandy to extremely sandy (50% sand), very fine to medium-grained, light orange to dark orange; small brown clay balls which give sample mottled appearance; sample is moist. Note: No odor.....	5.5 - 6.5	1.0
Clayey sand, very fine to medium-grained with a trace of coarse grains present, dark orange; sample is moist. Note: No odor.....	6.5 - 8.0	1.5
Very clayey sand, very fine to coarse-grained but predominantly medium-grained with a few coarse grains present, tan, light orange, and dark orange; sample is very moist. Note: No odor.....	9.5 - 11.0	1.5
Silty to very clayey sand, very fine to medium-grained but predominantly medium-grained, light orange, tan and dark orange; small blebs of brown clay and white Kaolinitic clay; sample is very wet (saturated). Note: No odor.....	11.0 - 12.5	1.5
Very silty sand, very fine to medium-grained but predominantly medium-grained, cream, tan and yellow; small blebs of white Kaolinitic clay; sample is saturated. Note: No odor.....	12.5 - 14.0	1.5
Very silty to clayey sand, very fine to medium-grained but predominantly medium-grained, cream, tan, brown and light red; a few cream clay lenses; sample is saturated. Note: Very slight chemical odor near bottom of sample.....	14.0 - 15.5	1.5

Geologic Log of Borehole GM - 9 (Continued)

Description	Depth (ft)	Thickness (ft)
Silty sand, very fine to medium-grained but predominantly medium-grained, fairly well sorted, burnt-orange and yellow; sample is saturated. Note: slight chemical odor.....	15.5 - 17.0	1.5
Silty sand, very fine to medium-grained but predominantly medium-grained, brown, light brown, tan and cream; a 1-inch white, Kaolinitic, clayey sand layer; small blebs of brown clay; sample is saturated. Note: Slight chemical odor.....	17.0 - 18.5	1.5
Silty sand, very fine to medium-grained but predominantly medium-grained, orange, cream and tan; abundant cream Kaolinitic clay lenses; sample is saturated. Note: Slight chemical odor.....	18.5 - 20.0	1.5
Silty sand, very fine to medium-grained but predominantly medium-grained, orange, cream and tan; abundant cream Kaolinitic clay (an increase from last interval); pink silt. Note: Chemical odor.....	20.0 - 21.5	1.5
Very silty sand, very fine to medium-grained but predominantly medium-grained, white, pink and light orange; abundant white Kaolinitic clay; sample is saturated. Note: Slight chemical odor.....	21.5 - 23.0	1.5
Clay, light gray and pink; trace streaks of light orange, very fine to medium-grained, poorly sorted silty and clayey sand; trace mica; trace silt; sample is saturated. Note: Slight chemical odor.....	23.0 - 24.5	1.5
Sand, very fine to medium-grained but predominantly fine-grained, fairly well sorted, red, tan, yellow, orange and white; intercalated with light gray, chalky clay; trace mica; trace black manganese grains; sample is saturated in sand but dry in clay. Note: No odor.....	24.5 - 27.5	3.0
Sand, very fine-grained, well sorted, burgundy, white, orange and dark brown; intercalated with gray clay; mica present; trace black manganese grains; sample is saturated. Note: No odor.....	27.5 - 29.0	1.5

Geologic Log of Borehole GM - 9 (Continued)

Description	Depth (ft)	Thickness (ft)
Sand, very fine-grained, extremely well sorted, tan, white, light orange and yellow; a ¼ inch red-brown oxidized layer; mica present; trace black manganese grains; trace gray clay streaks; sample is saturated. Note: No chemical odor.....	29.0 - 30.5	1.5
Sand, very fine-grained, extremely well sorted, light orange, tan, white and gray; several gray clay lenses; mica present; trace black manganese grains; sample is saturated. Note: No odor.....	30.5 - 32.5	2.0
Sand, very fine-grained, extremely well sorted, tan and white; mica present; trace black manganese grains; trace gray clay streaks; sample is saturated. Note: Chemical odor.....	32.5 - 33.5	1.0
Sand, very fine-grained, extremely well sorted, clean, gray, orange and tan; abundant gray clay streaks; mica present; trace black manganese grains; sample is saturated. Note: No odor.....	33.5 - 35.0	1.5
Sand, very fine-grained, extremely well sorted, tan and orange; intercalated with layers of gray clay; mica present; trace black manganese grains; sample is saturated. Note: No odor.....	35.0 - 36.5	1.5
Sand, very fine-grained, extremely well sorted, red and light tan; intercalated with layers of gray clay; a ¼-inch hematitic sand layer; sample is saturated. Note: No odor.....	36.5 - 38.0	1.5
Clay, gray; thin layers of red, white and tan, very fine-grained, extremely well sorted sand; mica present; trace black manganese grains; sample is saturated. Note: Trace chemical odor.....	39.0 - 40.5	1.5
Clay, gray; thin layers of red, white and tan, very fine-grained, extremely well sorted sand; mica present; trace black manganese grains; sample is saturated. Note: Chemical odor.....	44.5 - 46.0	1.5

Geologic Log of Borehole GM - 9 (Continued)

Description	Depth (ft)	Thickness (ft)
Clay, gray; a few lenses of gray and red, very fine to medium-grained, fairly well sorted sand; mica present; trace black manganese grains; sample is saturated. Note: <u>Chemical odor</u>	49.5 - 51.0	1.5
Clay, gray; a few lenses of gray and red, very fine to medium-grained, fairly well sorted sand; mica present; trace black manganese grains; sample is saturated. Note: <u>Chemical odor</u>	54.5 - 55.0	.5
Sand, very fine-grained, extremely well sorted, gray; mica present; trace black manganese grains; sample is saturated. Note: No odor.....	55.0 - 56.0	1.0
Clay, gray; a few thin streaks of tan and orange sand; sample is saturated. Note: No odor.....	59.5 - 61.0	1.5

- feasibility study
Hardeman County Landfill
Hardeman County, TN

- April 1991
Ref. No. 1722(12)

1.4.3.2 Conceptualization of Groundwater Flow System - prepared by: CRA
- copied: Sec. 1.4.3.2

The major hydrostratigraphic unit beneath the Site consists of the waterbearing sands of the Clairborne and Wilcox Formations. Within this unconfined aquifer, small isolated clay beds occur. However, these clay beds do not represent a continuous vertical barrier to groundwater flow and/or contaminant migration. It is believed that a regional confining bed may be present beneath the Site at an elevation of approximately 125 feet AMSL.

A number of VOC compounds have been detected in the groundwater beneath the Site: the two most common being carbon tetrachloride and chloroform. These contaminants have entered the groundwater through the leaching of the landfilled wastes by infiltrating waters. Examination of the well logs indicates that an unsaturated zone occurs in the Wilcox-Clairborne sand beneath the former waste disposal areas. The unsaturated zone varies in thickness from 75 to 95 feet. For contaminants to have reached the aquifer they must have infiltrated through the unsaturated zone. The transport of the leached material along this downward migration path is controlled mainly by infiltration. Prior to placing the cap on the waste disposal areas, the frequency and intensity of the precipitation at the Site would control the amounts of infiltration. Since the cap has been placed, it has been demonstrated that the cap has effectively reduced infiltration of precipitation through to the waste by approximately 98 percent.

Once the contaminants have migrated through the unsaturated zone to the water table, the fate of the contaminants are controlled by the groundwater flow regime. In general, the direction of groundwater flow is to the north, with the major discharge zone being Clover Creek. Pugh Creek to the east of the Site is a discharge zone preventing groundwater flow from flowing further east.

Since the aquifer is extremely thick beneath the Site, it is unlikely that contaminants migrating from beneath the waste disposal areas will mix completely through the entire depth of the aquifer. Therefore, it was necessary to choose a mixing zone to predict contaminant concentrations in the aquifer. Based on the geologic, hydrogeologic and contaminant distribution data collected to date it was determined that a reasonable base of the mixing zone would be set at an elevation of 300 feet AMSL. This resulted in a modeled aquifer thickness of approximately 125 feet beneath the waste disposal areas and 60 feet beneath Clover Creek which has been determined to be conservative.

Along the contaminant migration pathway a number of physiochemical properties may affect the mobility of the observed compounds. These processes may include:

- volatilization
- leaching/adsorption
- degradation
- precipitation

- advection
- diffusion/dispersion

In summary, the conceptual contaminant migration pathway originates as infiltration into the waste which passes through the unsaturated zone and into the water table aquifer. Mixing will occur in the upper portion of the aquifer and the migration of the contaminant is controlled by the groundwater flow field. The ultimate discharge locations of these contaminants are the lower reaches of Pugh Creek and Clover Creek.

1.4.3.3 Predictive Simulations

Using the set of calibrated parameters for carbon tetrachloride and chloroform, a 45-year simulation (1966-2011) was performed for each compound. The concentrations of each compound were predicted at monitoring wells GM-5, 13, 7 and GMP-5. The average concentrations by year at each of the above wells are summarized in Tables 1.11 and 1.12 for carbon tetrachloride and chloroform, respectively. In addition, temporal concentration profiles for carbon tetrachloride and chloroform are presented on Figures 1.7 and 1.8, respectively.

Examination of the calculated carbon tetrachloride profile indicates that at GM-5 (adjacent to the northern disposal area) the peak concentration (40 mg/L) occurred in 1982 and the concentrations are and will continue to decline with time. The maximum predicted concentration (15 mg/L) of carbon tetrachloride was modelled to show that it has also passed

- copied: executive summary (part 1)

Sec. 3.4-3.5.3

- Remedial Investigation Report
Hardeman County Land Fill
Volume I - Text
Hardeman County, TN

- March 1990
Ref. No. 1722(10)

- prepared by: CRA

CHARACTERIZATION OF THE STUDY AREA

Surface Water Features

The entire Site is within the Pugh Creek watershed. Surface water runoff on all sides of the disposal areas eventually drains east to Pugh Creek. Pugh Creek flows north along the east boundary of the Site. It turns west one mile north of the Site and joins Clover Creek approximately one half mile further downstream. Clover Creek flows west approximately 7 miles to the Hatchie River. The Hatchie River flows northwest to the Mississippi River.

Site Stratigraphy

The sediments underlying the Site are dominated by sand. The Claiborne Formation outcrops in the study area and is underlain by the Wilcox Formation. The two formations are not differentiated in western Tennessee and combine to form a fairly thick sequence of sand and silty sand with subordinate clay and silt. The Claiborne is mantled by a thin discontinuous deposit of Quaternary alluvium and loess.

The Quaternary sediments are present across most of the study area. The alluvium is similar to the underlying Claiborne sediments and could not be differentiated from the Claiborne in the study area. The alluvium is usually capped by loess which is glacially derived wind blown

silt, (Miller, 1974). Silt was present at the surface at 9 of the 12 well locations. The thickness of the loess deposits ranges from 0 to about 12 feet.

The stratigraphy encountered in the first 20 feet remained consistent across the Site. Clay or silt is almost always present from the ground surface to 3 to 5 feet below ground surface (BGS). The silt usually grades downward to silty sand which, in turn, grades to clean or slightly silty sand. Low permeability soils were encountered (below the surface sediments) in 8 boreholes. They were usually very thin clay or silt layers interbedded with sand. Total thickness of the low permeability layers was generally less than one foot.

The sand consists of fine to medium grained quartz. Coarse grained sand and gravel is rare. It is usually well to medium well sorted. Slightly silty to silty fine sand is common. Colors range from light gray, pinkish gray, beige, orange-brown to dark reddish brown. It is sparsely to very micaceous. Limonite concretions and limonite cemented sand is present but uncommon. Kaolin is often present as thinly interbedded laminations.

The clay layers in the Claiborne and Wilcox are usually less than two feet thick. Thicker layers are often interbedded with clayey or silty sand. The clay is typically silty and slightly sandy and has a low to medium plasticity. Colors range from white and pinkish white (kaolin) to dark gray and brown. Eleven samples of clay collected from nine well locations were submitted for grain size analyses.

The total thickness of the Claiborne and Wilcox was not determined during the investigation. The Wilcox rests unconformably on the Porter's Creek Clay. The top of the Porter's Creek Clay is estimated to occur at an elevation of 125 feet AMSL beneath the Site (Russell and Parks, 1975).

Site Hydrogeology

The geologic conditions beneath the Site were found to be much different than that previously presented in Rima et al, 1964. The hydrogeology of the study area is consistent with that of the northern Hardeman County region. The water bearing sands of the Claiborne and Wilcox Formations are essentially unconfined and therefore comprise a single water table aquifer. The water table elevations range from 425 feet to 370 feet AMSL from south to north across the study area. The Porter's Creek Clay is believed to form the lower boundary of the water table aquifer.

The Claiborne - Wilcox hydrostratigraphic unit is the only unit which was investigated during the RI. The Porter's Creek Clay is an aquitard and is believed to be the base of the groundwater flow system at the Site.

The hydraulic conductivity of the Clairborne-Wilcox unit, as determined from the grain size curves, ranges from 2×10^{-3} to 9×10^{-2} cm/sec with a geometric mean of 2×10^{-2} cm/sec. The in situ hydraulic conductivity, as determined by the slug-injection tests, ranged from 4.4×10^{-5} cm/sec to 1.1×10^{-2} cm/sec, with a geometric mean of

9.2×10^{-4} cm/sec. For most of the monitoring wells tested the hydraulic conductivity was in the range of 9×10^{-3} to 1.6×10^{-4} cm/sec. The variation of hydraulic conductivity between monitoring wells reflects the silt and clay beds that are found within the unconfined sand aquifer.

Water level elevations were collected from the CRA wells and GM wells in August and November, 1989. Examination of the data indicates that there is little seasonal variation in the water level elevations in the water table aquifer and that the water level elevations are generally consistent with the elevation presented in ERM's February 1985 document.

Groundwater in the study area flows from south to north, with an average horizontal gradient of 0.004 ft/ft. The water table contours also indicate that the unsaturated zone beneath the disposal areas is 75 to 95 feet thick.

The actual water table elevations in the vicinity of Pugh and Clover Creeks indicates that they are in fact discharge boundaries and groundwater originating from the Site does not flow beneath these streams. The major discharge area is Clover Creek and the lower reaches of Pugh Creek. In its upper reaches, Pugh Creek is intermittent indicating a poor hydraulic connection with the groundwater.

Using a horizontal hydraulic gradient of 0.004, a hydraulic conductivity of 3×10^{-3} cm/sec and an assumed porosity of 0.25, a velocity of 4.8×10^{-5} cm/sec or 50 feet per year was estimated. A maximum value for groundwater velocity was calculated using a hydraulic conductivity of $1.11 \times$

10^{-2} cm/sec (highest value from the single well response tests), a horizontal gradient of 0.004 and an assumed porosity of 0.2. These values yielded a velocity of 2.2×10^{-4} cm/sec or 230 feet per year.

The presence of the numerous clay beds and lenses within the water table aquifer would have the effect of reducing the effective porosity. Therefore, groundwater flow velocities may be much higher than noted above. This in fact is the case at the Site because if the maximum flow rates stated above were used, it would take approximately 26 years for groundwater beneath the Site to reach Clover Creek. However, Site-related contaminants have already been detected in the groundwater adjacent to the Clover Creek. Therefore, it is believed, based on the historical data, that the groundwater velocity is on the order of double the calculated velocity.

CONTAMINANT DISTRIBUTION

In order to further define the contaminant distribution at the Hardeman County Landfill, and in order to identify any changes in the contaminant distribution historically defined at the Site, the RI Work Plan included the collection of six specific groups of samples for chemical analyses. The six specific groups of samples collected under the RI program included:

- i) angled boring samples beneath the waste disposal areas;
- ii) confining clay samples;
- iii) groundwater samples;
- iv) surface water samples from Pugh and Clover Creeks;

3.4 SITE STRATIGRAPHY

The sediments underlying the Site are dominated by sand. The Claiborne Formation outcrops in the study area and is underlain by the Wilcox Formation. The two formations are not differentiated in western Tennessee and combine to form a fairly thick sequence of sand and silty sand with subordinate clay and silt. The Claiborne is mantled by a thin discontinuous deposit of Quaternary alluvium and loess.

Geologic cross sections are presented on Figures 3.2, 3.3 and 3.4. The cross section locations are shown on Figure 3.5.

The stratigraphy identified and described by Rima et al., 1964 is apparently only representative of the immediate vicinity of the central portion of the Northern Disposal Area. The sand units and confining clay layers, and their corresponding hydrostratigraphic units, described in that report do not persist laterally across the Site.

3.4.1 Quaternary Sediments

The Quaternary sediments are present across most of the study area. The alluvium is similar to the underlying Claiborne sediments and could not be differentiated from the Claiborne in the study area. The alluvium is usually capped by loess which is glacially derived wind blown

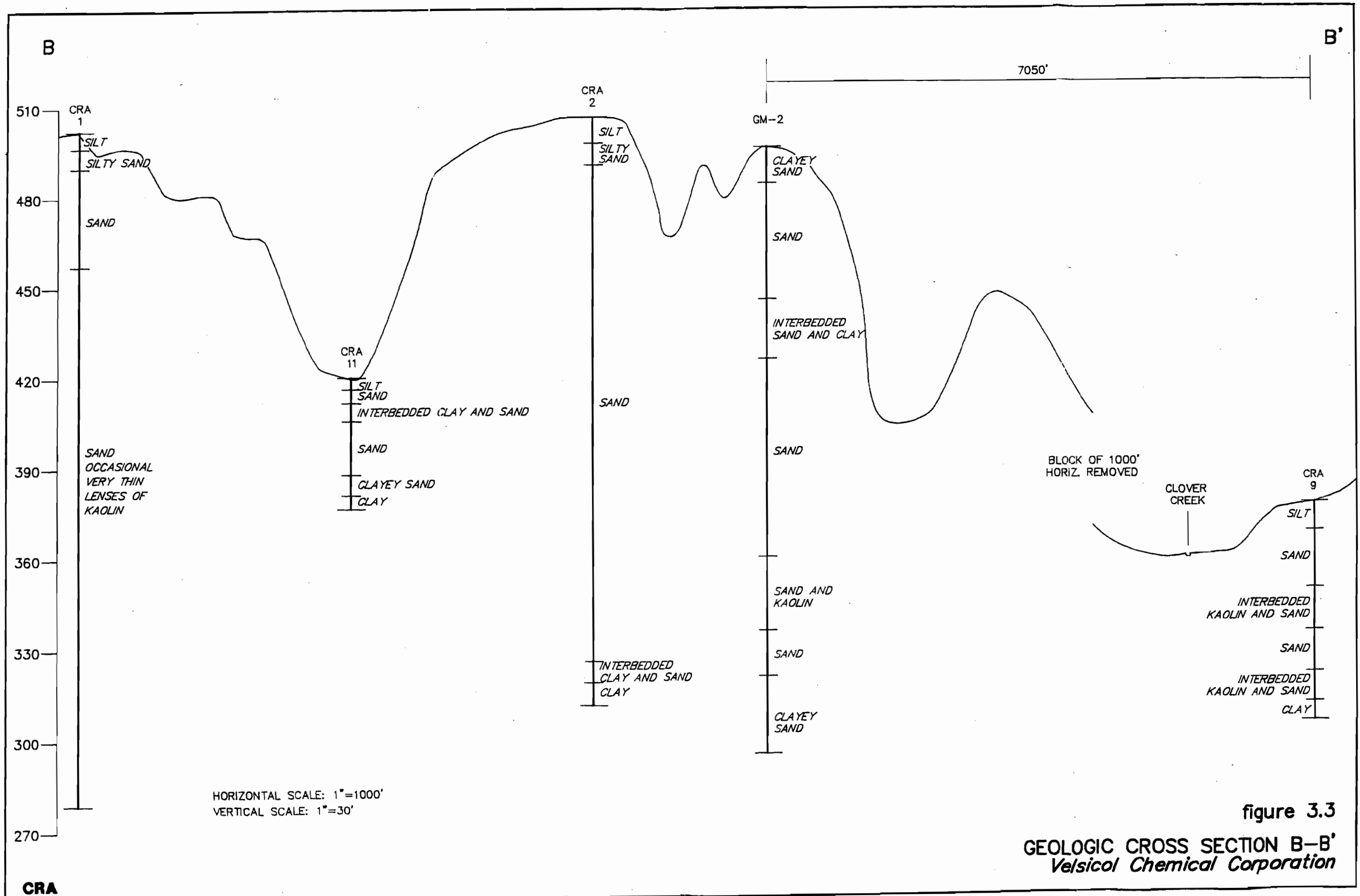
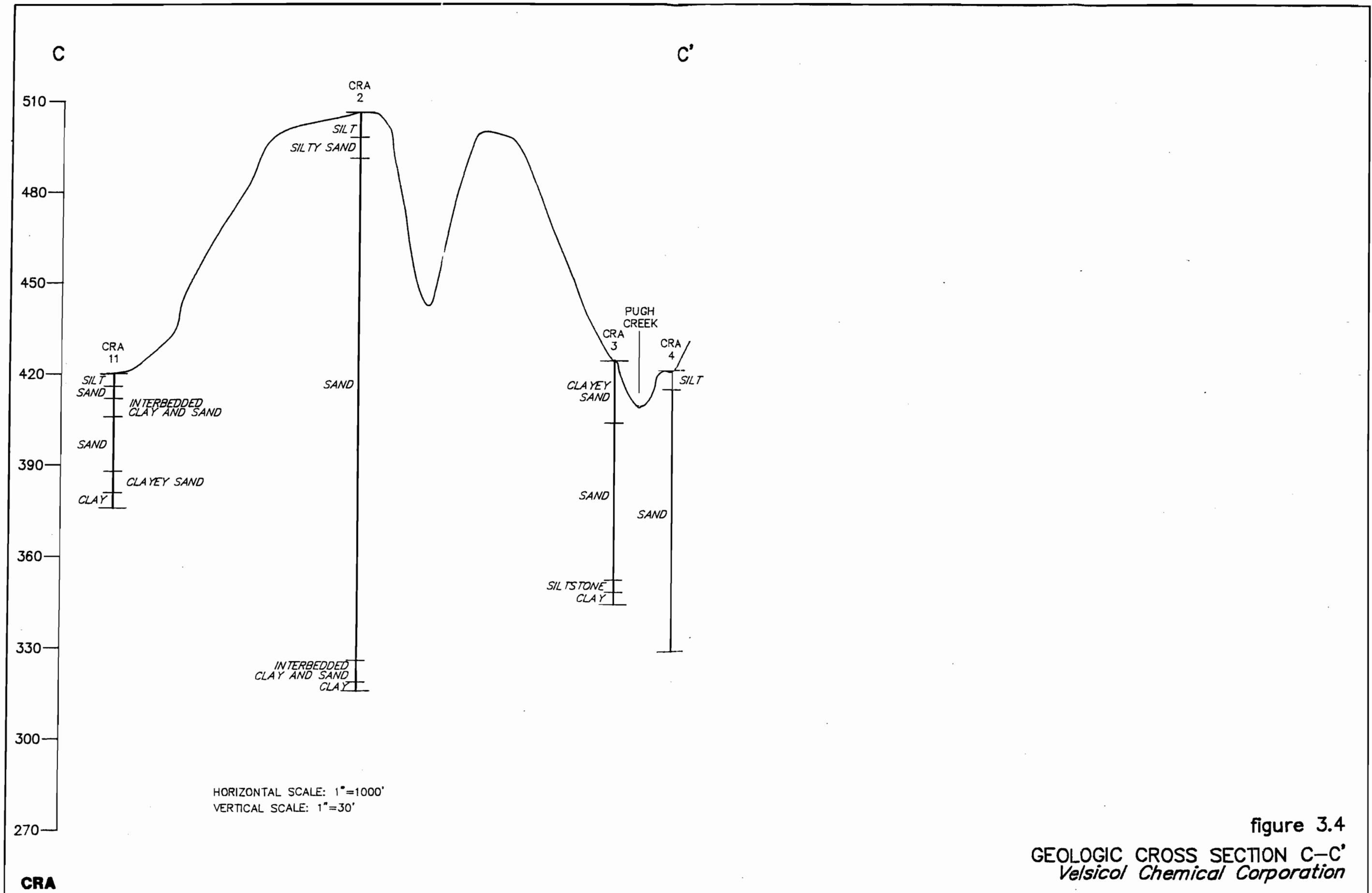


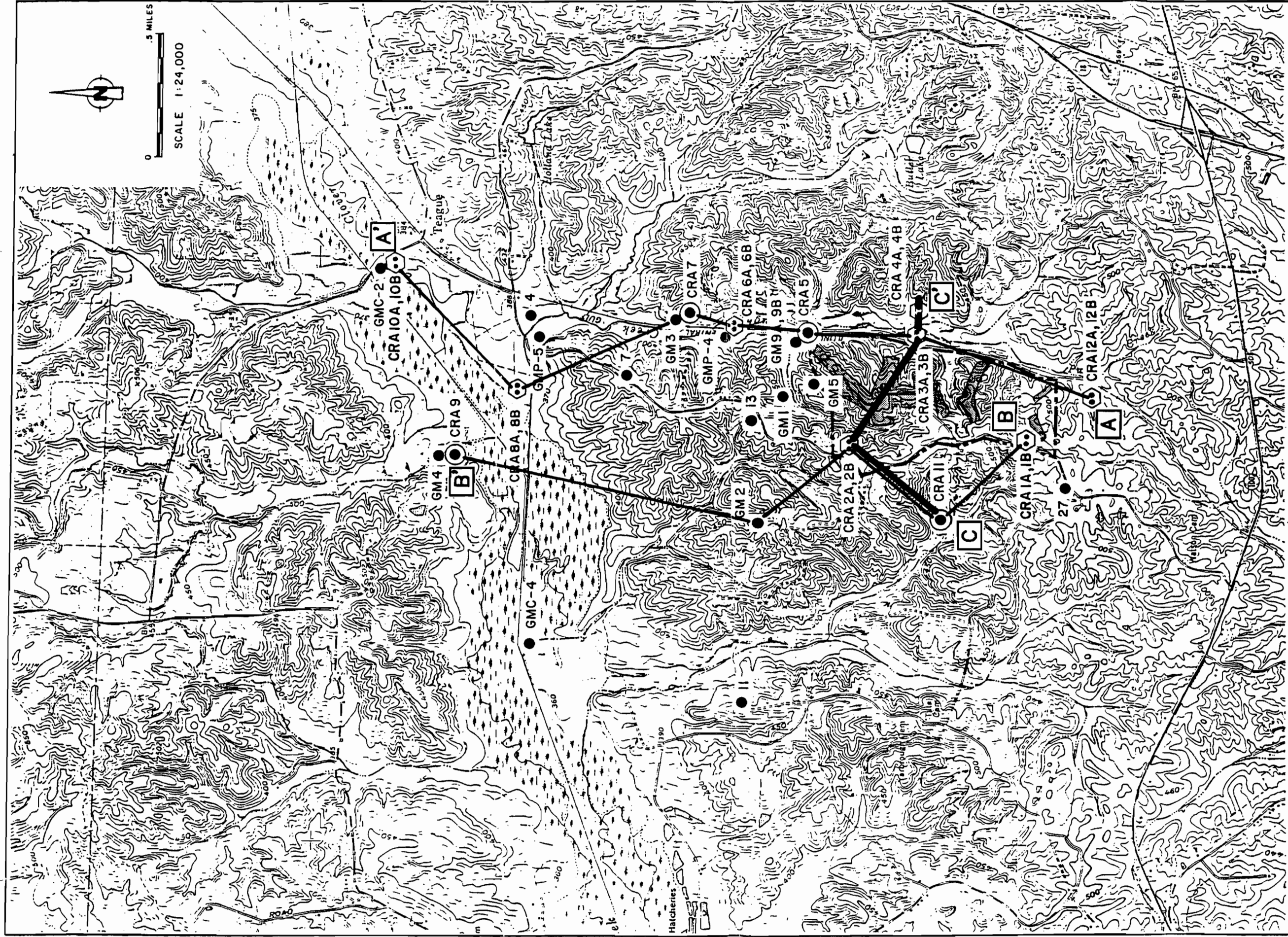
figure 3.3

GEOLOGIC CROSS SECTION B-B'
Velsicol Chemical Corporation



HORIZONTAL SCALE: 1"=1000'
 VERTICAL SCALE: 1"=30'

figure 3.4
 GEOLOGIC CROSS SECTION C-C'
 Velsicol Chemical Corporation



SOURCES : 1) BOLIVAR EAST QUADRANGLE, TENNESSEE, U.S.G.S.
 2) TEAGUE QUADRANGLE, TENNESSEE, U.S.G.S.

- LEGEND**
- EXISTING MONITORING WELL
 - ⊙ PROPOSED MONITORING WELL
 - ⊕ PROPOSED MONITORING WELL NEST
 - ▨ DISPOSAL AREA
 - ▭ A CROSS-SECTION LOCATION

figure 3.5
CROSS-SECTION LOCATIONS
Velsicol Chemical Corporation

silt, (Miller, 1974). Silt was present at the surface at 9 of the 12 well locations. The thickness of the loess deposits ranges from 0 to about 12 feet.

Previous Site investigations (Rima et al, 1964 and Sprinkle, 1978) suggested that perched water could flow laterally into the waste trenches and then percolate down to the water table aquifer. To assess this possibility, 41 soil borings were drilled at 13 locations around the perimeter of the three waste disposal areas. The boreholes were drilled to a depth of 15 to 20 feet BGS, which is the approximate depth of the nearby disposal trenches.

The stratigraphy encountered in the first 20 feet remained consistent across the Site. Clay or silt is almost always present from the ground surface to 3 to 5 feet below ground surface (BGS). The silt usually grades downward to silty sand which, in turn, grades to clean or slightly silty sand. Low permeability soils were encountered (below the surface sediments) in 8 boreholes. They were usually very thin clay or silt layers interbedded with sand. Total thickness of the low permeability layers was generally less than one foot.

3.4.2 Claiborne and Wilcox Formations

The Claiborne and Wilcox Formations were deposited during the Eocene epoch of the Tertiary period. Although the contact between the formations is an unconformity, lithologically they are very similar and can be treated as one unit. The unit consists of clean fine sand to

silty and clayey sand with occasional very thin lenses of clay. The sediments are often thinly interbedded and individual beds or groups of beds are not laterally persistent. The sediments are characteristic of nonmarine fluvial or deltaic depositional environments.

The sand consists of fine to medium grained quartz. Coarse grained sand and gravel is rare. It is usually well to medium well sorted. Slightly silty to silty fine sand is common. Colors range from light gray, pinkish gray, beige, orange-brown to dark reddish brown. It is sparsely to very micaceous. Limonite concretions and limonite cemented sand is present but uncommon. Kaolin is often present as thinly interbedded laminations.

Soil samples collected from the screen intervals of the 20 wells which were installed during the RI were submitted for grain size analyses. The results of the analyses are presented in Table 2.3. The uniformity of the sands in the Claiborne and Wilcox Formations is illustrated by the relatively thin envelope on the composite grain size distribution curve presented as Figure 3.6.

The clay layers in the Claiborne and Wilcox are usually less than two feet thick. Thicker layers are often interbedded with clayey or silty sand. The clay is typically silty and slightly sandy and has a low to medium plasticity. Colors range from white and pinkish white (kaolin) to dark gray and brown.

Eleven samples of clay collected from nine well locations were submitted for grain size analyses. The results are presented in Table 2.3.

At the bottom of boreholes CRA-3A and CRA-7A the gray clay graded upward to gray shale. The shale was overlain by a foot of thinly interbedded beige siltstone and fine sandstone which was capped by less than a foot of red shale.

The total thickness of the Claiborne and Wilcox was not determined during the investigation. The Wilcox rests unconformably on the Porter's Creek Clay. The top of the Porter's Creek Clay is estimated to occur at an elevation of 125 feet AMSL beneath the Site (Russell and Parks, 1975).

3.5 SITE HYDROGEOLOGY

3.5.1 General

The hydrogeologic investigation was designed to fill a number of data gaps that were identified in the Interim Report (CRA, 1987). The specific data requirements identified included:

- i) the demonstration that Clover and Pugh Creeks are hydraulic boundaries to flow;
- ii) the demonstration that groundwater flow beyond Clover the Pugh Creeks does not occur; and

- iii) a better definition of hydraulic heads and hydraulic conductivity in the aquifer beneath the Site.

As reported in the previous section, the geologic conditions beneath the Site were found to be much different than that previously presented in Rima et al, 1964. The results of the hydrogeologic investigation are summarized in the following sections of this report.

3.5.2 Hydrostratigraphy

The hydrogeology of the study area is consistent with that of the northern Hardeman County region. The water bearing sands of the Claiborne and Wilcox Formations are essentially unconfined and therefore comprise a single water table aquifer. The water table elevations range from 425 feet to 370 feet AMSL from south to north across the study area. The Porter's Creek Clay is believed to form the lower boundary of the water table aquifer.

The investigation of potential perched water adjacent to the disposal areas revealed that low permeability soils are uncommon in shallow (i.e. 20 feet BGS) sediments along the ridge tops. Of the 41 exploratory boreholes drilled, potentially confining layers were found in only 8 boreholes at 4 locations. Wet or saturated soils were encountered in only 2 boreholes.

Piezometer nests (P6, a, b and c and P7 a, b, and c) were installed at 2 locations next to the Northern Disposal Area. These were the

only locations where water was encountered. Water level elevations from different times throughout 1988 and 1989 are presented on Table 2.9. These data indicated that perched water is rarely present and does not accumulate to significant depths. The data collected indicate that horizontal flow of perched water into waste is minimal and is not a major source of leachate.

Stratigraphic units can be grouped into hydrostratigraphic units according to their water bearing properties. Those units which have a significant capacity to transmit water are termed aquifers, while low permeability materials which have little ability to transmit water are termed aquitards. The Claiborne - Wilcox hydrostratigraphic unit is the only unit which was investigated during the RI. The Porter's Creek Clay is an aquitard and is believed to be the base of the groundwater flow system at the Site.

The hydrogeology of the study is summarized on hydrogeologic cross-sections presented as Figures 3.7, 3.8 and 3.9. These cross-sections include water table elevations, well screens, and surface water locations. The locations of these cross-sections are shown on Figure 3.5.

3.5.3 Hydraulic Conductivity

Twenty monitoring wells were completed within the Claiborne - Wilcox unit. Horizontal hydraulic conductivity values were determined by slug-injection tests for 18 of the wells. Conductivities were also estimated from grain size curves using the Hazen Method. The data are summarized on Tables 2.3 and 2.5.

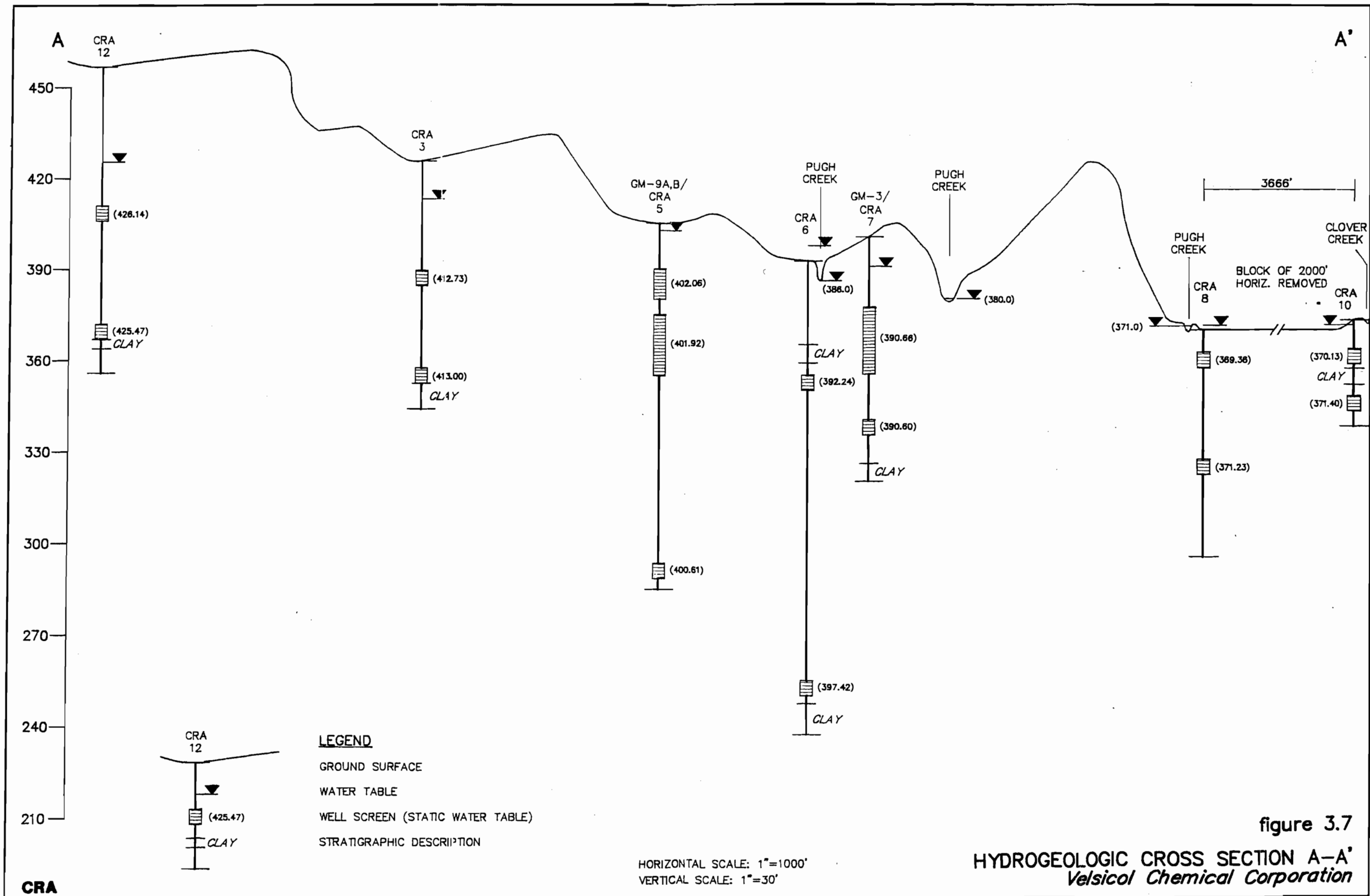
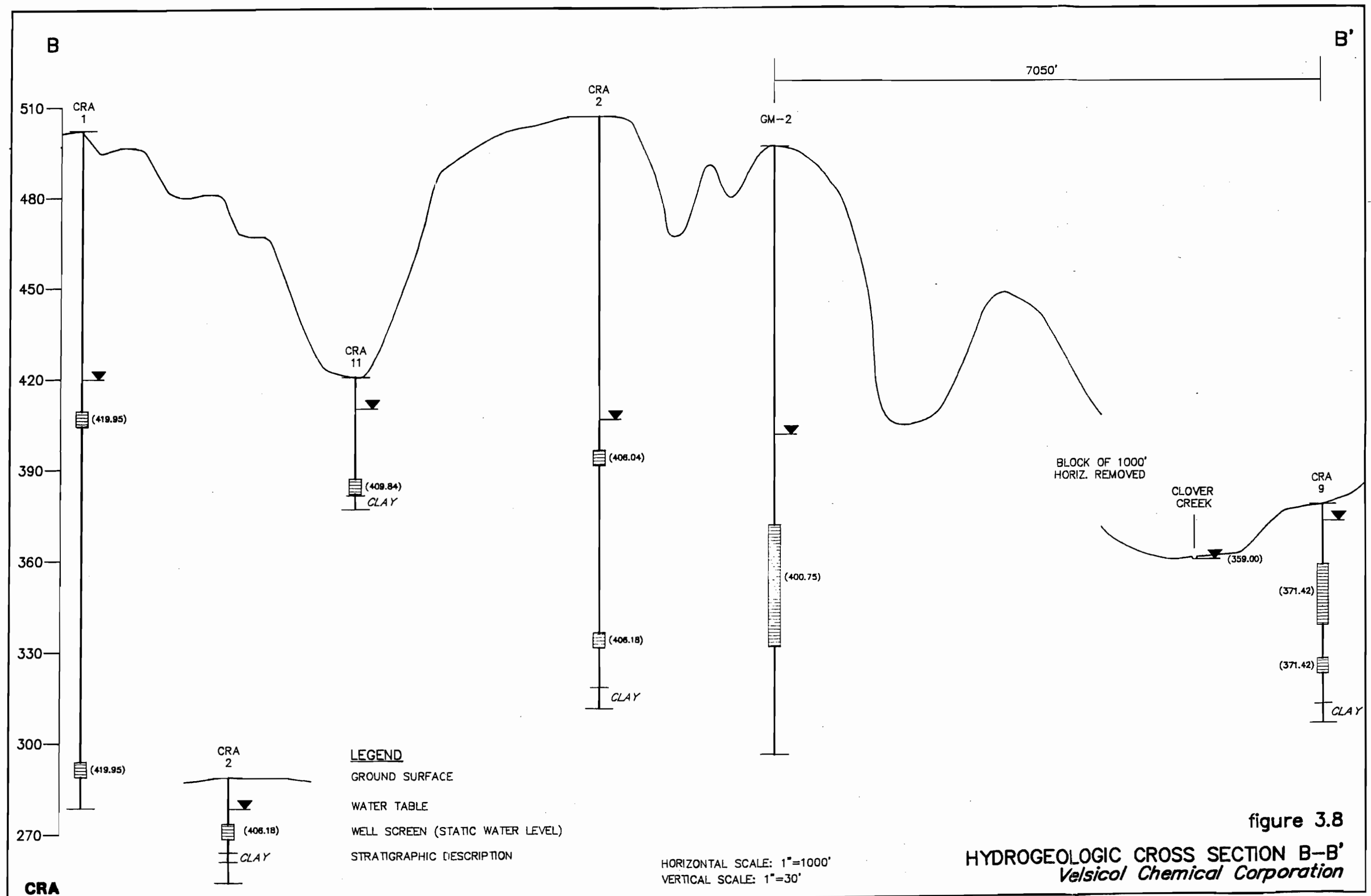
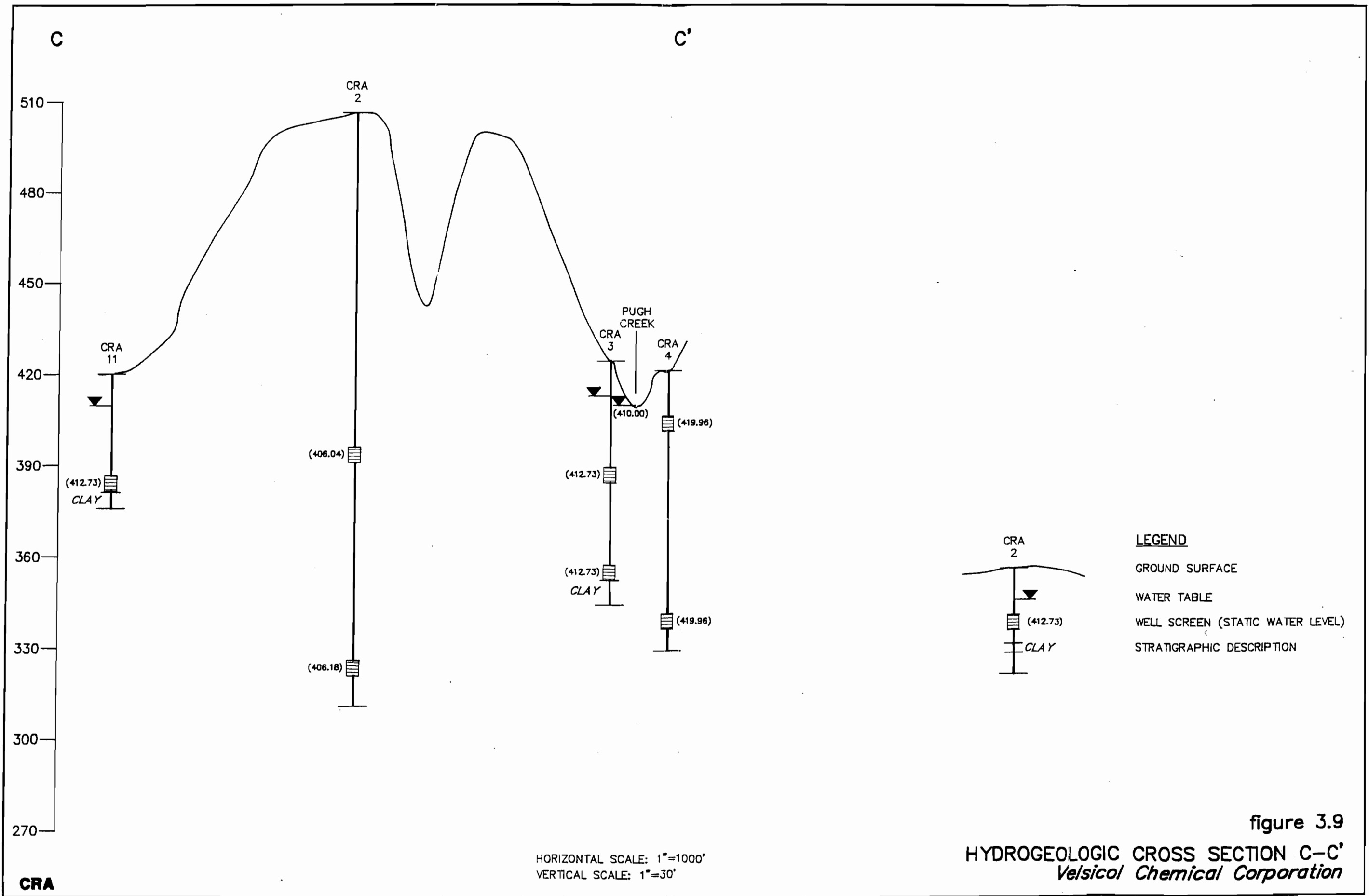


figure 3.7

HYDROGEOLOGIC CROSS SECTION A-A'
 Velsicol Chemical Corporation





Examination of Table 2.3 indicates that the hydraulic conductivity of the Clairborne-Wilcox unit, as determined from the grain size curves, ranges from 2×10^{-3} to 9×10^{-2} cm/sec with a geometric mean of 2×10^{-2} cm/sec. The in situ hydraulic conductivity, as determined by the slug-injection tests, ranged from 4.4×10^{-5} cm/sec to 1.1×10^{-2} cm/sec, with a geometric mean of 9.2×10^{-4} cm/sec. For most of the monitoring wells tested the hydraulic conductivity was in the range of 9×10^{-3} to 1.6×10^{-4} cm/sec.

The variation of hydraulic conductivity between monitoring wells reflects the silt and clay beds that are found within the unconfined sand aquifer.

Three undisturbed samples of clay were submitted for permeability testing. The samples yielded vertical hydraulic conductivities ranging from 2.4×10^{-6} cm/sec to 1.2×10^{-7} cm/sec. The testing results are presented on Table 2.4.

3.5.4 Hydraulic Gradients

Water level elevations were collected from the CRA wells and GM wells in August and November, 1989. The elevations are presented on Table 3.1. Examination of the data indicates that there is little seasonal variation in the water level elevations in the water table aquifer and that the water level elevations are consistent with the elevations presented in ERM's February 1985 document.

TABLE 3.1

**GROUNDWATER ELEVATIONS
HARDEMAN COUNTY LANDFILL RI/FS**

<i>Well Number</i>	<i>Reference(1) Elevation</i>	<i>Groundwater Elevations</i>		
		<i>8/23/89</i>	<i>8/28/89</i>	<i>11/28/89</i>
CRA-1A	505.21	420.25	420.36	419.95
CRA-1B	505.12	420.33	420.34	419.95
CRA-2A	509.07	406.50	406.56	406.18
CRA-2B	509.29	406.38	406.41	406.04
CRA-3A	426.45	413.16	413.23	413.00
CRA-3B	427.37	412.89	412.97	412.73
CRA-4A	423.97	420.67	420.72	420.44
CRA-4B	423.99	420.13	420.16	419.96
CRA-5	406.83	400.78	400.81	400.61
GM-9A	406.83	401.76	401.77	401.92
GM-9B	406.92	401.80	401.89	402.06
CRA-6A	399.44	397.29	397.69	397.42
CRA-6B	395.54	391.71	391.78	392.24
CRA-7	403.10	390.86	390.88	390.60
GM-3	402.88	390.91	390.83	390.66
CRA-8A	372.02	370.57	367.34	371.23
CRA-8B	372.15	367.41	363.09	369.36
CRA-9	378.93	370.65	370.88	371.25
GM-4	376.76	370.82	371.22	371.42
CRA-10A	375.29	370.38		371.40
CRA-10B	376.64	367.50		370.13
CRA-11	421.89	410.15	410.14	409.84
CRA-12A	458.87	426.03	426.02	425.47
CRA-12B	458.52	427.01	426.94	426.14
GM-1	424.87	402.65		402.34
GM-2	497.54			400.75
GM-5	503.35	407.35	407.35	407.01
GMP-5	373.34		370.99	370.81

Note:

(1) Reference elevation is top of monitoring well casing with cap removed.

A water table elevation contour map, using water levels collected on November 28, 1989, is presented on Figure 3.10. Examination of this figure indicates that the groundwater in the study area flows generally from south to north, with an average horizontal gradient of 0.004 ft/ft. The water table contours also indicate that the unsaturated zone beneath the disposal areas is 75 to 95 feet thick.

Examination of the actual water table elevations in the vicinity of Pugh and Clover Creeks indicates that they are in fact discharge boundaries and groundwater originating from the Site does not flow beneath these streams. The major discharge area is Clover Creek and the lower reaches of Pugh Creek. In its upper reaches, Pugh Creek is intermittent indicating a poor hydraulic connection with the groundwater. However, water level data from monitoring wells CRA-3 and CRA-4 confirm groundwater from the Site will not underflow this stream.

Vertical hydraulic gradients (VHGs) were calculated for each monitoring well nest and are summarized on Table 3.2. The VHGs indicated the wells in the upland areas (CRA-12, CRA-1) have downward gradients. In general, well nests adjacent to Clover and Pugh Creeks have upward (positive) VHGs indicative of discharge areas. The exceptions to this are CRA-9/GM-4, CRA-7/GM-3 and CRA-5/GM-9. The reason for downward vertical gradients is not clear.

SECTION C WASTE CHARACTERISTICS AND WASTE ANALYSIS PLAN

The purpose of the waste characteristics section is to provide a general description of the waste types treated at the HWOBA and the waste characterization procedures prior to disposal. This section is provided to fulfill the requirements of 40 CFR 264.13, 40 CFR 270.14, and THWMR 0400-12-01-.07 and 0400-12-01-.06.

C-1 PHYSICAL AND CHEMICAL CHARACTERISTICS OF WASTE AND RESIDUES

Kilgore's pyrotechnic device manufacturing processes at its main production plant include mixing, drying, soldering, milling, extrusion, pelletization, surface coating, testing, space heating, and storage. Hazardous waste generated at the main production plant includes scrap composition from upset conditions in the mixing/drying process, grains that do not pass quality control standards, and rags and miscellaneous materials from clean-up operations. The hazardous waste is accumulated in 15- and 30-gallon steel drums lined with conductive bags. During accumulation, diesel fuel is added to the drums to stabilize the waste. Waste drums are collected and staged in covered concrete-bermed HWAAs at the main production plant.

Hazardous wastes treated at the HWOBA include scrap pyrotechnic compositions, residual acetone-contaminated rags, scrap barium compositions, scrap lead compositions, and scrap ammonium perchlorate compositions (scrap propellant waste). No laboratory analysis has been performed on waste pyrotechnics before treatment at the HWOBA due to the amount of information available regarding inherent characteristics of pyrotechnics, generator knowledge of the chemical and physical characteristics of the material, and the safety threat involved in sampling pyrotechnic waste. Each hazardous waste treated at the HWOBA is discussed below.

C-1(a) Definition of Ignitable Hazardous Waste

Pyrotechnic wastes treated at the HWOBA which are hazardous because they exhibit the characteristic of ignitability are classified with U.S. EPA and THWMR Hazardous Waste Code D001. These wastes have the following properties characteristic of ignitability found in 40 CFR 261.21 and THWMR 0400-12-01-.02(3)(b)1(ii) and (iv):

- It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

- It is an oxidizer.

Because the constituents that comprise the waste stream have the inherent nature to undergo a spontaneous reaction and are oxidizers, the knowledge-based waste characterization approach has been utilized to classify this waste stream.

C-1(b) Definition of Reactive Hazardous Waste

Pyrotechnic wastes treated at the HWOBA which are hazardous because they exhibit the characteristic of reactivity are classified with U.S. EPA and THWMR Hazardous Waste Code D003. These wastes have the following property characteristic of reactivity found in 40 CFR 261.23 and THWMR 0400-12-01-.02(3)(d)1(vi):

- It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

Because the constituents that comprise the waste stream have the inherent nature of pyrotechnic devices to undergo detonation or explosive reaction, the knowledge-based waste characterization approach has been utilized to classify this waste stream.

C-1(c) Knowledge-Based Waste Characterization

Kilgore's pyrotechnic device manufacturing processes involve exact chemical mixing procedures and formulas that generate waste streams with known chemical composition and properties unlike traditional hazardous waste generated during manufacturing or maintenance processes. The manufacturing process specifications are strict and variations are limited. The identity of each waste pyrotechnic is traceable back to its original chemical ingredients and may be obtained from manufacturers and used for knowledge-based waste determination. Safety Data Sheets (SDSs) in Appendix C-1 may be used to characterize hazardous waste treated at the HWOBA.

All chemical compositions of the magnesium pyrotechnics have been ascertained from process knowledge (i.e., the physical and chemical characteristics of the components used to manufacture products) because of the potential safety hazards associated with sampling the material. Pyrotechnic materials have been tested in accordance DOT test criteria for explosives at 49 CFR 173.56-.58.

C-1(d) Scrap Pyrotechnics Compositions

The Magnesium/Teflon/Viton pyrotechnic process is associated with production of infrared flares and associated pyrotechnics. During production, manufactured magnesium pyrotechnic is milled

and drilled to accommodate boosters and casings. The milling and drilling processes generate the most significant quantity of waste pyrotechnics treated at the HWOBA. The scrap magnesium pyrotechnic compositions exhibit the characteristics of ignitability (D001) under 40 CFR 261.21 and THWMR 0400-12-01-.02(3)(b)1(ii) and (iv); reactivity (D003) under 40 CFR 261.23 and THWMR 0400-12-01-.02(3)(d)1(vi).

To minimize premature reactions associated with this waste, the compositions are accumulated, transported, and burned while submerged in diesel fuel, which significantly reduces the possibility that friction or static sparks can initiate a reaction. In addition, the diesel fuel slows any initiated reaction considerably, thus reducing the possibility of an explosion.

C-1(e) Residual Acetone-Contaminated Rags

Rags containing residual pyrotechnics and acetone are occasionally taken to the HWOBA for treatment. Clean-up and decontamination of process equipment generates rags that may contain trace amounts of acetone. These wastes are hazardous because they contain acetone, a solvent listed (based on ignitability) under Hazardous Waste Code F003, and may be characteristically hazardous for ignitability (D001). Because the rags may also contain trace amounts of pyrotechnic material, they are burned at the HWOBA. This waste typically has hazardous waste codes D001, D003, and F003.

C-1(f) Scrap Propellant Waste

Propellant waste treated at the HWOBA may contain explosives mixtures such as nitroglycerine, nitrocellulose, cyclotetramethylene tetranitramine (HMX), cyclotrimethylene trinitramine (RDX), aluminum powder, and ammonium perchlorate. This waste typically has Hazardous Waste codes D001 and D003.

C-1(g) Scrap Barium Compositions

Minor quantities of barium are also used during various pyrotechnic production processes; waste generated from those processes typically has Hazardous Waste codes D001, D003, and D005.

C-1(h) Scrap Lead Compositions

Minor quantities of lead are also used during various pyrotechnic production processes; waste generated from those processes typically has Hazardous Waste codes D001, D003, and D008.

C-2 CHEMICAL ANALYSIS OF RESIDUALS AND WASTE DEGRADATION PRODUCTS GENERATED FROM OPEN BURNING

Table C-1 lists the wastes generated at the main production plant and treated at the HWOBA. Less than 1 percent of the wastes treated contain combinations of residual acetone, chromium, barium, lead, and ammonium perchlorate.

Table C-1
Hazardous Waste Generated at Main Production Plant and Currently Thermally Treated at the HWOBA
Kilgore Flares Company, LLC — Part B Permit Application

TN Waste Stream Number	Waste Stream	Hazardous Waste Codes	HWOBA Waste Types	Chemical Composition/ Constituents of Hazardous Waste	Waste Degradation Product
1	Scrap Pyrotechnic Composition	D001, D003, D007	Magnesium/Teflon Flare Waste	Magnesium, Chromium, Teflon, Viton, Sodium Nitrate, Laminac, Lupersol, Boron Potassium Nitrate, and Hycar Rubber	Magnesium Ash
27	Residual Acetone-Contaminated Rags	F003 (I)	Acetone Rags	Acetone	Ash
31	Scrap Barium Composition	D001, D003, D005	Barium/Magnesium Waste	Barium Peroxide, Magnesium Powder, Potassium Nitrate, Cesium Nitrate, Silicon, Hexamine, Boron, Lactose, Boron Potassium Nitrate, and Wood Charcoal	Barium Ash
32	Scrap Lead Composition	D001, D003, D008	Silicone/Lead Oxide/Cupric Oxide Flare Waste	Lead, Water, Silicone, and Cupric Oxide	Lead Ash
45	Scrap Ammonium Perchlorate Composition	D001, D003	Ammonium Perchlorate Propellant Waste	Aluminum, Ammonium Perchlorate, Boron, Diisocyanate, GAP Hexamethylene, HMX, HTPB Lactose, Magnesium, RDX, Potassium Perchlorate, RTV, Trioxide, Bismuth, and Teflon	Ash

Notes:

- (I) — Ignitable
- GAP — Glycidyl azide polymer
- HMX — Cyclotetramethylene tetranitramine
- HTPB — Hydroxyl terminated polybutadiene
- RDX — Cyclotrimethylene trinitramine
- RTV — Room-temperature vulcanized

C-3 WASTE ANALYSIS PLAN

The Waste Analysis Plan (WAP) was developed in accordance with *Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes — DRAFT*, (U.S. EPA, January 2013) to ensure that Kilgore has sufficient information to identify the waste for proper handling, transport, and treatment; confirm the effectiveness of treatment; and ensure proper disposal. The WAP is designed to describe the procedures used to obtain chemical and physical information and data on wastes to ensure proper transportation, treatment, and disposal. The WAP details parameters for analysis and supporting rationale, test methods, sampling methods, and frequency of analysis,

along with other documentation for additional requirements pertinent to the HWOBA. Modifications to sampling, quality assurance (QA)/quality control (QC), or waste analytical methods, and additions to the types of hazardous waste treated at the HWOBA shall result in the modification of the WAP. Modifications shall be submitted to the TDEC Division of Solid Waste Management (DSWM).

All persons at Kilgore responsible for characterizing, handling, treating, and managing hazardous waste shall be familiar with this WAP. Any deviation in the methods needed to characterize a solid or hazardous waste shall be reviewed and accepted by Kilgore and incorporated into this plan.

C-3(a) Parameters and Rationale

Table C-2 lists the parameters to be analyzed, the rationale for parameters to be analyzed, and methods used to test the parameters.

**Table C-2
 Parameters, Rationale, and Test Methods for Sampling**

Parameters to be Analyzed	Rationale	Test Method(s)
Hazardous Waste Stream Numbers 1, 27, 31, 32, and 45¹.		
Reactivity	Required by TDEC DSWM for disposal purposes as special waste to establish reactivity (D003) under 40 CFR 261.23 and THWMR 0400-12-01-.02(3)(d)	Process knowledge
Ignitability	Required by TDEC DSWM for disposal purposes as special waste to establish ignitability (D001) under 40 CFR 261.21 and THWMR 0400-12-01-.02(3)(b)	Process knowledge
Ash Generated from Open Burning		
Chloride	Required by TDEC DSWM for disposal purposes as special waste	SW-846 Method 9056
Cyanide, Reactive	Required by TDEC DSWM for disposal purposes as special waste to establish reactivity (D003) under 40 CFR 261.23 and THWMR 0400-12-01-.02(3)(d)	SW-846 Method 7.3.3
Density	Required by TDEC DSWM for disposal purposes as special waste	Standard Methods Modified ² 2710-F (water) ASTM-D 1475-96 (solids)
Ignitability/ Flash Point	Required by TDEC DSWM for disposal purposes as special waste to establish ignitability (D001) under 40 CFR 261.21 and THWMR 0400-12-01-.02(3)(d)	SW-846 Method 1010
Ammonia, Total	Required by TDEC DSWM for disposal purposes as special waste due to be an underlying constituent of the original pyrotechnic waste stream	Standard Methods Modified ³ 4500-NH3-E
Acetone	Required by TDEC DSWM for disposal purposes as special waste due to be an underlying constituent of the original pyrotechnic waste stream	SW-846 8260B

**Table C-2
 Parameters, Rationale, and Test Methods for Sampling**

Parameters to be Analyzed	Rationale	Test Method(s)
Nitrogen, Nitrate, and Nitrite	Required by TDEC DSWM for disposal purposes as special waste due to being an underlying constituent of the original pyrotechnic waste stream	Standard Methods Modified ³ 4500-NO3-E
pH	Required by TDEC DSWM for disposal purposes as special waste	SW-846 9045C
Phenolics, TCLP	Required by TDEC DSWM for disposal purposes as special waste	SW-846 1311/9065
Phenolics, Solids	Required by TDEC DSWM for disposal purposes as special waste	SW-846 9065
Potassium, Total	Required by TDEC DSWM for disposal purposes as special waste due to be an underlying constituent of the original pyrotechnic waste stream	SW-846 6010B
Water Solubility	Required by TDEC DSWM for disposal purposes	Not Applicable
RCRA 8 Metals	Required by TDEC DSWM for disposal purposes as special waste to establish toxicity characteristics (D004 – D011) under 40 CFR 261.24 and THWMR 0400-12-01-.02(3)(e)	SW-846 1311/6010B/7470A
Sulfide, Reactive	Required by TDEC DSWM for disposal purposes as special waste to establish reactivity (D003) under 40 CFR 261.23 and THWMR 0400-12-01-.02(3)(d)	SW-846 7.3.4
Organic Carbon, Total	Required by TDEC DSWM for disposal purposes as special waste	SW-846 9060M
Rain Water in Containment Berms of Burn Pans		
TCLP metals	Hazardous Waste determination prior to release or for disposal	SW-846 1311, 6010, 7470

Notes:

1. — Scrap pyrotechnics that include all wastes (scrap, QA/QC testing debris, and refuse) containing magnesium, acetone, barium, chromium, lead and ammonium perchlorate to be treated at the HWOBA.
 2. — Modification of Standard Methods 2710-F (Sludge Specific Gravity) consists of a calculation change to reflect density instead of specific gravity.
 3. — Modification of Standard Methods 4500-NH3 F, 4500-NO3 E, and 4500-P E, respectively. Modification consists of dissolving/extracting sample in de-ionized water, filtering, and analyzing for “Total Soluble Analyte” in the extract.
- TDEC — Tennessee Department of Environment and Conservation
 DSWM — Division of Solid Waste Management
 CFR — Code of Federal Regulations
 THWMR — Tennessee Hazardous Waste Management Regulation
 TCLP — Toxicity Characteristic Leaching Procedure
 EPH — Extractable Petroleum Hydrocarbons
 RCRA — Resource Conservation and Recovery Act

C-3(b) Test Methods

Table C-2 describes the test methods used for parameters proposed in this WAP. Any information used to define or characterize a hazardous waste (i.e., generator knowledge, reference documentation, or analytical results) is maintained on file at Kilgore’s main production plant for at least 5 years from the last day the specific hazardous waste was treated at the HWOBA.

Scrap Waste Stream Numbers 1, 27, 31, 32, and 45

The chemical compositions of scrap waste pyrotechnics from Kilgore's main production plant are known to be reactive (D003). In addition, some of the constituents in the waste stream could also exhibit the characteristic of ignitability (D001), the characteristic of toxicity D005 (barium), D007 (chromium), D008 (lead), and listed hazardous waste F003 (acetone). As discussed in section C-1, the chemical and physical characteristics of these waste streams remain constant over time because of strict manufacturing standards and procedures. Because of that, and since there is a safety hazard posed by the handling and testing of wastes containing relatively high levels of pyrotechnics, pyrotechnic-contaminated wastes have been and will be assumed to be reactive in lieu of testing, based on this generator process knowledge.

The ignitability of wastes handled under diesel fuel has been established through reference to SDSs and literature such as the *Fire Protection Guide on Hazardous Materials* (National Fire Protection Association, 1986). Based on the definitions provided in 40 CFR 261.21(a)(1) and THWMR 0400-12-01-.02(3)(b), diesel fuel waste is considered to be ignitable.

Ash Generated from Open Burning

Initial characterization of the ash and residue performed in accordance with 40 CFR 261 and THWMR 0400-12-01-.02 has indicated that magnesium ash and residue do not meet the definition of hazardous waste. The magnesium waste has been routinely analyzed for the following parameters: Toxicity Characteristic Leaching Procedure (TCLP) RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) and phenols; and toluene, chloride, density, flash/ignitability, potassium, ammonia, nitrogen (nitrite), nitrogen (nitrate), pH, phenols (solids), phosphorus, cyanide (reactive), sulfide (reactive), water solubility, and total organic carbon (TOC). These parameters were chosen based on generator knowledge of underlying constituents of the original waste streams and past materials used, and the requirements of the TDEC DSWM. See Table C-2 for the rationale for all parameters used to characterize the ash.

All waste pyrotechnics ash characterization will be performed in accordance with 40 CFR 261 Subpart C and Tennessee Rules for Hazardous and Special Waste, and include parameters summarized in Table C-2. Ash is sampled and analyzed annually to ensure that no changes have occurred. Appendix C-2 contains a copy of the Kilgore ash sampling WI. Appendix C-3 contains Kilgore's Special Waste approval for ash disposal.

Rain Water in Containment Berms

Rain water, if any, in containment berms will be sampled for TCLP metals prior to release. If TCLP hazardous waste limits are exceeded, rainwater will be containerized for disposal. Analysis is limited to metals which may be found in ash and therefore may have contaminated the rain water.

C-3(c) Sampling Methods

Scrap Waste Stream Numbers 1, 27, 31, 32, and 45

As previously stated, all wastes treated at the HWOBA from Kilgore's main production plant are assumed to be hazardous prior to treatment, based on generator process knowledge of the physical and chemical properties of the pyrotechnics. Information provided in Section C-1 and Table C-1 provides adequate information to identify the waste streams. Because analysis of waste pyrotechnics to verify exact chemical characteristics would be dangerous, as would delays in routing wastes for treatment, full chemical characterization is not performed prior to treatment. This is the current industry practice for this type of waste stream.

Ash Generated from Open Burning Pans

After treatment by open burning, the waste ash material in burn pans in each area has the same constituents, although the homogeneity may vary in ash throughout a burn pan. Based on the availability of historical analysis and process information to accurately assess the chemical and physical properties of the waste, composite sampling will be used to obtain representative samples. This type of sampling involves the selection of sample locations based on knowledge of waste distribution and/or waste properties, as well as HWOBU container (burn pan) considerations.

To ensure collection of a representative sample from each burn pan, ash and residue will be composited from five discrete locations (i.e., four corners and the center) in a burn pan that is inherently representative of the waste material. The discrete samples will be collected using a non-sparking scoop and placed into a stainless-steel bowl for compositing, then transferred into an 8-ounce, wide-mouth glass jar with Teflon liner. The WI for sampling ash is in Appendix C-2. The sampling methods used are consistent with those referenced in 40 CFR 261 Appendix I and Tennessee Rule 0400-12-01-.02(5).

Rain Water in Containment Berms

A single sample from each bermed area will be collected using a dip jar and preserved in accordance with SW-846 for shipment to the laboratory.

C-3(d) Frequency of Analysis

Scrap Waste Stream Numbers 1, 27, 31, 32, and 45

Because laboratory analysis is not conducted on waste pyrotechnics, introduction of any new chemicals at Kilgore's main production plant that could result in generating a new hazardous waste stream or alter the composition of existing hazardous waste streams (even those that would not require treatment at the HWOBA), the Environmental Manager or designee would be provided with all technical specifications regarding this chemical in order to determine the necessity for modifications to the HWOBA, treatment procedures, or other information in this Part B Permit Application before treatment at the HWOBA.

Ash Generated from Open Burning

Ash samples from the open burn pans are collected and analyzed annually to ensure proper handling and disposal. Waste pyrotechnic ash will also be sampled in the unlikely event that a change or modification in the pyrotechnic manufacturing process is expected to significantly alter the constituents of the ash.

Rainwater from Containment Berms

Samples will be collected as required before rainwater, if any, is discharged to the ground.

C-3(e) Additional Requirements Pertaining to Boiler/Industrial Furnace Facilities

These requirements are not applicable to Kilgore's HWOBA.

C-3(f) Additional Requirements for Wastes Generated Offsite

The HWOBA only receives waste from the Kilgore main production plant and the Kilgore Test Tunnel Area. The requirements of 40 CFR 264.13(b) and (c) and THWMR 0400-12-01-.06(2)(d)2 and 3 — including procedures to determine waste identification, sampling frequency, and sampling methods, and for obtaining waste analysis information supplied by the generator — are accomplished through the methods described in this WAP for the HWOBA. Each movement of waste from Kilgore's main production plant to the HWOBA is accompanied by a manifest prepared by the same person responsible for the transport and treatment operations. Therefore, no sampling or analysis beyond that which is performed for the HWOBA in accordance with this WAP is employed. The provisions of 40 CFR 264.13 and THWMR 0400-12-01-.06(2)(d) are complied with by internal company documentation, including the manifest and accumulation records. Hazardous waste from Kilgore's main production plant is treated at the HWOBA following completion of a

uniform hazardous waste manifest for each waste pyrotechnic. This manifest must accompany the waste to the HWOBA and be returned to the main production plant.

C-3(g) Additional Requirements for Facilities Handling Ignitable, Reactive, or Incompatible Waste

This section details additional waste analysis requirements necessary to comply with 40 CFR 264.13(b)(6) and 264.17 and THWMR 0400-12-01-.06(2)(d) and 0400-12-01-.06(2)(h). The detailed chemical and physical analysis of waste pyrotechnics and waste pyrotechnic ash was discussed in Sections C-1 and C-2, as were the reasons laboratory analysis has not been performed on waste pyrotechnics before treatment. Section C-3(d) discussed the frequency of analysis of waste generated at the HWOBA.

C-3(h) Effectiveness Demonstration for Newly Constructed Burn Pan Units

The wastes Kilgore will burn in the newly constructed wastes units (as well as interim status wastes) exhibit the characteristics of ignitability and/or reactivity. To demonstrate that these hazardous characteristics are effectively treated in the new units, the following plan will be implemented. TDEC will be notified 15 days before the procedure and shall receive a report on test findings for evaluation prior to initiation of routine burns.

A trial burn will be planned using a representative type and maximum quantity of wastes. The wastes will be burned under normal operating conditions in a single pan. For safety purposes, the pan will be left undisturbed for 48 hours. At the end of the 48 hour period three samples of ash will be randomly collected using the procedures described above.

The samples will be shipped to a specialized explosive testing laboratory for evaluation for explosive characteristics. The test procedure (External Fire Test- UN Series 6c) is specified by the Department of Defense (DoD) and the Department of Transportation (DoT).

Additional ash characterization as described above will be conducted to 1) define other hazardous waste characteristics, if any, and to apply for TDEC Special Waste Approval (see Table C-2).

The absence of any indication of hazardous waste or explosivity characteristics shall be evidence of successful treatment in the pans.

C-4 LAND DISPOSAL RESTRICTIONS

With the implementation of the land disposal restrictions (LDR), all hazardous waste treated at the HWOBA is banned from direct land disposal unless it no longer exhibits any hazardous waste characteristic for which it was originally classified.

The HWOBA operation results in an ash waste being shipped offsite for disposal. Ash and residues collected after open burning are annually analyzed to ensure that treatment standards are met. Analysis of the ash and residue generated from open burning barium- and lead-containing waste pyrotechnics indicates the material is non-hazardous and contains no underlying hazardous constituents above the LDR standards at 40 CFR 268.48.

For the non-hazardous, non-restricted ash and residue, Kilgore annually completes a notice and certification stating that the waste meets applicable treatment standards set forth in 40 CFR 268 Subpart D and THWMR 0400-12-01-.10(3) and the applicable prohibition levels set forth in 40 CFR 268.34 and 268.37 and THWMR 0400-12-01-.10(2)(e) and (h). The notice and certification are submitted to the TDEC DSWM.

This requirement does not apply to incoming waste streams for treatment at the HWOBA. However, the ash produced by open burning will be evaluated in accordance with 40 CFR 268.7(a) to determine if it is restricted from land disposal. The additional requirements for disposal facilities, surface impoundments exempted from LDRs, and LDRs with an approved exemption or extension are not applicable to the HWOBA, which is only for treatment and not for storage or disposal.

C-5 RECORDKEEPING

All inspection logs, records, laboratory analysis, and other documentation used to establish physical and chemical characteristics of pyrotechnic waste in lieu of analysis are maintained in Kilgore's Environmental Manager's or designee's office for at least 5 years from the last day the waste was treated. Hazardous waste manifests are maintained by Kilgore's Environmental Manager at the main production plant for at least 5 years from the last day the waste was treated.

C-6 SAMPLING AND ANALYSIS PLAN FOR GROUNDWATER DETECTION, GROUNDWATER COMPLIANCE, AND CLOSURE ACTIVITIES AT THE HWOBA

A detailed sampling and analysis plan for groundwater sampling, soil sampling and wipe testing may be found in Appendix C-4.

Appendix C-1
Safety Data Sheets

KILGORE FLARES CO. LLC
MATERIAL SAFETY DATA SHEET

=====

SECTION I

MANUFACTURER'S NAME Kilgore Flares Co.,LLC	EMERGENCY TELEPHONE NO. 1-800-535-5053 & 731-658-5231
ADDRESS (Street, City, State, and Zip Code) Kilgore Drive, Toone, TN 38381	DOT SHIPPING NOMENCLATURE Waste Substances Explosives N.O.S., (Lead Composition) UN0479, 1.4C, PGII
NET EXPLOSIVE WEIGHT N/A	TRADE NAME & SYNONYMS Lead Waste Stream
CHEMICAL FAMILY Pyrotechnic	DOCUMENT NUMBER/DATE REV. MSD176-7/11/2012

=====

SECTION II HAZARDOUS INGREDIENTS

<u>NFPA HAZARDOUS MATERIAL CODE ID</u>	<u>HAZARD INDEX:</u>
HEALTH 1	0 - MINIMAL HAZARD
FLAMMABILITY 2	1 - SLIGHT HAZARD
REACTIVITY 1	2 - MODERATE HAZARD
	3 - SERIOUS HAZARD
	4 - SEVERE HAZARD

HAZARDOUS MIXTURES OF LIQUIDS, SOLIDS, OR GASES

Pyrotechnic Composition Consisting Of:

Magnesium	CAS# 7439-95-4	Phenols	CAS# Mixture
Teflon Resin	CAS# 25101-45-5	Binder	CAS# Mixture
Lead Thiocyanate	CAS# 592-87-0		

=====

SECTION III FIRE AND EXPLOSION HAZARD DATA

AUTO IGNITION +400 Degrees F	FLAMMABLE LIMITS N/A	LEL UEL
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EXTINGUISHING MEDIA
Water may be used. Do not approach closer than 2500 feet.

SPECIAL FIRE FIGHTING PROCEDURES:
Refer to DD Form 836.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
N/A

=====

SECTION IV HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

Non E.P. toxic.

EFFECTS OF OVEREXPOSURE

N/A

EMERGENCY AND FIRST AID PROCEDURES

N/A

=====

SECTION V REACTIVITY DATA

STABILITY: UNSTABLE STABLE

CONDITIONS TO AVOID: N/A

INCOMPATIBILITY (MATERIALS TO AVOID): Refer to DD Form 836.

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR MAY OCCUR

=====

SECTION VI SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Handle carefully to avoid ignition of composition. Do not smoke in area.

WASTE DISPOSAL METHOD: Open pit burning in accordance with applicable local, state, and federal air pollution and hazardous waste regulations.

=====

SECTION VII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: N/A

VENTILATION: N/A PROTECTIVE: GLOVES GLASSES

OTHER PROTECTIVE EQUIPMENT: N/A

=====

SECTION VIII SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep away from open flames or flame production sources. Store in a cool, dry area.

KILGORE FLARES CO. LLC
MATERIAL SAFETY DATA SHEET

=====

SECTION I

MANUFACTURER'S NAME Kilgore Flares Co.,LLC	EMERGENCY TELEPHONE NO. 1-800-535-5053 & 731-658-5231
ADDRESS (Street, City, State, and Zip Code) Kilgore Drive, Toone, TN 38381	DOT SHIPPING NOMENCLATURE Waste Substances Explosives N.O.S.,(Barium Magnesium Composition) UN0479, 1.4C, PGII
NET EXPLOSIVE WEIGHT N/A	TRADE NAME & SYNONYMS Barium Waste Stream
CHEMICAL FAMILY Pyrotechnic	DOCUMENT NUMBER/DATE REV. MSD177-7/11/2012

=====

SECTION II HAZARDOUS INGREDIENTS

<u>NFPA HAZARDOUS MATERIAL CODE ID</u>	<u>HAZARD INDEX:</u>
HEALTH 1	0 - MINIMAL HAZARD
FLAMMABILITY 2	1 - SLIGHT HAZARD
REACTIVITY 1	2 - MODERATE HAZARD
	3 - SERIOUS HAZARD
	4 - SEVERE HAZARD

HAZARDOUS MIXTURES OF LIQUIDS, SOLIDS, OR GASES

Pyrotechnic Composition Consisting Of:

Magnesium	CAS# 7439-95-4	Phenols	CAS# Mixture
Teflon Resin	CAS# 25101-45-5	Binder	CAS# Mixture
Barium Peroxide	CAS# 1304-29-6		

=====

SECTION III FIRE AND EXPLOSION HAZARD DATA

AUTO IGNITION +400 Degrees F	FLAMMABLE LIMITS N/A	LEL UEL
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EXTINGUISHING MEDIA
Water may be used. Do not approach closer than 2500 feet.

SPECIAL FIRE FIGHTING PROCEDURES:
Refer to DD Form 836.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
N/A

=====

SECTION IV HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

Non E.P. toxic.

EFFECTS OF OVEREXPOSURE

N/A

EMERGENCY AND FIRST AID PROCEDURES

N/A

=====

SECTION V REACTIVITY DATA

STABILITY: UNSTABLE STABLE

CONDITIONS TO AVOID: N/A

INCOMPATIBILITY (MATERIALS TO AVOID): Refer to DD Form 836.

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR MAY OCCUR

=====

SECTION VI SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Handle carefully to avoid ignition of composition. Do not smoke in area.

WASTE DISPOSAL METHOD: Open pit burning in accordance with applicable local, state, and federal air pollution and hazardous waste regulations.

=====

SECTION VII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: N/A

VENTILATION: N/A PROTECTIVE: GLOVES GLASSES

OTHER PROTECTIVE EQUIPMENT: N/A

=====

SECTION VIII SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep away from open flames or flame production sources. Store in a cool, dry area.

**KILGORE FLARES CO. LLC
MATERIAL SAFETY DATA SHEET**

=====

SECTION I

MANUFACTURER'S NAME Kilgore Flares Co.,LLC	EMERGENCY TELEPHONE NO. 1-800-535-5053 & 731-658-5231
ADDRESS (Street, City, State, and Zip Code) Kilgore Drive, Toone, TN 38381	DOT SHIPPING NOMENCLATURE Waste Substances Explosives N.O.S., (Magnesium Composition) UN0479, 1.4C, PGII
NET EXPLOSIVE WEIGHT N/A	TRADE NAME & SYNONYMS Magnesium Waste Stream
CHEMICAL FAMILY Pyrotechnic	DOCUMENT NUMBER/DATE REV. MSD178-7/11/2012

=====

SECTION II HAZARDOUS INGREDIENTS

NFPA HAZARDOUS MATERIAL CODE ID HEALTH 1 FLAMMABILITY 2 REACTIVITY 1	HAZARD INDEX: 0 - MINIMAL HAZARD 1 - SLIGHT HAZARD 2 - MODERATE HAZARD 3 - SERIOUS HAZARD 4 - SEVERE HAZARD
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HAZARDOUS MIXTURES OF LIQUIDS, SOLIDS, OR GASES

Pyrotechnic Composition Consisting Of:

Magnesium	CAS# 7439-95-4	Phenols	CAS# Mixture
Teflon Resin	CAS# 25101-45-5	Binder	CAS# Mixture

=====

SECTION III FIRE AND EXPLOSION HAZARD DATA

AUTO IGNITION +400 Degrees F	FLAMMABLE LIMITS N/A	LEL UEL
---------------------------------	-------------------------	---------

EXTINGUISHING MEDIA
 Water may be used. Do not approach closer than 2500 feet.

SPECIAL FIRE FIGHTING PROCEDURES:
 Refer to DD Form 836.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
 N/A

=====

SECTION IV HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

Non E.P. toxic.

EFFECTS OF OVEREXPOSURE

N/A

EMERGENCY AND FIRST AID PROCEDURES

N/A

=====

SECTION V REACTIVITY DATA

STABILITY: UNSTABLE STABLE

CONDITIONS TO AVOID: N/A

INCOMPATIBILITY (MATERIALS TO AVOID): Refer to DD Form 836.

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR MAY OCCUR

=====

SECTION VI SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Handle carefully to avoid ignition of composition. Do not smoke in area.

WASTE DISPOSAL METHOD: Open pit burning in accordance with applicable local, state, and federal air pollution and hazardous waste regulations.

=====

SECTION VII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: N/A

VENTILATION: N/A PROTECTIVE: GLOVES GLASSES

OTHER PROTECTIVE EQUIPMENT: N/A

=====

SECTION VIII SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep away from open flames or flame production sources. Store in a cool, dry area.

**KILGORE FLARES CO. LLC
MATERIAL SAFETY DATA SHEET**

=====

SECTION I

MANUFACTURER'S NAME Kilgore Flares Co., LLC	EMERGENCY TELEPHONE NO. 1-800-535-5053 & 731-658-5231
ADDRESS (Street, City, State, and Zip Code) Kilgore Drive, Toone, TN 38381	DOT SHIPPING NOMENCLATURE Waste Ammonia Perchlorate Composition UN1442, 5.1, PGII
NET EXPLOSIVE WEIGHT N/A	TRADE NAME & SYNONYMS Ammonia Perchlorate
CHEMICAL FAMILY Oxidizer	DOCUMENT NUMBER/DATE REV. MSD235-6/14/07

=====

SECTION II HAZARDOUS INGREDIENTS

NFPA HAZARDOUS MATERIAL CODE ID	HAZARD INDEX:
HEALTH 1	0 - MINIMAL HAZARD
FLAMMABILITY 2	1 - SLIGHT HAZARD
REACTIVITY 1	2 - MODERATE HAZARD
	3 - SERIOUS HAZARD
	4 - SEVERE HAZARD

HAZARDOUS MIXTURES OF LIQUIDS, SOLIDS, OR GASES

Pyrotechnic Composition Consisting Of:

Ammonia Perchlorate	CAS# 7790-98-9		
RTV 615 A&B (silicone rubber mixture)	CAS# Mixture	Kilgore Code# 10829	
Potassium Perchlorate	CAS # 7778-74-7		
RDX	CAS# 121-82-4		

=====

SECTION III FIRE AND EXPLOSION HAZARD DATA

AUTO IGNITION +400 Degrees F	FLAMMABLE LIMITS N/A	LEL UEL
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EXTINGUISHING MEDIA: Water may be used. Do not approach closer than 2500 feet.

SPECIAL FIRE FIGHTING PROCEDURES:
 Refer to DD Form 836

UNUSUAL FIRE AND EXPLOSION HAZARDS:
 N/A

=====

=====
SECTION IV HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
None established.

EFFECTS OF OVEREXPOSURE
N/A

EMERGENCY AND FIRST AID PROCEDURES
N/A

=====
SECTION V REACTIVITY DATA

STABILITY: UNSTABLE STABLE

CONDITIONS TO AVOID: N/A

-
INCOMPATIBILITY (MATERIALS TO AVOID): Refer to DD Form 836

HAZARDOUS DECOMPOSITION PRODUCTS: N/A.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR MAY OCCUR

=====
SECTION VI SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Handle carefully to avoid ignition of composition. Do not smoke in area.

WASTE DISPOSAL METHOD: Open pit burning in accordance with applicable local, state, and federal air pollution and hazardous waste regulations

=====
SECTION VII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: N/A

VENTILATION: N/A PROTECTIVE: GLOVES GLASSES

OTHER PROTECTIVE EQUIPMENT: N/A

=====
SECTION VIII SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep away from open flames or flame production sources. Store in a cool, dry area.

Appendix C-2
Work Instructions

Level III – Work Instructions		
Procedure: ASH SAMPLING FOR THE OPEN BURN (OB) UNIT		
Document ID: EMS- 337	Revision:	Revision Date:

I. Purpose

To establish instructions for sampling strategies of residual ash from the OB Unit.

II. Personnel Affected

Environmental

III. Equipment

Non-sparking Scoop
Distilled water
Sterile containers

IV. SAFETY REQUIREMENTS

- A. Operator must wear safety glasses with side shields.
- B. Operator must wear conductive safety shoes.
- C. Operator must wear 90% minimum cotton clothing.
- D. Operator must wear flame retardant coveralls.
- E. Operator must wear cotton or leather gloves.
- F. Ash sampling is prohibited prior to 72 hours after last burn.
- G. Observe the area to verify all treatment activities are complete.

V. Procedure

1. Decontaminate the scoop in the following sequence:
 - Scrub scoop with a laboratory grade detergent
 - Rinse with tap water
 - Final rinse with distilled water
2. Collect ash sample from five locations (i.e. the four corners and the center) in the burn tray to achieve a representative sample.
3. Once sample has been retrieved from the burn tray the sample is placed in a sterile container and capped.
4. Immediately after collection, samples are preserved by placing a sufficient amount of ice in an approved ice chest or refrigeration system to maintain the samples at 39.2° F and deliver to the applicable laboratory.

Level III – Work Instructions
Procedure: EMS – 337 ASH SAMPLING FOR THE OPEN BURN (OB) UNIT

TRAINING VERIFICATION FORM

Instruction given by: _____
Print Name
Instructor Signature

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel’s’ comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

RETURN ORIGINAL FORM TO HUMAN RESOURCES — COPIES WILL NOT BE ACCEPTED

Appendix C-3
Special Waste Approval



**ENVIRONMENTAL ASSISTANCE CENTER
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
362 CARRIAGE HOUSE DRIVE
JACKSON, TENNESSEE 38305-2222
PHONE (901) 661-6200 STATEWIDE 1-888-891-8332 FAX (901) 661-6283**

July 20, 2000

**NOTICE OF
SPECIAL WASTE APPROVAL**

Mr. Lloyd Bell , Landfill Supervisor
Bolivar- Hardeman County Landfill
75 Landfill Way
Bolivar, Tn. 38008

RE: Disposal Of Special Waste
(1) Scrap phosphorus ash
(2) Scrap pyrotechnic (magnesium) ash

Dear Mr. Bell :

Rule 1200-1-7-.01(4) of the regulation promulgated under the authority of the Tennessee Solid Waste Disposal Act states that: "Except as may be specifically allowed in the permit, an operator may not accept for processing or disposal at his facility any special waste unless and until specifically approved to do so in writing by the Department."

Ms. Lisa Bennett representing Alliant Kilgore Flares has petitioned the Division of Solid Waste Management for approval to dispose of these two waste streams in the Bolivar - Hardeman County landfill.

Based upon review of the submitted special waste data collection form the DSWM has determined the waste suitable for disposal in Bolivar-Hardeman County landfill contingent upon the following conditions/restrictions

Mr. Lloyd Bell
July 20, 2000
Page 2

If the physical or chemical properties of the waste change significantly, the Division must be immediately notified for re-evaluation.

Be advised that no free liquids are allowed for landfill disposal except as per the liquid waste restrictions policy.

The waste may be routinely managed with other solid waste at the facility.

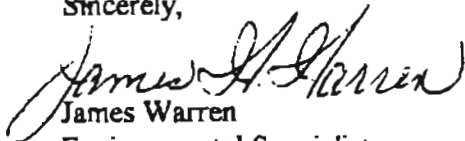
The waste must be transported separately which will facilitate management at the landfill.

The waste must be immediately covered upon unloading with six inches of compacted soil.

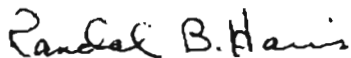
The operator must have prior notice or a prearranged schedule prior to transporting the waste to the facility.

Be advised that the facility operator may refuse to accept any special waste, even if it has been approved in writing by the Division.

Sincerely,



James Warren
Environmental Specialist
Division of Solid Waste Management



Randal B. Harris
Field Office Manager
Division of Solid Waste Management

cc: DSWM, Central Office
Ms. Lisa Bennett, Environmental Manager, Alliant Kilgore Flares
Mr. Pete Kelly, DSWM
File

Appendix C-4
Sampling and Analysis Plan

**KILGORE FLARES COMPANY, LLC
SAMPLING AND ANALYSIS PLAN
MISCELLANEOUS UNIT TREATMENT FACILITY**

Prepared for:

Kilgore

Part of the Chemring Group

**Kilgore Flares Company, LLC
Toone, Tennessee 38381**

and



**Tennessee Department of Environment and Conservation
Division of Solid Waste Management
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue
14th Floor
Nashville, Tennessee 37243**

Prepared by:

ENSAFE

**EnSafe Inc.
5724 Summer Trees Drive
Memphis, Tennessee 38134
(901) 372-7962
www.ensafe.com**

Revision: 0

May 2015

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1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been developed to ensure the proper documentation and implementation for the collection of environmental data associated with Kilgore's 5-acre Hazardous Waste Open Burn Area (HWOBA) during operations and closure. All sampling will be performed at the designation of Kilgore's Vice President Health, Safety, and Environmental using methods described in this SAP. A RCRA Part B Permit (Permit) Application and a Closure Plan for the HWOBA have been prepared under separate cover as required under Title 40 Code of Federal Regulations (CFR) 264 Subpart X (Miscellaneous Units), appropriate sections of 40 CFR 270, and Tennessee Hazardous Waste Management Regulations (THWMR) 0400-12-01-.07(5). This SAP supports the activities required during operation and closure of the HWOBA under the Permit.

1.1 Facility Description

Kilgore Flares Company, LLC (Kilgore), is in northern Hardeman County, in the Town of Toone, Tennessee. Kilgore is comprised of the main production plant and the approximately 240-acre Test and Treatment Facility (TTF) that includes the HWOBA, the Personal Protective Equipment (PPE) Test Area, the Test Tunnel/Marine Location Marker Test Area, and the Pole Barn Test Area. The HWOBA is where the Resource Conservation and Recovery Act (RCRA) hazardous waste treatment operations take place (Figure 1-1).

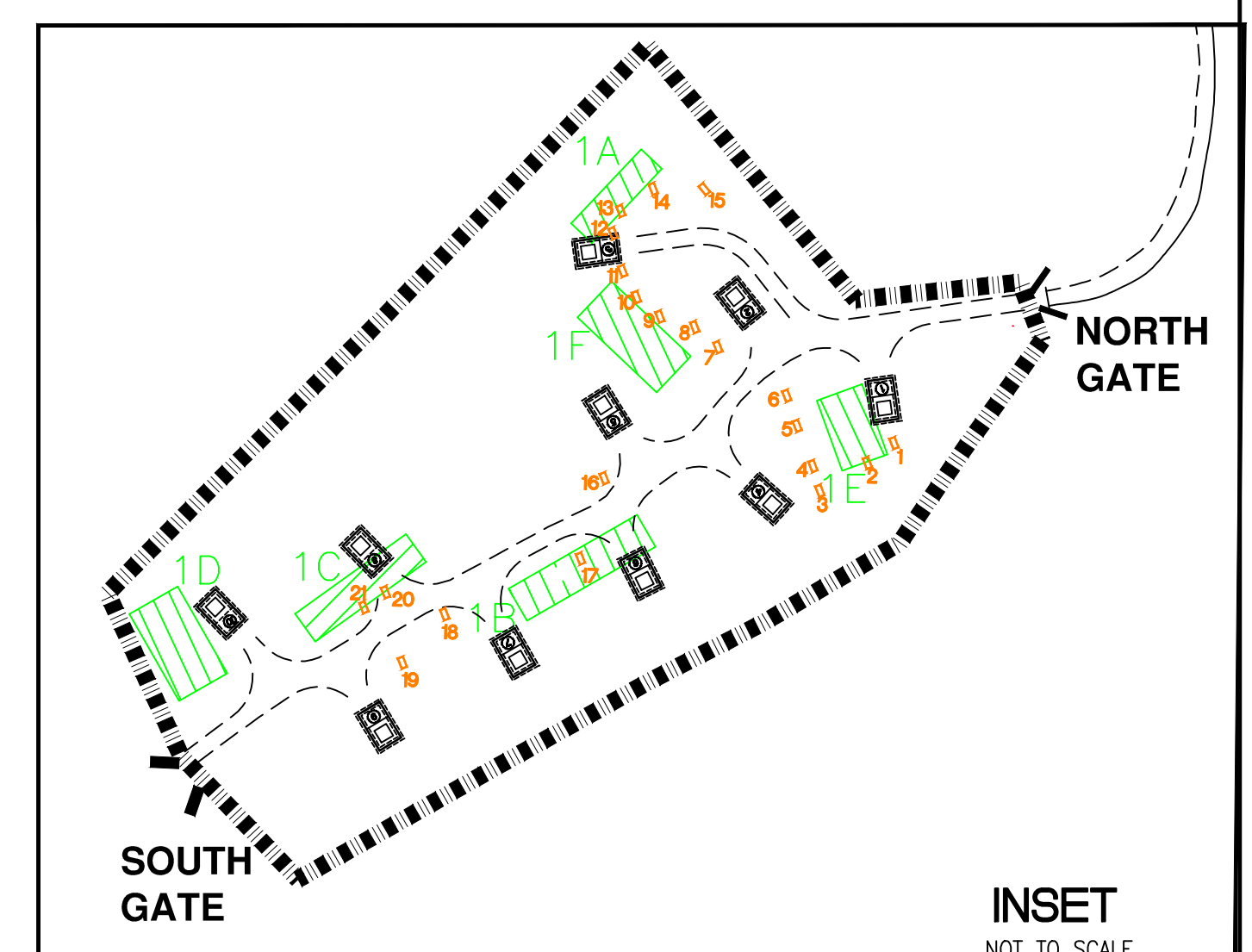
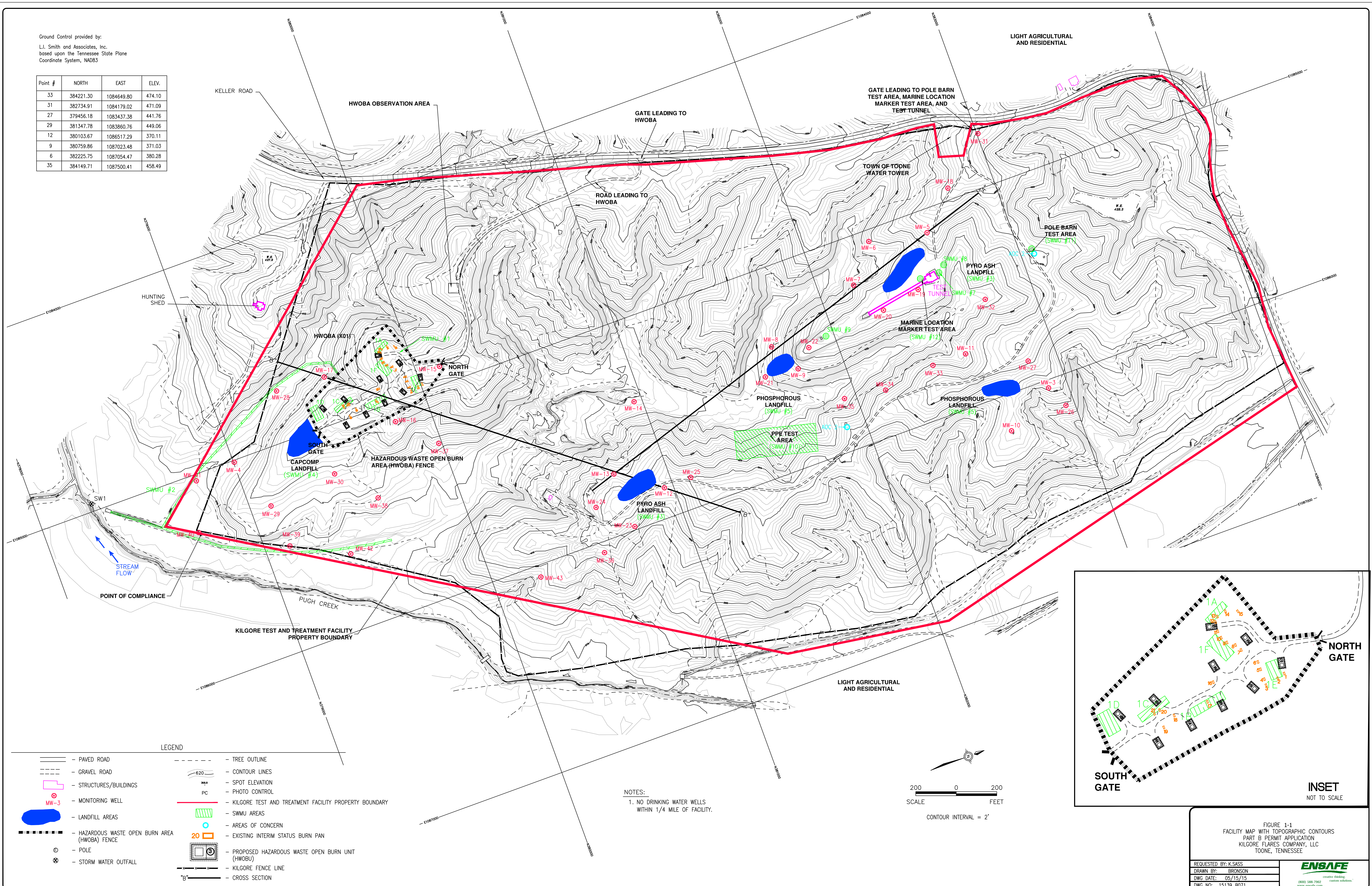
Kilgore manufactures pyrotechnic devices (e.g. distress signal flares, location markers, and illuminating rounds) for the U.S. Department of Defense and commercial users at its main production plant with approximately 175 buildings spread across the entire property. Primary processes include mixing, drying, soldering, milling, extrusion, pelletization, surface coating, testing, space heating, and storage.

1.2 Generation and Treatment of Wastes

Hazardous waste generated at the main production plant includes scrap composition from upset conditions in the mixing/drying process, grains that do not pass quality control standards, and rags and miscellaneous materials from clean-up operations. The hazardous waste is accumulated in 15- and 30-gallon steel drums lined with conductive bags. During accumulation, diesel fuel is added to the drums to stabilize the waste. Full drums are collected and staged in covered concrete-bermed hazardous waste accumulation areas (HWAAs).

Ground Control provided by:
L.I. Smith and Associates, Inc.
based upon the Tennessee State Plane
Coordinate System, NAD83

Point #	NORTH	EAST	ELEV.
33	384221.30	1084649.80	474.10
31	382734.91	1084179.02	471.09
27	379456.18	1083437.38	441.76
29	381347.78	1083860.76	449.06
12	380103.67	1086517.29	370.11
9	380759.86	1087023.48	371.03
6	382225.75	1087054.47	380.28
35	384149.71	1087500.41	458.49



- LEGEND**
- PAVED ROAD
 - GRAVEL ROAD
 - STRUCTURES/BUILDINGS
 - MONITORING WELL
 - LANDFILL AREAS
 - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
 - POLE
 - STORM WATER OUTFALL
 - TREE OUTLINE
 - CONTOUR LINES
 - SPOT ELEVATION
 - PHOTO CONTROL
 - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
 - SWMU AREAS
 - AREAS OF CONCERN
 - EXISTING INTERIM STATUS BURN PAN
 - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
 - KILGORE FENCE LINE
 - CROSS SECTION

NOTES:
1. NO DRINKING WATER WELLS WITHIN 1/4 MILE OF FACILITY.

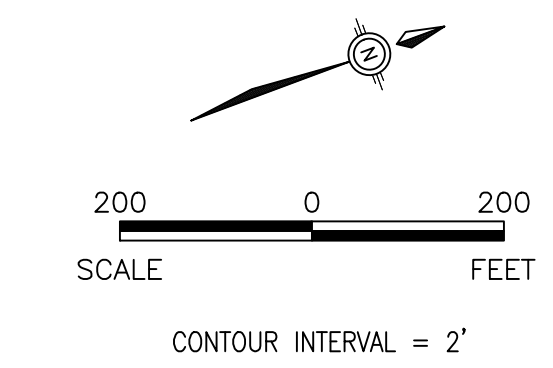


FIGURE 1-1
FACILITY MAP WITH TOPOGRAPHIC CONTOURS
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: K.SASS
DRAWN BY: BRONSON
DWG DATE: 05/15/15
DWG NO: 15139_B071

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1.2.1 Source of Waste

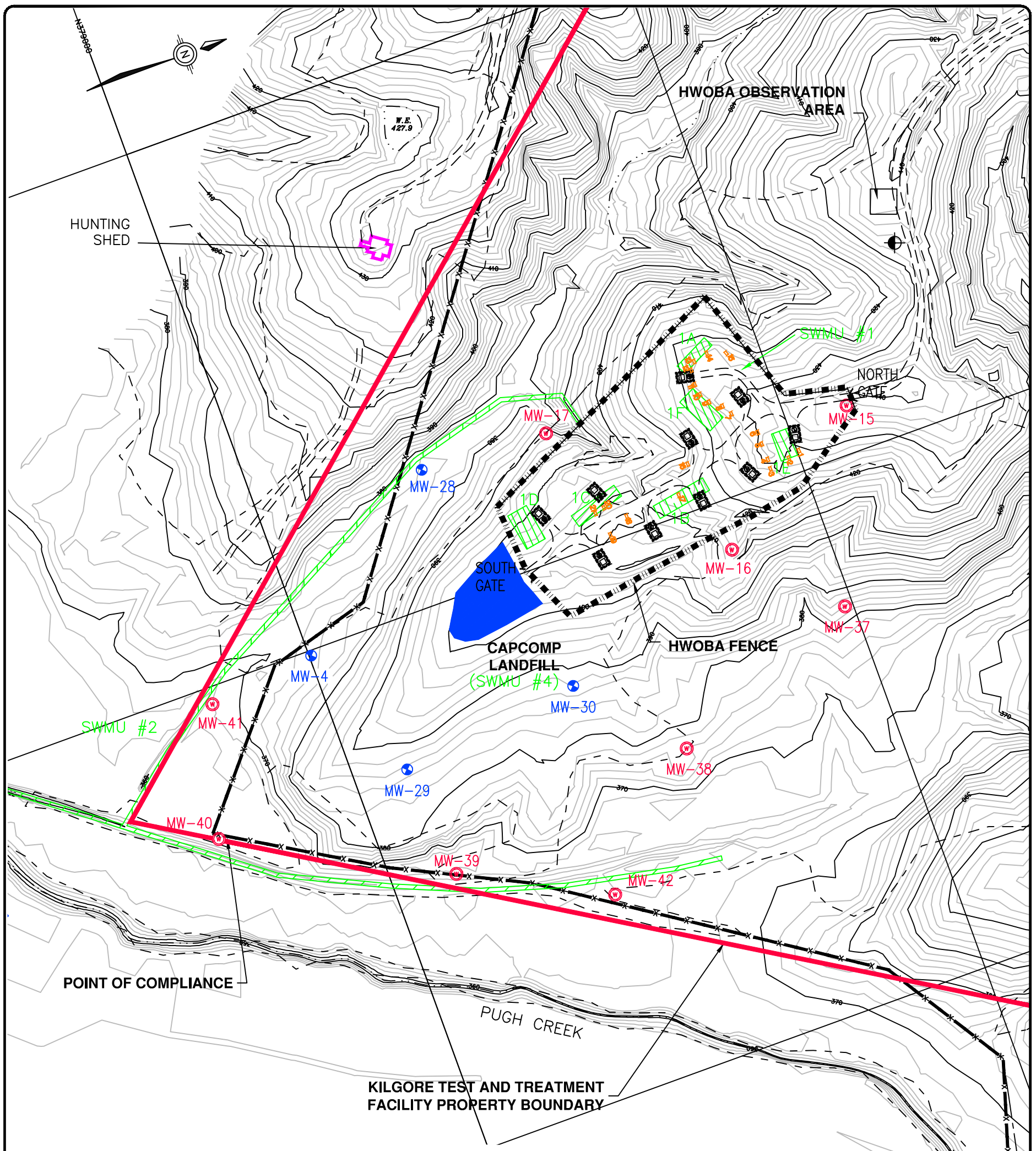
The only source of waste treated at the HWOBA is the hazardous waste pyrotechnics generated during the manufacturing process at Kilgore's main production plant. Unfired flares or other energetic materials, which are not normally generated at the TTF may be accumulated in ammunition cans and transported to the HWOBA for treatment. These wastes are considered RCRA hazardous because they meet the definition of ignitable (D001) and reactive (D003) hazardous wastes per 40 CFR Parts 261.21 and 261.23 and THWMR 0400-12-01-.02(3)(b) and (d), respectively. Some hazardous wastes generated from the manufacturing process also meet the definition of a toxicity characteristic waste for barium (D005), chromium (D007), and lead (D008), or contain acetone that meets the definition of the listed hazardous waste F003.

1.2.2 Transportation and Treatment of Waste

During normal operations, trained hazardous waste technicians transport the hazardous waste pyrotechnics daily in dedicated hazardous waste pyrotechnic trailers from the main production plant to the HWOBA. Kilgore has notified as a hazardous waste transporter and all transportation operations are conducted under the main production plant's hazardous waste transporter's permit and/or identification number (United States Environmental Protection Agency [U.S. EPA] ID TND 00-702-0159).

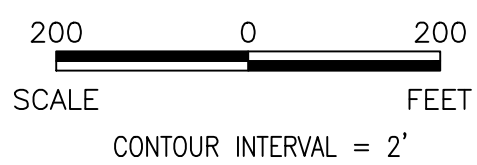
Waste treatment operations are conducted in steel burn pans, termed hazardous waste open burn units (HWOBUs). Currently, the HWOBA houses 21 steel burn pans, which are approximately 8 feet long by 4 feet wide by 2 feet high (Figure 1-2). One to two burn pans are used per burn. The maximum amount of waste pyrotechnics treated is 1,500 pounds per day, not to exceed 7,500 pounds per week, and 390,000 pounds per year, with an additional 24 pounds per year of barium (D005) waste and 24 pounds per year of lead (D008) waste. Currently the burn pans are situated on a gravel area. Once the hazardous waste is ready for treatment, it is placed in the steel pans and ignited (by use of newspaper and a 4- to 5-minute fuse). The waste is allowed to burn openly and completely, thereby rendering it non-ignitable and non-reactive. Ash and residue are not disturbed for 72 hours after treatment. After the 72 hours, the non-hazardous ash is containerized in steel drums and taken to the Bolivar-Hardeman County landfill for disposal under Special Waste Agreements.

Design changes to the HWOBA are proposed in Section D of the Part B permit application. The purpose of the proposed HWOBA design is to eliminate the potential for soil and water contamination by developing an engineered concrete base for each HWObU. The



LEGEND

- | | | | |
|--|---|--|---|
| | - PAVED ROAD | | - CONTOUR LINES |
| | - GRAVEL ROAD | | - TREE OUTLINE |
| | - STRUCTURES/BUILDINGS | | - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY |
| | - MONITORING WELL | | - SWMU AREAS |
| | - MONITORING WELL | | - EXISTING INTERIM STATUS BURN PAN |
| | - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE | | - WELL TO BE INSTALLED |
| | - POLE | | - KILGORE FENCE LINE |
| | - STORM WATER OUTFALL | | |
| | - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU) | | |
| | - LANDFILL AREAS | | |
| | - COMPLIANCE WELL | | |



SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE 1-2
WELL LOCATIONS MAP
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: D.FUEHRER	
DRAWN BY: BRONSON	
DWG DATE: 05/15/15	
DWG NO: 15139_B075	

concrete base provides a protective barrier between the burn pan and the underlying soil, and facilitates the collection and treatment of any precipitation that may contact ash or residual material. The proposed HWOBUs were designed by professional engineers in conjunction with Kilgore personnel to address Kilgore's specific open burning needs at the HWOBA. The upgrades discussed in the Part B permit, including construction of the HOWBU burn pans and concrete pads, will be conducted upon issuance of the Final Permit.

2.0 SAMPLING ACTIVITIES

This SAP will address the activities, methods and the data collection from the following sampling activities and operations at the HWOBA during operation and closure:

- Groundwater sampling and monitoring during operation of the HWOBA
- Wastewater sampling during decontamination activities to determine disposal requirements as part of the Closure Plan
- Source water and final rinsate water sampling during decontamination activities to confirm clean closure as part of the Closure Plan
- Sampling of steel burn tray and underlying concrete surfaces to confirm clean closure as part of the Closure Plan
- Soil sampling to confirm clean closure as required in the Closure Plan

The samples collected during the sampling operations will be analyzed for the following contaminants of concern (COCs):

Metals

- Antimony, Arsenic, Barium, Beryllium, Cadmium, Cobalt, Copper, Lead, Selenium, and Zinc
- Mercury

Explosive Compounds

- RDX

Propellants

- Ammonium perchlorate

Dioxins/Furans

2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent (TCDD), 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HxCDD), 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF), 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD), and Total Dioxin/Furan Compounds

The following sections discuss details of each of the media to be sampled, and the planned sampling tasks and methods employed.

2.1 Groundwater Monitoring During Operation of the HWOBA

Semi-annual groundwater monitoring events will be conducted during the first 2 years of the operation of the proposed final HWOBAs, and then continued annually for the operating life of HWOBAs. The detection and compliance groundwater monitoring will be conducted in the five previously identified groundwater monitoring wells completed in the uppermost aquifer beneath the HWOBA. The groundwater monitoring will help ensure that the control measures planned for the proposed final status HWOBA effectively protect groundwater. For monitoring during the operational life of the area unit, analysis will be conducted for only those constituents expected to be generated during disposal activities in the area. The locations of the wells are shown on Figure 2-1. One new well (MW-44) will be installed in upgradient locations prior to the beginning of the monitoring and compliance program and serve as a background well. Four existing wells (MW-4, MW-28, MW-29, and MW-30) will be monitored and constitute the downgradient compliance point required under 40 CFR 264.95 and THWMR 0400-12-01-.06(f). Additional hydrologic data will be collected along with chemical and indicator parameter data.

2.2 Closure Decontamination Wastewater Sampling

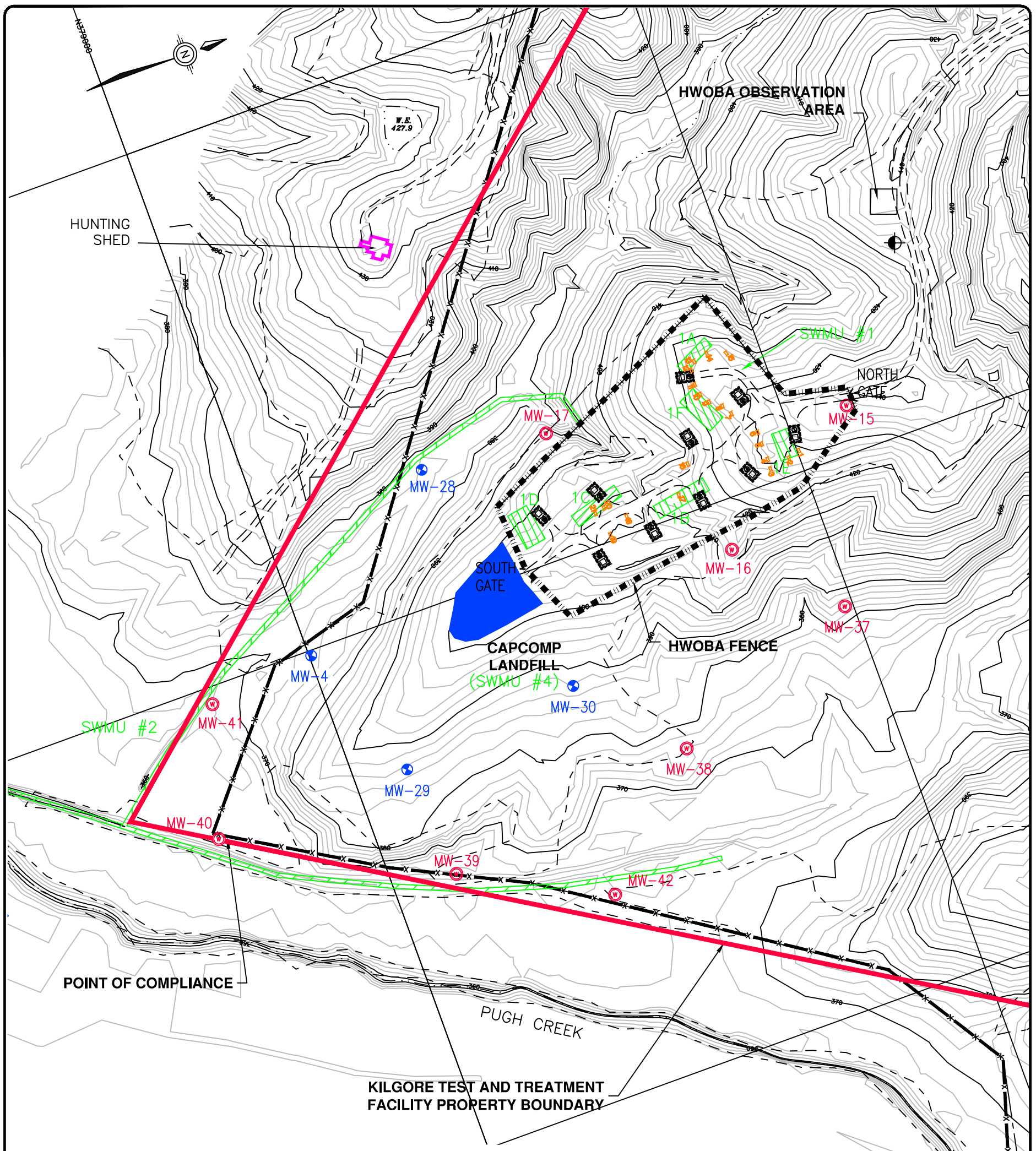
The Closure Plan proposes to decontaminate each burn pan and concrete pad structure using a triple wash/rinse. The initial decontamination cycle will involve washing using Liqui-Nox or a similar non-phosphate surfactant and wet brushing. The second cycle will consist of a simple water-only wash. These waste wash waters will be containerized, sampled and analyzed to determine disposal requirements.

2.3 Source and Final Rinsate Water Sampling

After initial decontamination, a final rinse will be conducted on burn pans and supporting equipment using spare amounts of water, which will be containerized separately. The rinsate and the source water (to establish background levels) will be sampled and analyzed to confirm that decontamination was successful, and to confirm and obtain clean closure for concrete pads.

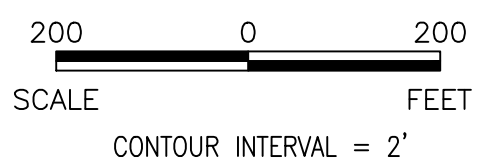
2.4 Wipe Sampling of Burn Pans and Concrete

The burn pans and underlying concrete surfaces will be decontaminated during closure operations. If decontamination of the burn pans or concrete pads proves not to be successful, wipe samples



LEGEND

- PAVED ROAD
- GRAVEL ROAD
- STRUCTURES/BUILDINGS
- MONITORING WELL
MW-3
- HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
- POLE
- STORM WATER OUTFALL
- PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
- LANDFILL AREAS
- COMPLIANCE WELL
- CONTOUR LINES
620
- TREE OUTLINE
- KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
- SWMU AREAS
- EXISTING INTERIM STATUS BURN PAN
20
- WELL TO BE INSTALLED
- KILGORE FENCE LINE



SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE 2-1
WELL LOCATIONS MAP
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: D.FUEHRER	<small>creative thinking. custom solutions.</small> (800) 588-7962 www.ensafe.com
DRAWN BY: BRONSON	
DWG DATE: 05/15/15	
DWG NO: 15139_B075	

will be collected from each to confirm waste disposal requirements, and confirm that solid waste disposal is acceptable where possible.

2.5 Soil Sampling for the Closure Plan

Soil characterization sampling will be conducted during closure operations to demonstrate that closure activities have removed all waste residuals. The distribution of the soil samples is discussed in the following sections.

2.5.1 Background Soil Sampling

To establish site-specific background concentrations of RCRA metals, dioxins, and furans, soil composite samples will be collected from multiple locations located in an area on the northeast corner of the TTF. This area has been selected since it is separated vertically and horizontally from the HWOBA and the Test Tunnel. This separation will help to ensure that the following background criteria are met:

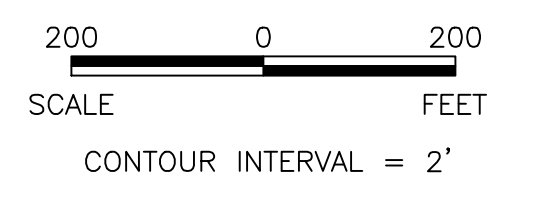
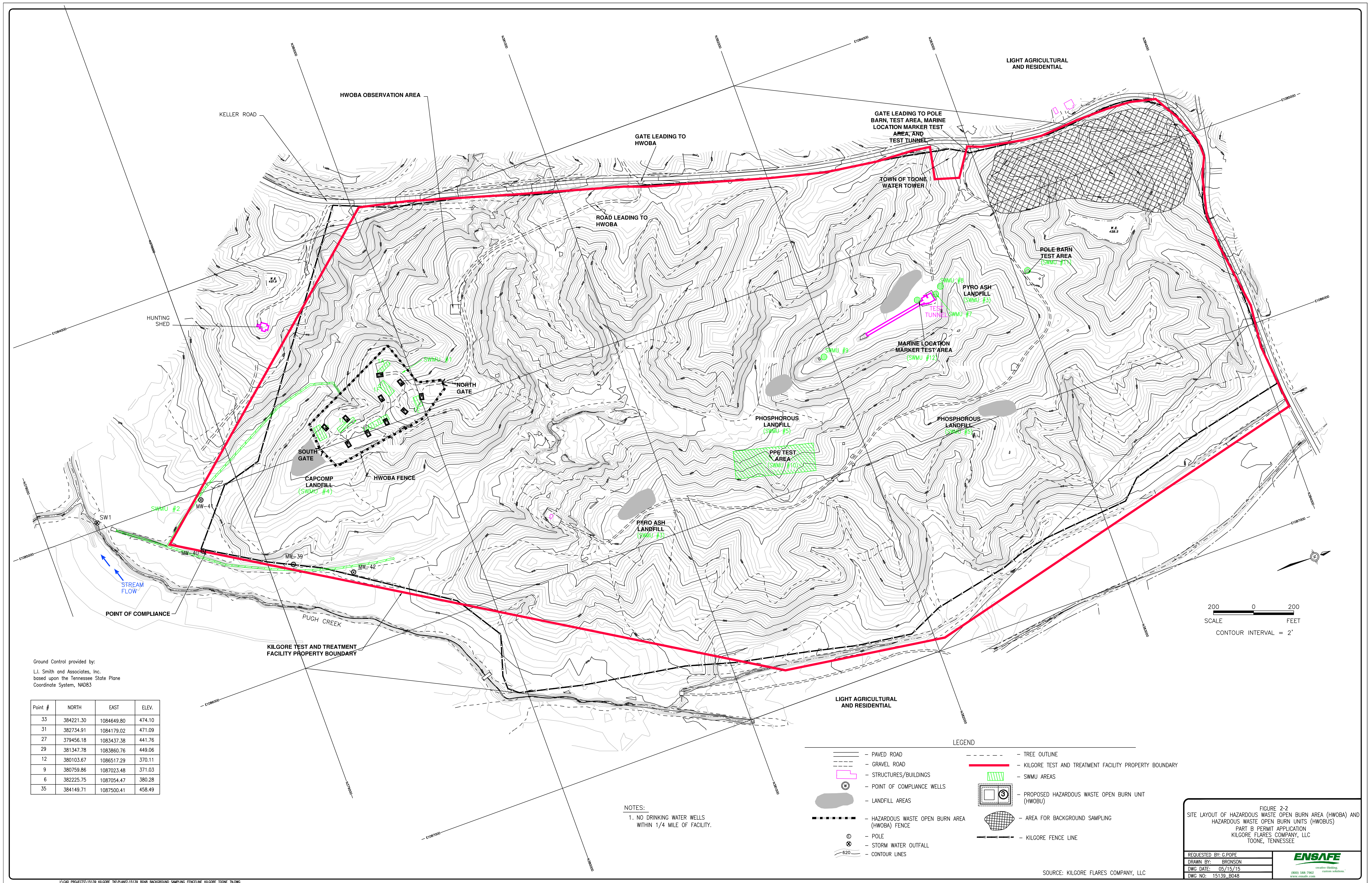
- Outside the byproduct deposition zone for byproducts of the HWOBA, as defined by the dispersion/deposition modeling completed in support of this application, but submitted under separate cover.
- In grassland/wooded areas not previously cultivated for crop production.
- Outside the current and past testing/treatment areas.

Background thresholds for RCRA metals, dioxins, and furans in soils will be established by collecting one composite sample comprised of 5 grab samples from 10 locations (10 composite samples) within the designated background area from 0 to 0.5 feet below ground surface (bgs) (see Figure 2-2).

2.5.2 Biased Soil and Sediment Sampling

Soil and sediment samples used to confirm successful closure will be collected at locations that are most likely to be impacted by releases from the HWOBA including:

One composite soil sample from outside the curbing at the ramp side of each concrete pad. Each composite sample will be comprised of three grab samples (0-0.5 foot bgs) collected at 5-, 10-, and 15-foot distances along the centerline of the external, earthen ramp at each HWOB (10 composite soil samples) (Figure 2-3).



Ground Control provided by:
L.I. Smith and Associates, Inc.
based upon the Tennessee State Plane
Coordinate System, NAD83

Point #	NORTH	EAST	ELEV.
33	384221.30	1084649.80	474.10
31	382734.91	1084179.02	471.09
27	379456.18	1083437.38	441.76
29	381347.78	1083860.76	449.06
12	380103.67	1086517.29	370.11
9	380759.86	1087023.48	371.03
6	382225.75	1087054.47	380.28
35	384149.71	1087500.41	458.49

NOTES:
1. NO DRINKING WATER WELLS
WITHIN 1/4 MILE OF FACILITY.

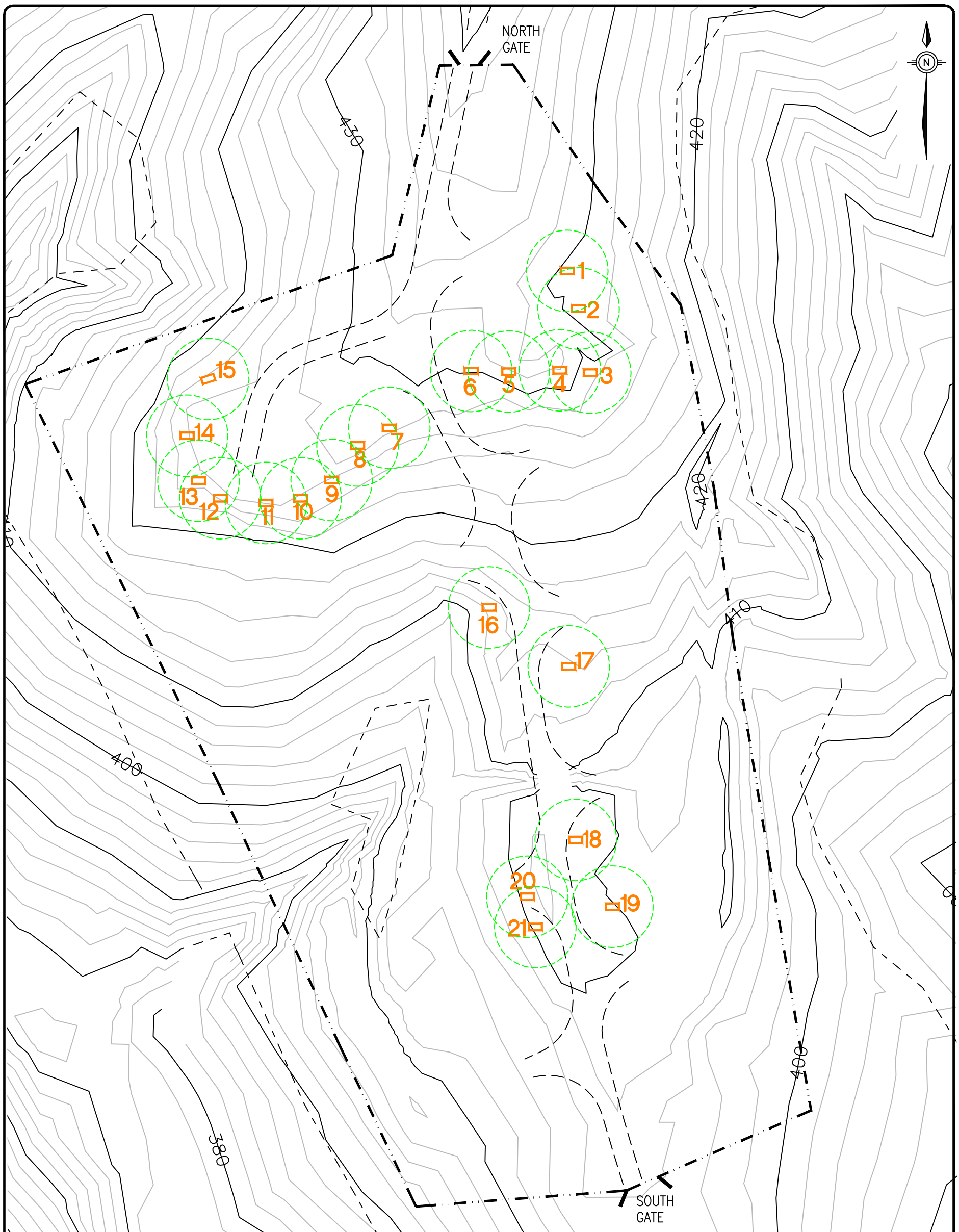
- LEGEND
- PAVED ROAD
 - GRAVEL ROAD
 - STRUCTURES/BUILDINGS
 - POINT OF COMPLIANCE WELLS
 - LANDFILL AREAS
 - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
 - POLE
 - STORM WATER OUTFALL
 - CONTOUR LINES
 - TREE OUTLINE
 - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
 - SWMU AREAS
 - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
 - AREA FOR BACKGROUND SAMPLING
 - KILGORE FENCE LINE

FIGURE 2-2
SITE LAYOUT OF HAZARDOUS WASTE OPEN BURN AREA (HWOBA) AND
HAZARDOUS WASTE OPEN BURN UNITS (HWOBU)
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: G. POPE
DRAWN BY: BRONSON
DWG DATE: 05/15/15
DWG NO: 15139_B048

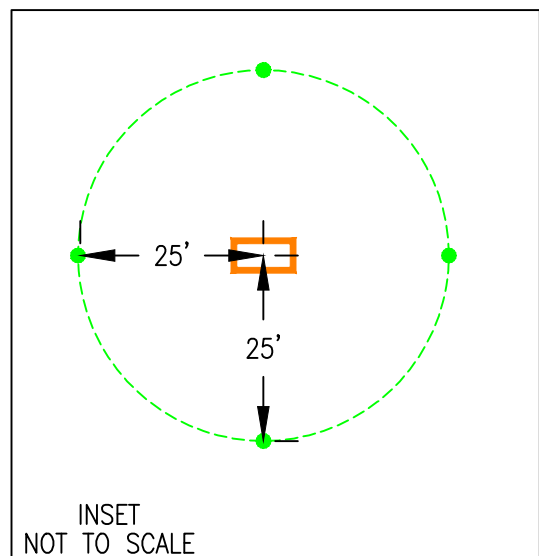
SOURCE: KILGORE FLARES COMPANY, LLC

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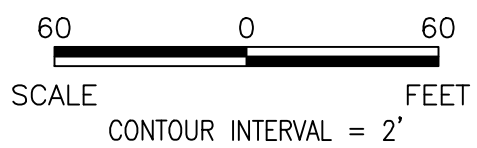


LEGEND

- HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
- GRAVEL ROAD
- CONTOUR LINES
- EXISTING INTERIM STATUS BURN PAN
- GRAB SAMPLE LOCATIONS



INSET
NOT TO SCALE



SOURCE: KILGORE FLARES COMPANY, LLC

<p>FIGURE 2-3 BIASED SOIL SAMPLING LOCATIONS EXISTING INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNITS (HWOBUS) PART B PERMIT APPLICATION KILGORE FLARES COMPANY, LLC TOONE, TENNESSEE</p>	
<p>REQUESTED BY: G. POPE</p>	<p>creative thinking. custom solutions. (800) 588-7962 www.ensafe.com</p>
<p>DRAWN BY: BRONSON</p>	
<p>DWG DATE: 05/16/15</p>	
<p>DWG NO: 15139_B073</p>	

- One composite soil sample from outside the curbing along each of the non-ramp sides of each HWOBUC concrete pad. Each composite sample will be comprised of three grab samples (0-0.5 foot bgs) spaced 5-feet apart and located 5 feet from the curb (3 composite soil samples per pad).
- One composite sediment sample (0-0.5-foot bgs) from each successive confluence of drainage swales downstream of the HWOBUC, including the confluence of Pugh Creek with Mill Creek (Figure 2-4). Composite sediment samples will be comprised of one grab from the center of the creek and one from each bank collected immediately upstream of the confluence (total 3 composite sediment samples).

2.5.3 Unbiased Soil Sampling

During closure unbiased soil samples will be collected on a grid to assess any generalized contamination from airborne fallout from emissions from the HWOBUC. The unbiased sampling approach will be completed as follows:

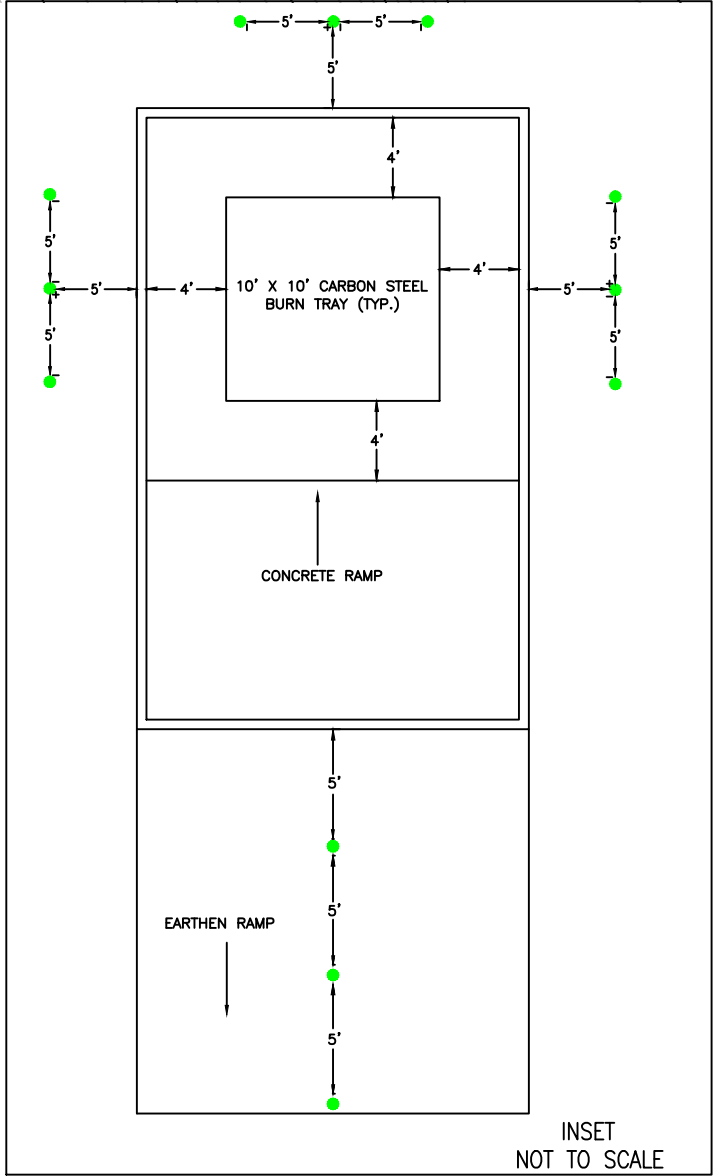
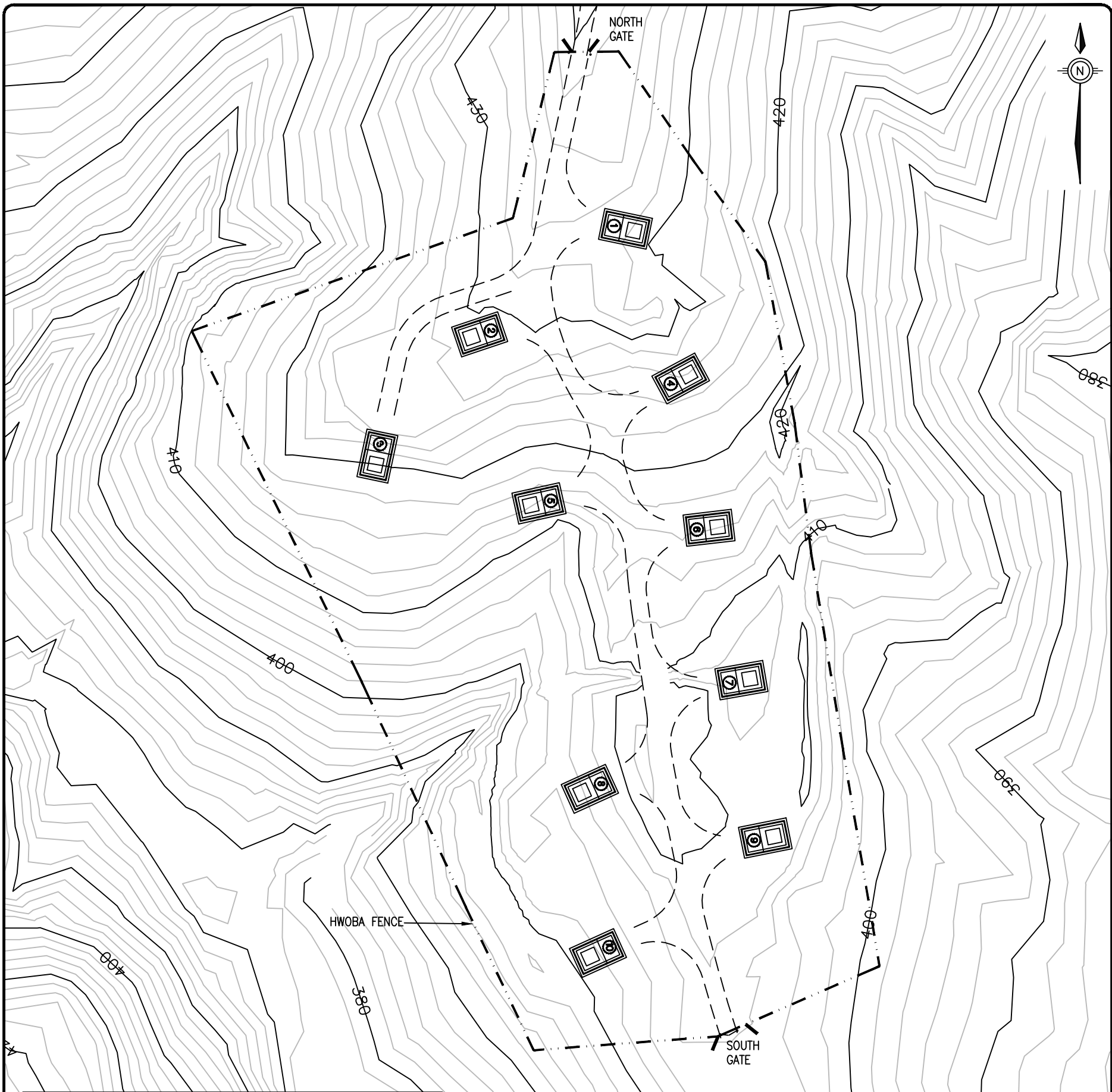
- Establish a 200-foot grid over an area extending 600 feet beyond the center of the HWOBUC (Figure 2-5).
- At each node outside the HWOBUC, collect a composite sample (0-0.5-foot bgs), comprised of five grab samples: one at the node and one along each grid line at a distance of 25 feet from the node.

The 49 unbiased samples resulting from the grid sampling will complement the 44 samples generated by the biased sampling pattern.

2.5.4 Follow-Up Soil Sampling (Biased Sampling Locations)

If any composite soil sample from the original, biased sampling program contains an identified COC above twice the respective background concentration or practical quantitation limit (PQL), additional sampling will be performed to identify the extent of contamination, as follows.

Concrete Pad Samples: At the location of an identified COC exceedance outside of a HWOBUC concrete pad, additional soil samples will be collected and at distances of 5- and 15 feet out from the original sample location. At each location, samples will be collected at 0 to 0.5 feet bgs, with each of the resulting grab samples analyzed individually for the identified COC to define the extent of localized contamination.



INSET
NOT TO SCALE

SOURCE: KILGORE FLARES COMPANY, LLC

LEGEND

- PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOB)
- HAZARDOUS WASTE OPEN BURN AREA (HWOB) FENCE
- GRAVEL ROAD
- CONTOUR LINES
- GRAB SAMPLE LOCATIONS

NOTE: BIASED SAMPLING TO BE PERFORMED AT EACH PAD AS SHOWN IN INSET

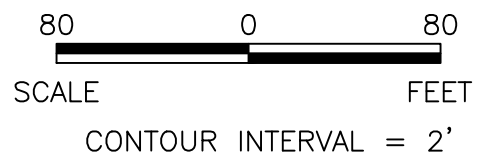
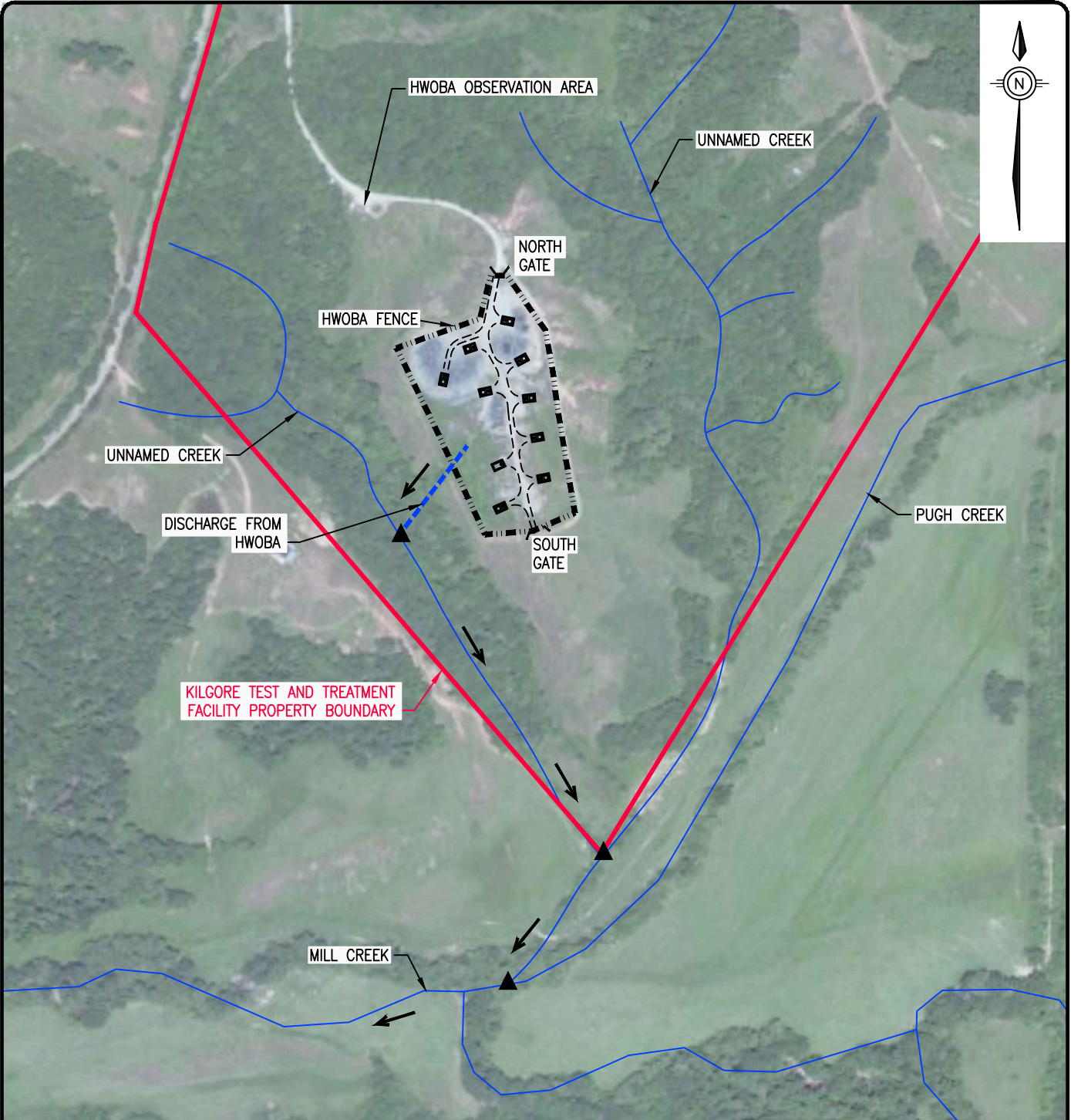


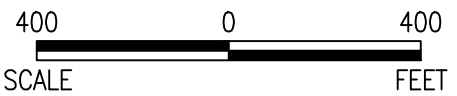
FIGURE 2-4
BIASED SOIL SAMPLING LOCATIONS
OUTSIDE OF HAZARDOUS WASTE OPEN BURN UNIT
(HWOB) CURBING
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY: G. POPE	<p>creative thinking. custom solutions. (800) 588-7962 www.ensafe.com</p>
DRAWN BY: BRONSON	
DWG DATE: 05/15/15	
DWG NO: 15139_B049	

I:\CAD PROJECTS\15139_KILGORE_TN\PLANS\15139_B050_DRAINAGE_SWALES_AND_CREEKS_PART_B_KILGORE_TOONE_TN.DWG



World Imagery - Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



LEGEND








-  - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
-  - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
-  - CREEK
-  - DRAINAGE SWALE
-  - SEDIMENT SAMPLING LOCATION
-  - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
-  - FLOW DIRECTION

FIGURE 2-5
BIASED DRAINAGE SWALE AND
CREEK SAMPLING LOCATIONS
PART B PERMIT APPLICATION
KILGORE FLARES COMPANY, LLC
TOONE, TENNESSEE

REQUESTED BY:	G. POPE
DRAWN BY:	BRONSON
DWG DATE:	05/15/15
DWG NO:	15139_B050



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- **Drainage Swale Sediment:** Three new grab samples will be collected, one from the location of the original COC exceedance and one at 20- and 50-foot downstream of the original location at depths of 0-0.5 feet bgs.

Should the follow-up sampling at any area exceed background levels, additional sampling events will be performed at 10-foot intervals, each successively expanding the sampling network beyond locations still reporting excessive contaminant concentrations, until the outermost samples are below background concentrations (RCRA metals, dioxins, and furans) or laboratory PQLs (RDX). Delineation samples will be collected from the 0-0.5 foot interval.

2.5.5 Follow-Up Soil Sampling (Unbiased Sampling Locations)

If any composite soil sample from the original, unbiased sampling program contains an identified COC (RCRA metals, dioxins, or furans) above twice its respective background concentration or PQL (RDX), additional sampling will be performed to identify the extent of contamination, as follows.

- At the location of the identified COC exceedance, a new grid, extending 100 feet in each direction from the original sample location, will be established, and one sample will be collected at each node along the new grid lines. At each location, samples will be collected at 0 to 0.5 feet bgs, with each of the resulting grab samples analyzed individually for the identified COC to define the extent of localized contamination.
- Should the follow-up sampling at any area fail to define the extent of soil contamination, additional sampling events will be performed at 10-foot intervals, each successively expanding the sampling network beyond locations still reporting excessive contaminant concentrations, until the outermost samples are below the threshold concentrations. Delineation samples will be collected from the 0-0.5 foot interval.

3.0 SAMPLING METHODS AND PROCEDURES

This section discusses the field methods, and procedures for collecting the various soil, water, sediment, and waste characteristic samples for the HWOBA during operation and closure. The methods and procedures employed for the sampling will be consistent with those prescribed in the U.S. EPA *Field Branches Quality System and Technical Procedures* established by the U.S. EPA, Region 4 Science and Ecosystem Support Division (SESD) in Athens, Georgia.

3.1 HWOBA Groundwater Sampling

Groundwater samples for both the semi-annual and annual monitoring of the HWOBA will be collected from each of the five wells located around the HWOBA. These wells include existing downgradient wells MW-4, MW-28, MW-29, and MW-30, and one new upgradient well to be installed (MW-44). All wells are constructed of 2-inch poly vinyl chloride well pipe and screens. Well depths for the four existing wells range from 13-23 feet. The new well is anticipated to be completed at depths of approximately 70-75 feet. The locations of the wells are shown in Figure 2-1.

During each sampling event, the samples will be collected using either a bladder pump (QED Sample Pro Pump™ or Equivalent) or a peristaltic pump (Geopump Series II™ or equivalent). U.S. EPA Region 4 SESD low-flow (considered 100 to 250 milliliters per minute) techniques will be employed with these pumps to reduce turbidity. The general procedures for groundwater sample collection are:

- Don protective clothing and equipment as specified in the site-specific Health and Safety Plan (HASP).
- Prepare the site by covering the ground surface around the wellhead with plastic sheeting and arrange the required sampling equipment for convenient use. If onsite decontamination is required, arrange the necessary supplies in a separate nearby location, away from the wellhead.
- Measure water levels on the same day in as short a time span as possible, but not during or immediately following a large rain event. Measure static water levels using an electronic water level indicator with a weighted cord that is accurate to 0.01 feet relative to the surveyed measurement point at the top of inner well casing. Calculate the static water volume in the well casing for purging. Record the well number, time, date, measuring point, depth to water, and observations on the condition of the well in the field logbook.

Spray water level indicators between each well with a deionized water-Liquinox wash and a deionized water rinse, and then wipe with clean paper towels.

- Purge the well prior to sampling. For purging with a bladder pump, attach the effluent Teflon tubing to the pump outlet, then lower the pump with tubing to the mid-point of the saturated screen length so as not to disturb any sediment at the bottom of the well. Start the pumps at their lowest settings and slowly increase the pumping rates until discharge occurs. Initially monitor water levels frequently to minimize drawdown and then regularly thereafter. In the event that the water level falls below the top of the bladder pump, report the deepest water level on the sample log sheet and document that the level fell below the pump in the Remarks or Comment column. Stable drawdowns of less than 0.3 feet are desired. Purging with the peristaltic pump is similar to purging with the bladder pump. For purging, the tubing inlet is lowered to the mid-point of the screen, and the pump is started at the lowest setting. Flow rates and water levels are monitored, and drawdowns of less than 0.3 feet are desired.

- During purging measure water quality parameters consisting of pH, temperature, specific conductance, dissolved oxygen, and oxidation-reduction potential (ORP) using a YSI Model 600 Series multi-parameter meter™ or equivalent coupled with a flow-through cell. Measure turbidity separately using a LaMotte Model 2020™ or equivalent nephelometer. Collect an aliquot of water from a T-connection before the flow-through cell to measure turbidity.

- Record the water level, pumping rate, turbidity, dissolved oxygen, ORP, specific conductivity, temperature, pH, and visual observations every 3 to 5 minutes (or as appropriate). Using calibrated field instruments, stabilization during purging will be considered to be achieved when three consecutive readings, taken at 3- to 5-minute intervals, are within the following limits:
 - Turbidity (± 10 Nephelometric Turbidity Units)
 - Dissolved Oxygen (± 20 percent saturation)
 - Specific Conductance (± 5 percent of past measurement)
 - Temperature (± 0.2 degrees centigrade)
 - pH (+/- 0.2 standard unit)
 - ORP (± 10 millivolts)

Groundwater samples should be collected following stabilization of measured water quality parameters or after a maximum of 2 hours (the field personnel collecting the sample will make and document that determination on the sample log sheet in the field log book). Fill the appropriate sample bottles directly from the sample tubing filled with water to the sample point.

In all cases, sampling will be completed within 24 hours of the beginning of purging. All reusable sampling equipment will be decontaminated before and after each use.

3.1.1 Monitoring Well Inspection and Closure

During each sampling event and for every well, the requirements for well inspection will be followed as detailed in the *Well Inspection and Maintenance Plan* found in Attachment 1 of the SAP. As specified in the Plan, a *Monitoring Well Inspection Check List* must be completed for each well. Following completion of the sampling event, the check lists will be reviewed to determine if maintenance or repair is required for any well.

A Well Closure Plan is included in Attachment 2 of the SAP.

3.2 Closure Soil and Sediment Sampling

Soil samples will be collected around concrete structures using stainless steel spoons, scoops, or hand augers. Soil samples for metals, dioxins, furans, and RDX analyses will be placed into a stainless-steel bowl, composited, and placed into sample jars.

3.2.1 Soil/Sediment Sampling Procedures

The following procedures will be used to collect soil samples specified to support closure of the HWOBA. Modifications made according to site conditions should be recorded in the sampling notes.

Before Surface Soil/Sediment Sampling

These steps will be followed prior to sampling.

1. Don personal protective clothing and equipment as required by the site-specific HASP.
2. Stake the location(s) to be sampled.
3. Clear vegetation, scrap, and other debris from the surface around the boring location.

4. Place clean plastic sheeting on the surface near the sample collection location to hold decontaminated sampling equipment.
5. Set up a decontamination area for sampling equipment, if required.

During Surface Soil/Sediment Sampling

These steps will be followed during sampling.

6. Remove surface debris and scrap from the sample location.
 7. With a stainless-steel device, scrape the sample collection location to obtain a previously unexposed surface.
 8. Use a decontaminated stainless-steel or Teflon-lined sampling device (e.g., spoon or spatula) to collect the volume needed to fill the sample container(s).
 9. For grab samples:
 - Completely fill the sample containers directly from the sampling device, avoiding twigs, large rocks, and grass
 - Fill the sample container so there is zero or minimal headspace
- For composite samples:
- Empty contents of the sampling device into a decontaminated stainless-steel or Teflon-lined bowl
 - Collect enough to fill all sample containers
 - Mix sample using a decontaminated stainless-steel or Teflon-lined spoon, knife, or spatula
 - Place the homogenized mixture into the appropriate sample containers
10. Secure container with Teflon-lined cap
 11. Label each sample container and preserve to 4 degrees Celsius

After Surface Soil/Sediment Sampling

These steps will be followed after sampling is completed

12. Backfill the borehole with any excess soil
13. Record pertinent information in the field logbook. Field logbook contents might include:
 - Date and time task started and ended, weather conditions, and the names, titles and organizations of personnel performing tasks
 - Specific comments on any problems encountered, their resolution, and any impact on the field investigation
 - Description of PPE levels and any changes
 - Detail description of site activities
 - Description of field tests and results
 - List of the time, equipment type, and procedures followed for decontamination
 - Record of instrument calibration and any failures, with a brief description of repairs and/or replacements
14. Clean site
15. Place contaminated disposable materials in the designated drum for disposal

3.3 Closure Water Sampling

Wash water, rinsate, and background-source water samples will be collected for closure activities by grab sampling from batch tanks or drums used to collect the water.

3.3.1 Wash, Rinse, and Source Water Sampling

There are various site conditions that require considerable judgment regarding the choice of methodologies and procedures for collecting representative samples of wastewater. Based on the process generating the wastewater, grab sampling with a laboratory bottle according to the following procedures will be used for sampling wash, rinse, and source water.

Before Sampling with Laboratory Bottle

1. Locate the sample collection point where the wastewater is well-mixed (such as near the center of the container), where the turbulence is at a maximum, and where the possibility of solids settling is minimized. Avoid skimming the surface or dragging the bottom.
2. Don personal protective clothing and equipment as the site-specific HASP requires.

During Sampling with Laboratory Bottle

3. Use the actual sample container that will be used to transport the sample to the laboratory.
4. Uncap containers and fill carefully, ensuring that the container is rinsed with the water at least twice before the sample is collected, unless preservatives are present. Slowly fill pre-preserved bottles, taking care not to flush the containers. Recap containers before beginning another bottle.
5. If the depth of the container does not allow careful filling of bottles, collect water samples with a decontaminated glass or stainless-steel cup and carefully decant into the containers.
6. Chemically preserve the samples as needed and seal with Teflon-lined caps.

After Sampling with Laboratory Bottle

7. Place bottles in cooler and preserve to 4 degrees Celsius.
8. Note pertinent sampling information in the field logbook.
9. Decontaminate equipment.

3.4 Surface Wipe Sampling

Concrete and steel surfaces will be sampled using wipe kits consisting of an absorbent pad soaked in a solvent and stored in glass jars prior to use. The wipe kits will be obtained from the analytical laboratory selected for the sample analysis. The following procedures will be used during wipe sampling.

Before Wipe Sampling

1. Don personal protective clothing and equipment as required by the site-specific HASP.

2. Identify and mark a 100-cm² grid over each area to be sampled.

During Wipe Sampling

3. Using a 3-inch by 3-inch gauze pad wet with 8 milliliters of pesticide-grade hexane or other specified solvent, wipe the marked area in a horizontal direction using a forward and backward motion. Do a second wiping of the surface using a clean portion of the same gauze pad in the vertical direction with the same forward and backward motion.
4. Place the gauze pad in a brown glass sample container equipped with a Teflon-lined lid.

After Wipe Sampling

5. Record pertinent information in the field logbook.
6. Clean site.
7. Place contaminated disposable materials in the designated drum for disposal.

3.5 Quality Control Sampling

The primary measurements for both field and laboratory QA and QC regarding sampling are derived from matrix spike/matrix spike duplicate (MS/MSD), duplicate samples, field blanks, and rinsate blanks collected in the field. Table 3-1 summarizes QC sample collection frequency. The following sections briefly describe the types of QC samples that will be collected for sampling.

3.5.1 Duplicate Samples

A duplicate is an identical sample collected from the same location, at the same time, under identical conditions as the original. Duplicate samples are analyzed along with the original to ascertain procedural precision and inherent source variability. Soil duplicate samples will be collected to assess the heterogeneity of contaminant concentrations in the soil matrix (at a specific location). Duplicate samples (water and soil) will be collected for every 10 samples of each medium (10% frequency).

3.5.2 Field Blanks

A field blank is a sample container filled with the source water of the final rinse water used to decontaminate field equipment. The field blank is prepared, preserved, and stored in the same manner as the other water samples. Field blanks are analyzed for contamination imparted by

containers, source waters, or other external sources. One field blank will be submitted for each sampling event.

3.5.3 Rinsate Blanks

Rinsate (or equipment) blanks are collected by retaining rinsate from the final rinsing of reusable sampling equipment. The equipment is rinsed with potable water and/or deionized water after full decontamination procedures have been completed. One rinsate sample will be collected for each type of non-disposable sampling equipment used and media sampled.

Table 3-1
Quality Control Sample Collection Frequency
Kilgore Flares Company, LLC — Part B Permit Application

Quality Control Sample	Frequency of Collection	Additional Sample Volume Required
Matrix Spike/Matrix Spike Duplicate Samples	5 percent (One Matrix Spike and Matrix Spike Duplicate sample for every 20 primary samples)	Collect additional sample volume (aqueous samples only) as required by the analytical laboratory.
Field duplicates	10 percent (One field duplicate for every 10 primary samples)	Collect two times the standard sample volume. The second volume is labeled as a different sample
Rinsate Blanks	One blank will be taken for each type of sampling equipment used and media sampled.	Standard volume
Field blanks	One blank of the organic-free water used for the final rinse will be collected for each sampling event	Standard volume

4.0 DECONTAMINATION

All soil, sediment and groundwater sampling equipment will be thoroughly decontaminated prior to and in between sampling locations. Decontamination of equipment will be conducted using the following steps:

1. Clean with tap water and phosphate-free soap (e.g., Liquinox) using a pressure washer or brush if necessary to remove particulate matter and surface films.
2. Rinse thoroughly with tap water.
3. Rinse thoroughly with organic/analyte free water.
4. Remove the equipment from the decontamination area, and allow air drying. Wrap the equipment in plastic or aluminum foil as/if required.

Workers doing the decontamination will wear nitrile gloves and other personal protective equipment as needed. A temporary decontamination pad may be constructed from wood and plastic sheeting, or decontamination may be done in other containers such as plastic tubs or plastic 5-gallon buckets. The pad/containers will serve to contain waste soil and water-soap solutions. Waste solutions will be held and containerized in labeled, steel, 55-gallon drums for later characterization and disposal.

5.0 HEALTH AND SAFETY

All sampling and field operations will be conducted by staff from the Kilgore Environmental Department or qualified subcontractors. All personnel involved in these activities must have completed training and medical monitoring as specified in Hazardous Waste and Emergency Response (HAZWOPER) 29 Code of Federal Regulations 1910.120. All activities must adhere to the Kilgore Health and Safety Plan for the facility. This includes the use of appropriate personal protective equipment (PPE) and coordination with Kilgore personnel and samplers to ensure that hazards associated with site operations are avoided. For the activities included in this SAP, Level D PPE will be considered sufficient unless specific site conditions dictate otherwise.

6.0 SAMPLE PROCESSING

Sample processing includes proper sample preservation and packing, identification, and documentation. These procedures are crucial to ensure sample quality, integrity and representativeness. The following methods and procedures must be followed for every sample regardless of the type of sample or the media sampled.

6.1 Sample Preservation

Clean samples jars will be provided by the laboratory before each sampling event. Immediately following collection, all samples are retained in a field cooler with ice double-bagged in re-sealable plastic bags. Samples are preserved to ensure integrity during transport to and subsequent temporary storage at the laboratory before analysis. Examples of preservation techniques that are observed when conducting waste sampling include refrigeration or cooling to 4 degrees Celsius with wet ice, and storing and shipping samples in the appropriate container provided with double-bagged wet ice. Dry ice should not be used. Implementing these preservation methods, and others when necessary, ensures the integrity of the sample, provided that the samples are analyzed within the proper holding times as specified.

6.2 Sample Identification

Each sample will have affixed a sample label uniquely and clearly identifying the sample and its origin. The label is completed when the sample is collected and will include:

- Unique sample identification number/code designated for Kilgore
- Data collected
- Sampler's name and signature
- Preservative(s)

Lids to all sample containers are sealed properly to prevent leaking and/or tampering once the sample is released from Kilgore.

6.2.1 Sample Identification Numbers

Unique sample identification numbers will be assigned to each sample based on the location, sampling media, and depth or sequence of sample collection. Samples collected will be assigned a 10-digit sample identification code, based on the site name, sampling matrix, sampling location, sampling depth (soil sampling only), the sequential number of samples collected (wipe sampling),

and the date the sample was collected (trip, field, and rinsate blanks). The 10-digit sample identification process is discussed below.

For all samples, the first three digits —KGR— indicate the site (Kilgore). The next (fourth) digit identifies the type of media sampled. For soil, the letter “S” indicates a soil sample, sediment is an “M”, groundwater is a “G”, and wipe samples are a “Z”. The next two letters further clarify the sample type. For soil, “SB” indicates a soil boring, “SS” is a sediment sample, “WW” is a wastewater sample, “MW” is a groundwater sample from a monitoring well, “BG” is a background sample, and “WP” is a wipe sample. The next two digits indicate the sampling location (01, 02, etc.) The last two digits indicate either the depth at which the sample was collected for soil, or the event it was collected in for all other media. For soil, “02” indicates 2 feet. Samples collected at 6 inches below ground surface are labeled 01, with notations in the project notes to indicate they were collected at 6 inches.

Table 6-1 provides examples of field investigation sample identifications.

Table 6-1
Investigation Sample Identification Examples

Sample Type	Sampling Area	Sample ID	Description
Soil	Soil Boring	KGRSSB0102	KGR = Kilgore
			S = Soil sample
			SB = Collected from a soil boring
			01 = Collected at location #01
			02 = Sample collected from 2 feet below ground surface
Sediment	Sediment	KGRMSS0101	KGR = Kilgore
			M = Sediment sample
			SS = Collected from a sediment sampling location
			01 = Collected at location #01
Groundwater	Monitoring Well	KGRGMW0101	KGR = Kilgore
			G = Groundwater sample
			MW = Collected from a monitoring well
			01 = Collected at well #01
			01 = Sample collected during Event 1

6.3 Chain-of-Custody Forms

Sample chain-of-custody procedures begin at the time the sample is containerized and labeled, and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records of sample custody will be maintained in the field records, project files, and laboratory records. Kilgore will use the chain-of-custody forms for transferring sample shipments to the laboratory. Upon transfer of custody, the form will be signed

by the sampling team leader, who will note the date and time the samples were relinquished. All chain-of-custody forms received by the laboratory will be signed and dated by the laboratory sample custodian and returned to Kilgore following receipt, or as part of the data-reporting package. The analytical laboratory will carry the custody process throughout the laboratory as indicated in its Quality Assurance Plan (QAP).

6.4 Sample Packaging and Shipment

A cooler, in good condition, will have a sealed drain plug on the inside and taped outside to prevent leakage. Once labeled, all samples must be packed so as to avoid breakage and prevent cross-contamination according to the following procedures.

- Ensure that cooler is clean and strong enough for shipping purposes.
- Include a temperature blank or strip in each sample cooler.
- Place double-bagged ice inside the cooler to chill the samples to 4 degrees Celsius.
- Place a chain-of-custody record describing the contents of each cooler in a sealed plastic bag inside each cooler.
- Seal the cooler with tape and custody seals so that the cooler cannot be opened without breaking the seal.

7.0 SAMPLE ANALYSIS

A qualified, Tennessee state-certified laboratory will be selected for the analytical program. Analytical methods used will follow Test Methods for Evaluating Solid Waste — Physical/Chemical Methods, (U.S. EPA SW-846). Level III analytical data is specified for the data deliverables. Analytical methods used to characterize soil and groundwater quality for all samples collected will include the following.

Selected Target Analyte List Metals/U.S. EPA Methods 6010B, 7470A and 7471

- Antimony, Arsenic, Barium, Beryllium, Cadmium, Cobalt, Copper, Lead, Selenium, and Zinc (6010B) and Mercury (7470A aqueous and 7471 soil).

Explosive Compounds (U.S. EPA Method 8330B)

- RDX

Dioxins/Furans (U.S. EPA Method 8280A)

- TCDD
- HxCDD
- OCDF
- OCDD
- Total Dioxin/Furan Compounds

Propellants (U.S. EPA Method 314.0)

- Ammonium perchlorate

If corrective action is required by the analytical laboratory, the corrective action process should be conducted in accordance with the laboratory's QAP, following guidelines provided in the analytical methods.

8.0 DATA QUANTITATIVE QUALITY OBJECTIVES

The quality of the laboratory data is assessed in terms of precision, accuracy, representativeness, comparability, and completeness. The following items discuss methods for assessing quantitative QA objectives: precision, accuracy, representativeness, comparability, completeness, and detection limits. These are crucial for acceptance of the data.

8.1 Precision

Precision measures the reproducibility of measurements and methods, defined for qualitative data as a group of values' variability compared with its average value. To assess the precision of the measurement systems used in this project, field duplicates will be obtained and analyzed with the samples collected. Precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSDs and laboratory control sample/laboratory control sample duplicates (LCS/LCSDs) for organic analysis, and laboratory duplicate results for inorganic analysis. The relative percent difference (RPD) will be calculated for each pair of duplicate analysis using industry-standard equations.

8.2 Accuracy

Accuracy is the degree to which a given result agrees with the true value. Spiked sample results provide information needed to assess the accuracy of analyses. Specifically, surrogate spike, MS/MSD, and LCS/LCSD percent recoveries (%Rs) are used to assess accuracy. Every organic sample is spiked with known quantities of non-target surrogate compounds. Five percent of all samples analyzed are spiked with target chemicals for the MS/MSD. If the calculated %Rs for the known spike concentrations are within defined control limits set by each method, the reported sample concentrations are considered accurate.

8.3 Representativeness

Representativeness is an expression of the degree to which the data accurately and precisely represent a characteristic of a population or environmental condition existing at the site. Adherence to the project planning documents and use of standardized sampling, handling, preparation, analysis, and reporting procedures ensures that the final data accurately represent the desired populations. Ensuring representativeness of field data depends on the proper design of the sampling program and will be satisfied by ensuring that the project planning documents are followed and that proper sampling techniques are used. Representativeness in the laboratory is ensured or evaluated by using the proper analytical procedures, meeting sample holding times, and analyzing and evaluating field duplicate samples relative to laboratory duplicates.

8.4 Comparability

Comparability is defined as the confidence with which one data set can be compared with another (e.g., between sampling points and between sampling events). Comparability is achieved by using standardized sampling and analysis methods and data reporting formats (including use of consistent units of measure), and by ensuring that reporting and detection limits are sufficiently low to satisfy project detection and quantitation criteria for the duration of the project. Comparability depends on the proper design of the sampling program and will be satisfied by ensuring that the project planning documents are followed and that proper sampling techniques are used. Planned analytical data will be comparable when similar sampling and analytical methods are used and documented. Results will be reported in units that ensure comparability with previous data.

8.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. Results will be considered valid if all the precision, accuracy, and representativeness objectives are met. The target completeness goal for this work is 100% (combined field and laboratory results) for a given analysis. Valid data is required in order to make decisions regarding treatment and disposal requirements, and for further investigation and remediation from operation of the HWOBA. The formula for calculating completeness is presented below:

$$\% \text{ completeness} = \frac{(\text{Number of valid \{i.e., non-R flagged\} results})}{(\text{Number of possible results})} \times 100$$

8.6 Detection Limits

Detection limits are described in many different terms depending on the analysis being performed and the capabilities of the instrument. The following terms are important in describing detection limits and are used throughout this Part B Permit Application.

- **Method Detection Limit (MDL)** — is defined as the lowest concentration of an organic analyte a method can reliably detect taking into consideration the reagents and preparation steps applied to a sample. If TDEC requests that all MDLs be lower than screening levels applicable at the time, the laboratory will analyze for the COCs using High-Powered Liquid Chromatography as an alternate method.

- **Practical Quantitation Limit (PQL)** — is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operations. The PQL is generally 5 to 10 times the MDL.
- **Instrument Detection Limit (IDL)** — is the smallest signal above background noise that can be reproduced, achieving statistical confidence requirements for varying inorganic analytical runs and conditions.

9.0 DATA MANAGEMENT

This section describes the standard recordkeeping, data deliverables, storage, and retrieval requirements that support and document the sampling efforts and sample analysis. Copies of all field and laboratory data and analysis will be maintained by the Vice President Health, Safety, and Environmental, along with other documentation, for at least 3 years.

9.1 Data and Data Storage

Both analytical and field data will be generated during the planned sampling events. For the sampling specified here, U.S. EPA Level III data will be required. Laboratory procedures for data management, reduction, and reporting will be included in the laboratory QAP. Data reduction and reporting by the laboratory will meet Kilgore's data evaluation criteria.

9.2 Field Data Package

The field data package includes all field records, measurements, and observations maintained on sampling logs, field notebooks, or other notes. This package will be maintained in the Vice President Health, Safety, and Environmental's office at Kilgore's main production plant.

9.2.1 Field Logbook and Data Sheets

All field and project information will be recorded in a bound project logbook to be kept updated by the field crew and site manager during each sampling event. The field observations and measurements will include at a minimum, but not be limited to, the following:

- Time and date of arrival on and departure from the site
- Field crew members present
- Weather and site conditions
- All sampling and site activities, including health and safety and equipment calibration.
- Field and well measurements, or if those are included on field data sheets then a statement to that affect.
- Other individuals present besides the sampling crew.

The same event will be used from one event to the next, and when a new book is required the previous book will be referenced in the newer book.

Field data sheets can be prepared and used for a variety of field measurements. These may include, but not be limited to, the following: purging and sampling measurements, water level measurements, and instrument calibration. If field data sheets are used, then they must be referenced in the field log book. For sampling of monitoring wells, the field data sheets will contain, at a minimum, the following items:

1. Well identification number;
2. Depth and diameter of the well;
3. Date and time of purging/sampling, including event number;
4. Static water level initially and during purging;
5. All reading of water quality parameters (pH, conductivity, temperature, ORP, turbidity);
6. Total amount purged;
7. Any other observations of the purged groundwater (color, visual clarity, odor, sheen, etc.);
8. Date and time of sample collection, and time the sampling was completed;
9. Climatic conditions;
10. Sampler's name(s)

The field sheets will be maintained in the project records with all other field data and the project logbook.

9.3 Analytical Laboratory Data Package

The Level III analytical data package is designed to provide laboratory analysis using standard U.S. EPA-approved procedures. This level applies to site characterization, environmental monitoring, risk assessment, and/or confirmation of field-produced data. Level III data require QC forms to review data quality, but raw data are not submitted for full evaluation. Level III deliverables include all forms from the current Contract Laboratory Program (CLP) guidelines. These forms or similar laboratory QC summaries are required for evaluation purposes.

For methods not defined by the CLP, the following will be summarized by the laboratory (as appropriate): sample results, case narratives, analytical sequences, preparation logs, gas chromatography/mass spectrometry (GC/MS) tuning data, calibration information [including percent relative standard deviation or percent difference from calibration], method blanks, organic

MS/MSDs, GC/MS internal standard areas and retention times, inorganic spikes/duplicates, laboratory control samples, inductively coupled source plasma emission spectroscopy (ICP) check standards, ICP interference check samples, ICP serial dilutions, and atomic absorption spike recoveries. All analytical data will be reported using Level III deliverables. All laboratory analyses will be reviewed by Kilgore's Vice President Health, Safety, and Environmental and maintained in the Vice President Health, Safety, and Environmental office at Kilgore's main production plant. Analyses will be compared to previous analyses, production data, and/or appropriate regulations to determine consistency of the waste pyrotechnics to be treated.

10.0 DATA VALIDATION AND REPORTING

Data evaluation, the systematic and independent verification of data quality, is performed to verify that the QC requirements of the data set have been met. The Quality Assurance Manager will review all waste pyrotechnic and waste pyrotechnic ash data, field data and analytical soil, water and surface sampling data. The Quality Assurance Manager will compare the sample descriptions with the field data for consistency and will ensure that any anomalies in the data are appropriately documented. The Quality Assurance Manager will also be responsible for overall evaluation, validation, and final approval of the data in accordance with project purpose and use of the data.

10.1 Field Data Evaluation

All field data will be reviewed for completeness and accuracy by:

- Reviewing field entries on water and soil/ash sampling logs for completeness;
- Verifying that rinsate blanks and trip blanks were properly prepared, identified, and analyzed; and
- Reviewing chain-of-custody forms for proper completion, dates, and signatures of field personnel and the laboratory sample custodian.

10.2 Validation and Verification Methods

The analytical data package will be evaluated by the Quality Assurance Manager or a designee. The evaluation will be performed, where applicable, according to the U.S. EPA Contract Laboratory Program, *National Functional Guidelines for Organic and Inorganic Data Review* (Functional Guidelines; February, 1994) and U.S. EPA precision and accuracy statements for the analytical methods employed. Functional Guidelines will be used as a guide for data evaluation because estimated data qualifiers indicating bias will not be assigned to analytical results. Data evaluation is accomplished through a series of checks and reviews intended to assure that the reported results are of verifiable and acceptable quality. The analytical data package evaluation procedure includes the following.

- Comparison of sampling, sample extraction, and analysis dates to check that samples were extracted and/or analyzed within the proper holding times.

- Review of analytical methods and required detection limits to verify that they agree with the project data quality objectives.
- Evaluation of all blanks (rinsate, field, trip, reagent, method, and extraction blanks) to assess potential cross-contamination.
- Evaluation of surrogate spike, MS/MSD, LCS/LCSD recoveries, plus internal standard areas to assess accuracy.
- Evaluation of duplicates (field, MS/MSDs and LCS/LCSDs) to assess precision.
- Review of instrument performance checks (calibration, check samples, tuning) to ensure samples were analyzed within method guidelines.
- Assessment of data usability.

The analytical data will be certified by the Quality Assurance Manager or a designee based on the level of reportable and the result of evaluating field and analytical data packages. The possible data flags are:

- **U flag:** Undetected; the analyte was analyzed for but not detected, or was found in an associated blank but at a concentration less than 5 times the blank value (10 times for common laboratory contaminants).
- **D flag:** Diluted Result; the compound was reanalyzed at a secondary dilution factor. The D flag will remain on the value to alert the data user that the value from a secondary dilution was used.

10.3 Reconciliation with User Requirements

Completeness will be evaluated to determine if the completeness goal for this project has been met. If data quality indicators do not meet the project's data quality objectives as outlined in this SAP, the data may be discarded and re-sampling may occur. The Quality Assurance Manager will evaluate the cause of the failure (if possible) and make the decision to discard the data and resample. If the failure is tied to the analysis, calibration, or maintenance, techniques will be reassessed as identified by the appropriate lab personnel. If the failure is associated with the sample collection and resampling is needed, the samplers will be retrained.

10.4 Reporting

Reports will be prepared and maintained by the Quality Assurance Manager. These reports will detail all sampling activities, provide analytical data reporting, and results of data validation. Also included will be ancillary data such as hydrogeological information and mapping, groundwater measurements, observations and other data.

10.4.1 Laboratory Reports

The laboratory will supply the Quality Assurance Manager with copies of the chain-of-custody, as well as a sample summary sheet during sampling. A summary sheet identifying all samples received, the required analyses, and the sample delivery group identification will also be faxed following receipt of the shipment to show that the samples have been received. The laboratory must not alter or truncate any digits of the sample identification without prior permission. The sample identification numbers on the chains of custody are to remain on all deliverables.

11.0 CORRECTIVE ACTION

During sampling, Kilgore field personnel are responsible for seeing that field instruments are functioning properly and that work progresses satisfactorily. Field personnel are also responsible for performing routine preventive maintenance and QC procedures, thereby ensuring collection of valid field data.

If a problem is detected by field personnel, the Quality Assurance Manager shall be notified immediately, at which time corrective action will begin. Similarly, if a problem is identified during a routine audit by the project or regulatory Quality Assurance Manager, an immediate investigation will be undertaken and whatever corrective action deemed necessary will be taken as early as possible. Samples with sampling or analyses that does not meet QC or QA criteria may be resampled, reanalyzed, or the analysis reviewed by Kilgore or its designee. The Kilgore's Vice President Health, Safety, and Environmental is responsible for initiating investigation rework and review efforts. The Quality Assurance Manager will document cases of noncompliance with criteria, and assure that the corrective action is implemented and recorded.

The necessity for corrective action is determined after the data have been evaluated. If data completeness and representativeness have met project objectives, no corrective action will be taken. For data considered grossly deficient compared to project objectives, corrective action may include reevaluation for limited exclusion or resampling.

Attachment 1
Inspection Plan

**KILGORE FLARES COMPANY, LLC
WELL INSPECTION AND MAINTENANCE PLAN
MISCELLANEOUS UNIT TREATMENT FACILITY**

Prepared for:

Kilgore |

Part of the Chemring Group

**Kilgore Flares Company, LLC
Toone, Tennessee 38381**

and



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September 2014

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Attachment A Well Inspection Check List



1.0 INTRODUCTION

This Well Inspection and Maintenance Plan (Plan) has been developed to support the long-term groundwater monitoring proposed in the April 2014 Part B Permit for the hazardous waste open burning area (HWOBA) at the Kilgore Flares, LLC (Kilgore) facility in Toone, Tennessee. The facility is regulated under the Resource Conservation and Recovery Act (RCRA), and a RCRA Facility Investigation (RFI) has been completed for the Solid Waste Management Units present. Information and data from the RFIs have been used to develop a Groundwater Detection and Compliance Monitoring Plan (Groundwater Monitoring Plan) for long-term groundwater monitoring, required as part of the monitoring of open burning operations at the HWOBA. Details of the Groundwater Monitoring Plan have been presented in the proposed 2014 Part B Permit Application (Revision 8, April 2014) made to the Tennessee Department of Environment and Conservation (TDEC). The objective of the Groundwater Monitoring Plan is to establish baseline groundwater conditions and monitor for potential future significant releases associated with treatment operations that cross a groundwater compliance point at the regulated HWOBA. The Groundwater Monitoring Plan follows a detection and compliance monitoring program specified under 40 CFR 264.91 and 270.14(c), and THWMR 0400-12-.07(c). As part of this Groundwater Monitoring Plan, four existing monitoring wells will form the downgradient point of compliance and two new wells will be installed to establish an upgradient background monitoring area, in accordance with in 40 CFR 264.97 and THWMR 0400-12-01-.06(f) and (h).

2.0 WELL INSPECTION AND MAINTENANCE PLAN

Pursuant to 40 CFR 264.97 (c) and THWMR 0400-12-.06(h)3, the integrity of each of the monitoring wells included in the Groundwater Monitoring Plan must be maintained during the monitoring period. Well integrity is crucial in ensuring that representative samples are collected. To that end, this Plan combines a regular assessment of each well's physical condition, selected geochemical trends, and groundwater production performance history to identify physical and chemical-related problems with the well that could affect well integrity and the collection of representative samples.

2.1 Well Inspections

A key component of maintaining the wells in good condition is conducting regular inspections of the physical condition of each well to determine whether repairs need to be made to maintain well integrity. As proposed here, inspections will be made of each well during every sampling event during the monitoring period. The inspections will be conducted by the well samplers. The results of each inspection will be documented in a Monitoring Well Inspection Checklist (Attachment A of this Plan).

2.2 Physical and Chemical Properties

Simple physical and chemical monitoring of the groundwater can frequently detect changes in the groundwater environment that can indicate the formation of precipitates and encrustations in the well screen, and/or bio-fouling related to bacterial growth along the well screen. These conditions can affect sample quality and degrade well performance (Smith 1995; ASTM 2005). Key parameters that can help detect changes include:

- Hydrogen-ion concentration (pH)
- Dissolved oxygen (DO)
- Specific conductance
- Turbidity
- Redox potential (Eh)
- Total organic carbon (TOC)
- Iron (Fe)
- Manganese (Mn)
- Sulfur (S)
- Sulfate (SO₄)

Some of these parameters (pH, DO, specific conductance, and turbidity) are already scheduled to be measured during groundwater sampling to determine well stability prior to sampling. These scheduled parameters will be evaluated after each sampling event. Where significant changes are noted, the parameters Eh, TOC, Fe, Mn, S, and SO₄ may be added to the sampling program. For example, Eh is very important to the make-up of the micro-flora in the well and aquifer, and can indicate the fate of Fe, Mn, and S, which produce mineral precipitates. Total organic carbon is a good indicator of bio-fouling potential. Particle counting and turbidity are significant in denoting the origin of minerals and/or precipitates. Increases in turbidity and particle counts can be used to evaluate suspended solids content that may result from silting or bio-fouling.

2.3 Well Performance

During routine groundwater sampling activities, flow rates and recovered volumes of groundwater are logged in the field sampling notes for each well. These rates and volumes will be compared from event to event to look for production changes indicating reduced flow and performance in the well. This comparison will be assessed along with the other physical-chemical data as another potential indicator of well screen obstructions that may develop over time.

3.0 WELL MAINTENANCE AND REHABILITATION

Well maintenance and rehabilitation will be performed as necessary on the site wells once indicator parameters and evaluations discussed previously clearly show that well performance is declining in a well. Chemical and physical problems can be encountered in monitoring wells during long-term monitoring, as wells are often left idle for long periods between sampling events. It is also very important that any methods of well rehabilitation and maintenance employed should not alter the groundwater chemistry being monitored.

Methods to rehabilitate a monitoring well can include pumping, surging, and redevelopment to remove fine-grained sediments and other materials that may be clogging the well screen. In severe cases of bio-fouling, chemical rehabilitation may be necessary to improve flow and well performance. Any method employed will be discussed with TDEC prior to the work.

4.0 REFERENCES

American Society for Testing and Materials. 2005. *ASTM D 5978, Standard Guide for Maintenance and Rehabilitation of Ground Water Monitoring Wells*, American Society for Testing and Materials International, West Conshohocken, Pennsylvania.

Smith, S. A. 1995. *Monitoring and Remediation Wells: Problem Prevention, Maintenance, and Rehabilitation*, CRC Press.

Attachment A
Well Inspection Checklist

**Monitoring Well
Inspection Check List**

Site/Project:

Job Number:

Well ID:

Date Of Inspection:

Inspected By:

Original Well Depth:

Measured Well Depth:

Depth To Water:

Inspection Item	Yes	No	N/A	Comment
Well is visible and easy to locate.				
Area around the well is cleared, easily accessible, safe for foot traffic, and free of brush and debris. There are no signs of unusual staining, odors, or dead vegetation around the well that was not present during the previous inspection.				
Well pad is in good condition, there are no cracks or sign of deterioration in the concrete, and the concrete is tight around the well head and cover with no gaps or separation.				
Well cover is in place and secured tightly. All bolts, spacers and washers are in place and in good condition.				
Well cover is in good condition, and there is no corrosion, holes or cracks visible on the cover.				
An O-ring or gasket is seated under the cover properly.				
Well has a clearly visible well number designation (on the cover, on a plate under the cover, painted on the pad or scribed into the concrete).				
Standing water is present beneath the well cover.				
There is an adequate gap between the top of capped well and the well cover.				
The well cap is firmly affixed to the well pipe, is in good condition and free of cracking or corrosion.				
A lock is affixed to the well cap, is locked, free of corrosion and in good condition.				
The top of the well casing has a clear mark or notch to indicate where the water level should be measured.				
Well casing is in good condition and free of cracks.				
The grout-concrete around the well casing is in good condition, there is no gap between the well pipe and grout.				
Well is clear and free of obstructions to total depth.				

**Monitoring Well
Inspection Check List**

Site/Project:

Job Number:

Well ID:

Date Of Inspection:

Inspected By:

Original Well Depth:

Measured Well Depth:

Depth To Water:

Inspection Item	Yes	No	N/A	Comment
The bottom of the well is "hard" with no indications of soft sediment.				
All equipment used to sound the well and measure the groundwater level was clean and decontaminated prior to use				
The well requires repair or rehabilitation to improve flow.				

Attachment 2
Well Closure Plan



INTRODUCTION

The following Well Closure Plan (Plan) has been developed to support the long term groundwater monitoring proposed in the April 2014 Part B Permit for the hazardous waste open burning area (HWOBA) at the Kilgore Flares, LLC (Kilgore) facility in Toone, Tennessee. The facility is regulated under the Resource Conservation and Recovery Act (RCRA), and a RCRA Facility Investigation (RFI) has been completed for the Solid Waste Management Units present on the facility. Information and data from the RFIs has been used to develop a Groundwater Detection and Compliance Monitoring Plan (Groundwater Monitoring Plan) for long term groundwater monitoring required as part of the monitoring of open burning operations at the HWOBA. The details of the Groundwater Monitoring Plan have been presented in the proposed 2014 Part B Permit Application (Revision 8, April 2014) made to the Tennessee Department of Environment and Conservation (TDEC). The objective of the Groundwater Monitoring Plan is to establish baseline groundwater conditions and monitor for potential future significant releases associated with treatment operations that cross a groundwater compliance point at the regulated HWOBA. The Groundwater Monitoring Plan follows a detection and compliance monitoring program as specified under 40 CFR 264.91 and 270.14(c), and THWMR 0400-12-.07(c). As part of this Groundwater Monitoring Plan, four existing monitoring wells will form the downgradient point of compliance and two new wells will be installed to establish an upgradient background monitoring area, as specified in 40 CFR 264.97 and THWMR 0400-12-01-.06(f) and (h).

Pursuant to 40 CFR 264.97 (c) and 40 CFR 264.118, this Plan is one element in the maintenance and operation of an effective groundwater monitoring system during the active operation and management of the HWOBA and during the post-closure care period. Well closure(s) may be required during the operational period of the HWOBA if a regular well inspection indicates the well is damaged to the extent where it cannot be repaired or rehabilitated. Well closure will also follow at the end of post-closure care where the monitoring wells are no longer needed for groundwater monitoring activities.

WELL CLOSURE

Well closure activities proposed here will adhere to the closure standards, methods and procedures promulgated under Rules of TDEC Division of Water Supply *Water Well Licensing and Well Chapter 1200-4-9 Construction Standards (Rule 1200-4-9-.16)*. Supplemental guidance and information has been obtained from *Design and Installation of Monitoring Wells. SESDGUID-101-R0*. (U.S. Environmental Protection Agency, 2008), and *Handbook of*



Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells (U.S. Environmental Protection Agency, 1991).

The well closures will be completed by a licensed Tennessee well driller and will be done under the guidance of Kilgore personnel or their designated representatives. Prior to doing the actual well closure, the following steps will be taken:

- All sampling equipment, if present, will be removed from the well.
- The entire depth of the well will be checked for any obstructions that may interfere with sealing the well.
- Any obstructions found will be removed.
- The well will be thoroughly chlorinated using sufficient quantities of liquid bleach or dry hypochlorite granules (concentration of 25 parts per million of free chlorine residual).

Once the initial steps have been completed the well will be completely grouted and filled from the bottom of the well to the ground surface using a tremie pipe.

The grout will extend from the bottom of the well to a depth of 2-feet below the surface. The remaining 2-feet to surface will be filled with concrete to form a concrete cap at the ground surface. The concrete cap will be marked with a pipe or piece of steel set in the concrete. This will serve to mark the well and can aid in any future attempts to find the well location. Once the well borehole has been filled and topped, the well pad and manhole with cover will be removed and disposed of properly.

The grout material used to fill the well may consist of a cement grout, a high solids bentonite grout, or bentonite chips. The cement grout will be a mixture consisting of cement or quick setting cement in a ratio of not over six gallons of water per one 94-pound sack of Portland Class A cement. The high solids bentonite grout must contain a minimum of 20% solids, have a weight of no less than 9.2 pounds per gallon as measured by a standard mud balance, and be mixed according to the manufacturer's directions. If bentonite solids are used, they must be in chip or tablet form, ranging in size from ¼-inch to ¾-inch of an inch, and carefully hydrated during placement.



Once the well abandonment is complete, the required reporting documents will be submitted to TDEC by the driller.

REFERENCES

- U.S. Environmental Protection Agency Region 4. (2008). *Design and Installation of Monitoring Wells. SESDGUID-101-R0*. February 13, 2008. Advanced Monitoring Systems Division Environmental Monitoring Systems Laboratory; Las Vegas, Nevada 89193-3478.
- U.S. Environmental Protection Agency. (1991). *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells*. EPA160014-891034. March 1991 Environmental Monitoring Systems Laboratory Office of Research and Development, U.S. Environmental Protection Agency. Las Vegas, Nevada 89193-3478.

SECTION D PROCESS UNITS

The information provided in this section is submitted in accordance with requirements of 40 CFR 270.23, 270.32, 264.601, and 265.382 for miscellaneous units, and THWMR 0400-12-01-.07(5).

D-1 REQUIRED CONDITIONS PRIOR TO TREATMENT IN A UNIT

D-1(a) Facility Description

Kilgore has manufactured pyrotechnic devices since 1962. Kilgore's main production plant generates waste pyrotechnics including scrap composition from upset conditions in the mixing/drying process, grains that do not pass quality control standards, and rags and miscellaneous materials from clean-up operations. These wastes are considered RCRA hazardous waste primarily due to their ignitable (D001) and reactive (D003) characteristics. Some hazardous wastes generated from the manufacturing process and clean-up operations also meet the definition of a toxicity characteristic waste for barium (D005), chromium (D007), and lead (D008), or contain acetone that meets the definition of the listed hazardous waste F003. Section C details descriptions of the physical and chemical characteristics of the pyrotechnic wastes treated at the HWOBA. The waste streams are also discussed in Section D-2.

Open burning treatment operations are conducted at the HWOBA, approximately 1.5 miles southwest of Kilgore's main production plant. The HWOBA is within an approximately 240-acre TTF bound to the north and west by an area of residential/agricultural use, to the northeast by Toone, to the south by an agricultural area, and to the east by Pugh Creek and agricultural land. The HWOBA is an irregularly shaped, 5-acre parcel defined by the existing HWOBA fence and encompassing burn pans.

Hazardous waste is accompanied by a manifest and transported to the HWOBA by truck (from the main production plant through Toone) on the day of treatment operation. The Environmental Manager and trained hazardous waste technicians have primary authority for conducting all treatment activities at Kilgore's HWOBA.

D-1(b) Allowable Quantity of Waste per Unit per Treatment Event

The HWOBA is designed to open burn pyrotechnic waste. The only treatment structures at the HWOBA are burn pans.

By nature, when energetic compounds are burned, releases occur that can impact the surrounding area via air, water, and soil pathways. The primary pathway of concern is from the burn pan to air. From the air, combustion products may be transported to potential receptors, or they may be deposited onto soil. If combustion products are deposited onto soil, they may migrate to groundwater or surface water.

Additional facility process information is provided in Section B-1(c).

D-1(c) Operating Time Frame

Waste is loaded into burn pans by Kilgore personnel and then treated. The burn pans may contain waste for as long as 30 to 45 minutes with Kilgore personnel present within the HWOBA. That delay before initiating the burn is to allow personnel working in the area to move to a safe distance or inside any necessary enclosure, to determine whether the area is clear, and to ensure proper weather conditions for treatment. The waste is under direct observation at all times. Open burning in pans is relatively quick, with burns of up to 3,300 pounds of pyrotechnic wastes taking less than 30 minutes to complete.

After open burning is completed, the pans cannot be reused for a minimum of 72 hours; at the end of such time, the pans must be misted with water, cleaned of any residues, and inspected. If a misfire occurs, treatment personnel cannot return to the burn pan until the next working day's treatment activities for safety reasons. Therefore, during a misfire, waste may remain in the burn pans for up to 72 hours (if the misfire occurs on a Friday and open burning is not conducted again until the following Monday).

D-1(d) Meteorological Conditions

Due to the inherent nature of the HWOBA, Kilgore has set meteorological guidelines for its operations, which are stated in Kilgore's WIs and referenced in its Title V Air Operating Permit. Except for an emergency necessitating immediate open burning, which requires next-day notification to TDEC, the HWOBA will not be operated under any of the following meteorological conditions:

- Wind speed in excess of 20 miles per hour (mph).
- When precipitation does not allow for combustion.
- When ambient conditions do not promote good dispersion.
- Times other than between 9:00 a.m. and 2:00 p.m.

- Any day declared to be an Air Pollution Emergency Episode by TDEC's Division of Air Pollution Control (DAPC).

The meteorological conditions (ambient air monitoring, wind direction, speed, cloud cover, and precipitation requirements) under which thermal treatment conducted in the HWOBA is permitted or prohibited are outlined below.

D-1(d)(1) Open Burning Weather Requirements

Open burning weather requirements are as follows.

1. When an electrical storm is approaching, all personnel shall evacuate to the HWOBA entrance (north gate).
2. If an unfavorable change in meteorological conditions (electrical storms approaching, etc.), occurs during the day and a charge has already been prepared, the Environmental Manager or hazardous waste technicians will postpone the burn.
3. Open burning activities will not be conducted during any of the following adverse meteorological conditions:
 - (a) Precipitation or forecasted high probability of precipitation for the duration of operations.
 - (b) When surface wind speed is more than 20 mph.
 - (c) Electrical storms or thunderstorms.
 - (d) Dense fog, blowing snow/sand, dust storms, or other situations that restrict visibility to 1,000 feet.
 - (e) Extremely cloudy days, defined as overcast (more than 80 percent cloud over) with a ceiling less than 2,000 feet.
 - (f) During an inversion (air temperature increase with increasing altitude).

4. Provided weather conditions are suitable, the Environmental Manager directs the preparation of energetics for burning. After drums of waste energetics have been prepared, hazardous waste technicians again obtain the above weather data and telephone the necessary information to the Environmental Manager. If, at that time, weather conditions exceed limits set above, burning will be postponed until weather conditions stabilize.
5. Meteorological data statistics and OB Form AMC 2886-R-E-December 94 are maintained daily and include all required information obtained from the previously mentioned sources. Any required information that is not obtainable from the Kilgore facilities will be obtained from the nearest U.S. Weather Station. The statistics are maintained in the Environmental Manager's files.

D-1(d)(2) Air Monitoring Requirements

As part of Kilgore's Part B Permit Application, modeling was conducted to compare the emissions from open burning operations with the National Ambient Air Quality Standards (NAAQS) and the Tennessee State Ambient Air Quality Standards (AAQS). The modeling was completed in accordance with U.S. EPA's *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) and general modeling guidance from TDEC. The U.S. EPA air dispersion model AERMOD (version 12345) was used for this analysis since it is the preferred model listed in U.S. EPA's *Guideline on Air Quality Models*. AERMOD handles simple, intermediate, and complex terrain seamlessly. The model also includes cavity impact evaluations and is programmed specifically to calculate currently applicable newer NAAQS. The AERMOD results found that the emissions generated from open burning are in compliance with NAAQS and AAQS.

Additionally, air dispersion and deposition modeling were completed using the U.S. EPA Open Burn and Open Detonation Dispersion Model. The modeling was completed to determine if any adverse impacts to air quality or environmental and human receptors would exist. Results of the dispersion modeling analysis and the risk assessment are submitted under separate cover.

D-1(e) Noise Consideration

Environmental noise is not a consideration at the HWOBA because very little noise is produced during open burning operations.

D-1(f) Distance of the HWOBA from Offsite Inhabited Buildings

An Offsite Receptor Report was prepared to identify public and environmental receptors within a 5-mile radius of the HWOBA. Of the estimated 3,657-person population within this radius, two public receptors were identified: a daycare center and a school. Toone Elementary School was mapped 1.25 miles northeast of the HWOBA. The daycare center was mapped 5 miles south of the HWOBA. All public receptor sites were mapped at elevations higher than the HWOBA. An area reconnaissance confirmed public receptors identified in the report. A copy of the Offsite Receptor Report is in Appendix B-4 (Section B of this Part B Permit Application).

D-1(g) Wind Direction

Section B discussed wind direction and presented wind rose diagrams (Figure B-5 and B-6) showing meteorological data obtained from weather stations 13893 in Memphis, Tennessee, and 3816 in Paducah, Kentucky. The wind rose for Memphis was included because it is the nearest weather station to the HWOBA that maintains long-term climatic records. The Paducah wind rose was included because it was used in the air dispersion modeling completed to support this Part B Permit Application.

D-1(h) Manner of Placing the Waste in the HWOBUs Burn Pans

Hazardous waste pyrotechnics are accumulated at Kilgore's main production plant in 30-gallon steel drums lined with a conductive bag in accordance with WI EMS-333G (Appendix F-2 in Section F of this Part B Permit Application). Waste material, once generated and collected, is immediately moved to one of the HWAAAs within the main production plant. Upon arrival at the HWAAAs, Kilgore personnel ensure sufficient diesel fuel is present in the accumulation container to submerge the scrap material. The material is submerged in diesel fuel contained in conductive bags. Kilgore personnel visually inspect the container to ensure that adding scrap material will not fill the drum more than halfway. If there is insufficient diesel fuel, Kilgore personnel will contact one of the designated hazardous waste technicians. Secondary containment for these bags is provided by the containers.

Extreme care is taken to ensure that no pyrotechnics fall in the area surrounding the container, or remain on the outside or lid of the container. Any spill must be immediately cleaned and the spill area decontaminated according with WI EMS-352 (Appendix 2 in Section G). Before leaving the HWAA, the lid will be placed on the container (but not fastened for safety reasons) to prevent rainwater from mixing with the scrap material.

D-1(h)(1) Scrap Material Collection Procedure at the Main Production Plant

- The hazardous waste technicians will ensure the lids to the waste containers are not sealed. Sealed lids could cause an accidental ignition of materials and the scrap material submerged in diesel fuel, thereby causing an explosion instead of merely accidental burning.
- If the container is more than two-thirds full, the overfill material will be transferred to another container. The hazardous waste technicians will check the accumulation area and containers for spilled material.
- If spilled or contaminated material is found, a supervisor will be promptly notified and the area where the spill or contamination is present will be promptly decontaminated.
- Materials used to decontaminate the area will be handled and disposed along with the generated wastes.
- The hazardous waste technicians will load the drums containing hazardous waste onto the scrap transport trailer. The trailer will be placed at the edge of the scrap accumulation area to minimize the distance required to load the trailer. A dedicated hazardous waste pyrotechnic trailer will be used for each waste stream.
- After the containers are loaded onto the scrap trailer, the lids will be placed (but not fastened) on each container.
- The trailer door will be closed before transport.
- The scrap materials will then be transported to the HWOBA using the route shown on Figure B-8 (in Section B of this Part B Permit Application). The scrap collection procedures discussed above will always be conducted by trained hazardous waste technicians. The employees will use the proper safety equipment (described in Section F of this Part B Permit Application) and follow approved WIs. All communication equipment will be checked before arrival onsite.
- Based on the amount of each waste type that needs to be burned, the Environmental Manager and the hazardous waste technicians will determine on a daily basis which pans will be used and which wastes will be treated. According to Kilgore WIs, the

existing interim status HWOBUs are cleaned out before another burn occurs in the same pan.

D-1(h)(2) Ignition and Treatment of Scrap Pyrotechnic Material

- Upon arrival at the HWOBA, the hazardous waste technicians will unlock the entrance gates.
- The scrap trailer will be positioned at the specified HWOBU to minimize the material handling distance during unloading. The trailer wheels will be chocked and/or truck parking brake engaged to prevent inadvertent movement of the trailer.
- Before loading the burn pans, the selected treatment areas will be carefully inspected in accordance with WI EMS-334E (Appendix F-2 in Section F) to ensure that no evidence of heat exists from a previous treatment cycle that might cause premature ignition of the hazardous waste pyrotechnic.
- The conductive bags will be removed from the drums and placed in the burn pan.
- The trailer will be moved at least 50 feet from the loaded burn pan.
- The conductive bags will be cut open and the waste distributed across the burn pan.
- After all the hazardous waste is staged in the pan, it is prepared for ignition (by use of newspaper and 4- to 5-minute fuse). The newspaper will be placed into the staged pan and the fuse secured in place around the newspaper.
- The fuse will be lit and the hazardous waste technicians will move to the observation area, approximately 200 feet northwest of the HWOBA, to observe the reaction portion of the treatment cycle.
- The reaction portion of the treatment cycle will be observed for at least 30 minutes, or until there is no visible reaction.

The treatment of hazardous waste in a burn pan is a 72-hour cycle (30 minutes for the reaction and 72 hours for the observation period following treatment). If a misfire occurs, treatment personnel cannot return to the burn pan until the next working day's treatment activities for safety reasons.

Therefore, during a misfire, waste may remain in the burn pans for up to 72 hours (if the misfire occurs on a Friday and open burning is not conducted again until the following Monday).

The burn pans are checked on the next work day following open burning to ensure that all of the waste has been completely treated. If untreated remains, additional diesel fuel is applied for stabilization, and the arming and ignition procedures are repeated on the remaining untreated waste.

Ash generated from open burning is placed in containers and disposed as detailed in the following section.

D-1(h)(3) Disposition of Residual Waste Ash

After the 72-hour treatment cycle is complete, ash and residues from the treatment process are removed from the burn pans using non-sparking conductive shovels and rakes, and placed in containers to be disposed of offsite. After the drums are full, they are closed and transported to the Bolivar-Hardeman County landfill, according to the TDEC Special Waste Agreement included in Appendix C-3 (Section C of this Part B Permit Application).

D-2 MISCELLANEOUS UNIT WASTES

D-2(a) Pyrotechnic Waste

All chemical compositions of the pyrotechnics have been ascertained from process knowledge (i.e., the physical and chemical characteristics of the components used to manufacture products, as detailed in Section C-1) because of the potential safety hazards associated with sampling the material. The pyrotechnics are considered ignitable (D001) under 40 CFR 261.21(a)(2) and THWMR 0400-12-01-.02(3)(b)(1)(ii), and reactive (D003) according to 40 CFR 261.23(a)(1), (2), (6), and (7), and THWMR 0400-12-01.02(3)(d)(1)(i), (ii), (vi), and (vii). The ignitability/reactivity of wastes handled under diesel fuel has been established through testing in accordance with U.S. DOT test procedures for ignitable and reactive materials, as referenced in Section C.

The dispersion modeling analysis and risk assessment report, submitted under separate cover, discusses the thermodynamic prediction of raw materials, by-products, and products of combustion of these waste types treated by open burning. The information contained in that report addresses the prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air, considering the volume and physical and chemical characteristics of the waste including its potential for the emission and dispersal of

gases, aerosols, and particulates, as required by 40 CFR 264.601(c)(1) and 270.23(c), and THWMR 0400-12-01-.06(b)(3)(i) and 0400-12-01-.07(b)(9)(iii).

D-2(b) Waste Pyrotechnic Ash

Initial characterization of the ash and residue, performed in accordance with 40 CFR 261 and THWMR 0400-12-01-.02, has indicated that magnesium ash and residue do not meet the definition of hazardous waste. The magnesium waste has been routinely analyzed for the following parameters: TCLP RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) and phenols, and toluene, chloride, density, flash/ignitability, potassium, ammonia, nitrogen (nitrite), nitrogen (nitrate), pH, phenols (solids), phosphorus, cyanide (reactive), sulfide (reactive), water solubility, and TOC. Those parameters were chosen based on generator knowledge of underlying constituents of the original waste streams, past materials used, and requirements of the TDEC DSWM. See Table C-2 (Section C of this Part B Permit Application) for the rationale for all parameters used to characterize the ash.

D-2(c) Containment Device Description

Details of the proposed HWOBUs and the existing, interim status HWOBUs are provided in Sections D-10 and D-11, respectively.

D-3 OPEN BURNING ON THE GROUND SURFACE WHERE HWOBU INCORPORATES THE SOIL AS PART OF THE UNIT

Kilgore does not conduct open burning on the ground surface; therefore, this section is not applicable.

D-4 GEOLOGIC REPOSITORIES

Kilgore does not have a geologic repository; therefore, this section is not applicable.

D-5 DEACTIVATED MISSILE SILOS

Kilgore does not have deactivated missile silos; therefore, this section is not applicable.

D-6 CERTAIN THERMAL TREATMENT UNITS OTHER THAN INCINERATORS

Kilgore does not have any of the thermal treatment units listed in 56 FR 720002; therefore, this section is not applicable.

D-7 CERTAIN CHEMICAL, PHYSICAL, AND BIOLOGICAL TREATMENT UNITS

Kilgore does not have chemical, physical, or biological treatment units; therefore, this section is not applicable.

D-8 TREATMENT OF BUILDINGS WITH EXPLOSIVES CONTAMINATION

Kilgore does not treat buildings with explosive contamination; therefore, this section is not applicable.

D-9 TREATMENT OF WASTE IN AN ENCLOSED CONTAINMENT

Kilgore does not treat waste in an enclosed containment; therefore, this section is not applicable.

D-10 DETAILS REGARDING THE PROPOSED HWOBUS

The purpose of the proposed HWOBA design (see Sheets C-5.0 and C-6.0 in Appendix D-1) is to eliminate the potential for soil and water contamination by developing a HWOBU, which provides a barrier between the burn pan and the underlying soil and which facilitates collection and treatment of any precipitation that may contact ash or residual material. The proposed HWOBUs were designed by professional engineers in conjunction with Kilgore personnel to address Kilgore's specific open burning needs at the HWOBA. The upgrades discussed in the following section, including construction of the HOWBU burn pans and concrete pads, will be conducted upon issuance of the Final Permit.

Upon issuance of the Final Part B Permit by TDEC, Kilgore will implement improvements at the HWOBA by upgrading the existing, interim status HWOBUs to the proposed HWOBUs. The HWOBA will have 10 HWOBUs capable of treating a maximum capacity of 3,300 pounds of pyrotechnic waste per burn. No more than 3,300 pounds of waste pyrotechnics may be treated per day, not to exceed 16,500 pounds per week, and 858,000 pounds per year.

D-10(a) Physical Characteristics, Construction Materials, and Dimensions of the Proposed HWOBUs

The dimensions of the proposed HWOBU burn pans to be used upon issuance of the Final Part B Permit are 10 feet long by 10 feet wide by 2 feet high. These dimensions were designed based on past experience with open burn pans, Kilgore's intent to burn 3,300 pounds of waste pyrotechnics at a time, and to facilitate filling and cleaning the burn pans.

The burn pans are capable of withstanding extreme temperatures and are designed to contain the waste pyrotechnics and residual ash. This design will incorporate a 2-inch outer diameter carbon steel capped discharge pipe. The cap will also be constructed of carbon steel and will have a 2-inch inner diameter. The discharge pipe will remain capped at all times.

The bottom of each pan will be constructed of 0.5-inch boiler plate carbon steel. Each of the four sides will be constructed of 0.25-inch boiler plate carbon steel. Carbon steel was chosen because it is inexpensive, readily available, and of sufficient thickness to support burning, based on Kilgore's past experience. The burn pans will be unlined due to the lack of readily available materials that can withstand 5,000-degree-Fahrenheit temperatures generated during open burning. The bottom of each pan is supported by series of parallel 0.25-inch carbon steel tubes, which also serve as fork lift guides for relocating the pans.

D-10(b) Engineering Drawings of the Fabricated Devices

Plan and cross-sectional views of a proposed HWOBU burn pan are provided on Sheet C-6.0 in Appendix D-1. Engineering drawings showing the locations, dimensions, and design plans and specifications of the proposed HWOBUs are provided in Appendix D-1.

D-10(c) Leak Detection Provisions

As outlined in WI EMS-332E (Appendix F-2 in Section F), before loading a pan for a burn, the trained operator inspects the integrity of the pan to ensure no munitions or donor charge will escape the pan during open burning. Aside from the diesel fuel that is used to stabilize the material during transport, no liquid wastes are treated in the burn pans and treatment is not conducted during periods of precipitation.

D-10(d) Control of Releases of Ashes and Residue during Open Burning

Because of the high temperatures (5,000 degrees Fahrenheit) generated during open burning, no covers or other equipment can be used to minimize effects of wind dispersion of residues or to prevent precipitation from contacting residual material during or within 72 hours following open burning.

After burning, approximately 1.5 inches or less of ash will remain in the pan and, after 72 hours (an established Kilgore safety procedure); the ash will be containerized for disposal. These basic procedures were designed to limit the effects of wind dispersion and precipitation accumulation.

For ash or residue that is released from the burn pan during open burning or because of forceful winds or precipitation, the construction of the concrete pad will facilitate capturing fallen residue and minimize residue run-off from contacting the ground.

D-10(e) Methods to Control Deterioration of Fabricated Burn Pans

This section addresses the concern that ash, residue, or wastes may be released from the containment device in the event the device develops leaks, breaks, or cracks. The environmental contamination that could potentially result from such a loss of integrity of the containment device is minimized in the following ways.

First, each containment device is situated aboveground over concrete pads, which allows for visual inspection of leaks and/or structural problems including broken seams or joints.

Second, all burn pans are thoroughly inspected before each use for structural damage, cleanliness, and structural support. If the inspection determines that a burn pan is damaged and not suitable for use, it will not be used until the recognized deficiency is either repaired or is replaced with a new pan.

D-10(e)(1) Preliminary Containment Design

The first step of the design was to determine what area to contain. Based on the original layout, the types of materials burned, and the resulting wastes, 10 separate containment pads are needed. Based on the amount of each waste type that needs to be burned, the Environmental Manager and the hazardous waste technicians will determine on a daily basis which pans will be used and which wastes will be treated. According to Kilgore WIs, the burn pans will be cleaned out before another burn occurs in the same pan.

A fork lift will be used to place each new burn pan within its respective containment pad; however, all scrap pyrotechnic material for treatment will continue to be loaded into the burn pans manually by the hazardous waste technicians. The containment areas must be large enough to maneuver the burn pans within them using the fork lift and also to contain any residual material (i.e., fallout) that might escape during and in the 72 hours following open burning. Based on these criteria, and measurements Kilgore made of areas of fallout around the existing burn pans, the containment areas must be at least 18 feet wide. The lengths of the areas will be approximately 30 feet long to account for construction of the access ramp into each unit (see Sheet C-5.0 in Appendix D-1).

The height of the concrete curbing was selected to provide adequate freeboard for containment of a “worst case” release of 3,300 pounds of energetic waste and diesel fuel from a burn pan and precipitation from a 25-year/24-hour rainfall event (7.25 inches). However, waste is not typically treated if a rain event is forecast; therefore, it is unlikely that untreated waste pyrotechnic and diesel fuel would be in a burn pan during a significant rain event.

Each HWOBUs will include a concrete pad surrounded by concrete curbing on three sides, with an access ramp on the fourth side. All concrete will have a minimum 28-day strength of 4,000 pounds per square inch. The containment pad will be 12-inch-thick reinforced concrete and the curbing will be 6-inch-thick reinforced concrete with a footing around the entire perimeter. The curb and access ramp will be 15 inches above the slab to provide containment. The access ramp (15 inches high) will consist of CR610 limestone at a 12:1 slope on the outside of the containment pad and concrete at a 9.6:1 slope on the inside of the containment pad. The concrete area, curb, and ramp will be placed in a monolithic pour. To control cracking, there will be one sawed joint along the short axis of the ramp and another sawed joint at the base of the ramp on the inside of the containment. Joints will be sealed with a compound resistant to permeation of petroleum compounds and as resistant to heat as reasonably possible. The soil subgrade under the containment pad and a minimum of 12 feet beyond it in all directions will be compacted 95% modified Proctor. A 6-inch compacted base of #57 stone overlain with a 6-millimeter thick polyethylene vapor barrier base will be installed under each concrete pad and footings (see Sheet C-5.0 in Appendix D-1).

Each HWOBUs concrete containment will have a gate valve installed as part of the curbing; with the floor of the containment slightly sloped to direct collected precipitation towards the gate valve. The gate valve will be maintained in a “closed” position and locked to prevent unauthorized discharge of collected precipitation onto the ground.

D-10(e)(2) New HWOBUs Construction Sequencing

D-10(e)(2)(i) HWOBUs 6-10

Construction of the proposed HWOBUs will be conducted in a two-phased approach to accommodate construction of the new HWOBUs while allowing for the continuation of OB activities during construction. The first phase of construction will address the southern half of the HWOBAs (that is, the portion containing existing, interim status HWOBUs 16-21) (see Figure D-1 in Appendix D-2).

Following partial closure of existing, interim status HWOBUs 16-21, the southern half of the HWOBA will be graded and construction of HWOBUs 6-10 will begin in accordance with the plans and specifications provided in Appendix D-1. Details regarding partial closure of the existing, interim status HWOBUs are provided in Section I-1(a). Once grading on the southern half is complete, TDEC will be notified once construction of HWOBUs 6-10 is complete so a TDEC construction inspection can be performed prior to HWOBUs 6-10 being used for OB activities.

The proposed schedule for partial closure of existing, interim status HWOBUs 16-21 and construction of HWOBUs 6-10 is provided in Appendix D-3. The provided construction schedule is presented as the proposed duration and not with an actual start date; since partial closure of the existing, interim status HWOBUs and construction of the new HWOBUs is dependent on the date of approval of the permit.

D-10(e)(2)(i) HWOBUs 1-5

Once HWOBUs 6-10 are approved for OB use, the second phase of construction will address the northern half of the HWOBA (that is, the portion containing existing interim status HWOBUs 1-15) (see Figure D-1 in Appendix D-2). Following partial closure of existing, interim status HWOBUs 1-15, the northern half of the HWOBA will be graded construction of HWOBUs 1-5 will begin in accordance with the plans and specifications provided in Appendix D-1. Details regarding partial closure of the existing, interim status HWOBUs are provided in Section I-1(a). TDEC will be notified once construction of HWOBUs 1-5 is complete so a TDEC construction inspection can be performed prior to HWOBUs 1-5 being used for OB activities.

The proposed schedule for partial closure of existing, interim status HWOBUs 1-15 and construction of HWOBUs 1-5 is provided in Appendix D-3. The provided construction schedule is presented as the proposed duration and not with an actual start date; since partial closure of the existing, interim status HWOBUs and construction of the new HWOBUs is dependent on the date of approval of the permit.

D-10(f) Management of Precipitation Accumulated Inside an HWOBU

D-10(f)(1) Management of Precipitation on HWOBU Concrete Containment Pads

Precipitation collected inside of a HWOBU curbed containment pad, but outside of an HWOBU burn pan, will be managed in accordance with the hazardous waste determination procedure and compliance-sampling plan provided in Section C-3 of this permit application.

All discharges from a concrete containment pad must be documented on the Secondary Containment Drainage Log in Appendix D-4.

D-10(f)(2) Management of Precipitation Inside of HWOBUs Burn Pans

Once all precipitation collected on a HWOBUs concrete containment pad, but outside of a HWOBUs burn pan, has been managed, precipitation inside of a HWOBUs burn pan will be managed as follows.

1. The steel cap on the 2-inch discharge pipe at the pan will be removed and a felt, polyester, 25-micron bag filter placed around the discharge pipe outside of the pan.
2. Free liquids will be allowed to drain out of the pan, through the filter, and onto the concrete containment pad; with the slope of the concrete pad directing the liquids towards the gate valve.
3. Once all of the free liquids have been drained from the pan, the bag filter (and any captured waste pyrotechnics) will be placed inside of the pan for incineration during the next treatment event.
4. Free liquids discharged onto the concrete containment pad will be removed by the hazardous waste technicians, containerized, and transported offsite for disposal.

D-10(g) Controls to Prevent Wind Dispersion of Ash and Other Residues

Burns are not conducted during inclement weather conditions, such as high winds, which reduces the potential for spread of ash and residues (see Section D-1(d) for description of inclement weather conditions). The burn pans are in a depression with slight rises to the south and west, which also reduces the impact of prevailing winds.

D-10(h) Inspection, Monitoring, and Maintenance Plan

All equipment at the HWOBAs is inspected before and after each use. Visual assessments shall be made of the HWOBUs on a daily basis, in accordance with WI EMS-332E, Inspection of Hazardous Waste Open Burn (OB) Unit (Appendix F-2 of Section F). All observations made requiring repair will be reported immediately to the Environmental Manager or designee. The procedures for remediating problems (beyond minor repairs) associated with the deterioration or

malfunction of the HWOBA and associated equipment and structures identified during an inspection are as follows.

- A Maintenance Work Order Request Form (pre-printed form in Appendix F-4 of Section F) is completed which identifies the location of the problem, work/problem description, type of request (i.e., emergency, safety, routine, project specific), parts/materials required, date ordered, and estimated costs.
- A copy of this form is retained by the Environmental Manager or designee, and the original and second copies are forwarded to Kilgore's Maintenance Department.
- Appropriate main facility personnel or hazardous waste technicians make the necessary repairs and modifications, depending on the actual problem.

As directed by TDEC, replacement in kind of a HWOBU burn pan or concrete pad will not constitute partial (or final) closure of the HWOBU. TDEC DSWM (both the Nashville Central Office and the Jackson Environmental Field Office) will be notified via email or letter (or both) at least five days prior to replacement should replacement of a pan or pad be needed.

Prior to replacement, any ash/residue within the burn pan to be replaced will be swept clean, collected, and disposed of offsite as appropriate based on the existing TDEC Special Waste Agreement (Appendix C-1 in Section C).

Once the ash and residue are removed from each burn pan, the interior of each pan will be subjected to a triple wash/rinse. The initial cycle will involve washing using Liqui-Nox or similar surfactant and wet brushing. The second cycle will consist of a simple water-only wash. The final rinse will be conducted using sparing amounts of water, which will be collected and containerized separately. This rinsate will be analyzed, along with the source water (to establish background levels) for the identified COCs (metals, dioxins, furans, and RDX) to confirm that decontamination of the burn pans was successful. Following the guidance approach in Supplemental Guidance to RAGS: Region 4 Bulletins — Human Health Risk Assessment Bulletin No. 1: Data Collection and Evaluation (U.S. EPA, 1995), if the concentration of the identified COCs in the final rinsate is less than twice the concentration of the respective COCs in the source water (for metals, dioxins, and furans) or the laboratory PQLs (for RDX), decontamination will be considered successful. All wash and rinse water will be containerized for characterization,

transport, and disposal through a licensed disposal company (to be determined at the time of disposal) following sampling methods and parameters listed in the SAP in Section C.

If decontamination of the burn pan is successful, the burn pan will be disposed offsite as scrap metal. If decontamination of the burn pans is not successful, decontamination procedures (and sample collection) may be repeated as necessary to demonstrate successful decontamination or the burn pans may be disposed offsite as solid waste at the Bolivar-Hardeman County Landfill under a TDEC Special Waste Agreement.

Cracked or otherwise degraded concrete will be repaired immediately. If a concrete containment pad is to be replaced, the respective pad will be pressure-washed using clean potable water and Liqui-Nox detergent, followed by two potable water rinses. All wash and rinse water will be containerized for characterization, transport, and disposal through a licensed disposal company (to be determined at the time of replacement) following sampling methods and parameters listed in the Sampling and Analysis Plan in Section C of this Part B Permit Application. The concrete pads will be demolished and disposed offsite at an appropriately permitted facility.

D-11 DETAILS REGARDING THE EXISTING, INTERIM STATUS HWOBUS

D-11(a) Physical Characteristics, Construction Materials, and Dimensions of the Interim Status HWOBUS

Currently, the HWOBA operates 5 days a week, with only one burn per day. Open burning at the HWOBA is conducted in burn pans that are approximately 8 feet long by 4 feet wide by 2 feet high. These dimensions are based upon Kilgore's historical burning of 1,500 pounds of waste pyrotechnics at a time, and to facilitate filling and cleaning of the existing, interim status HWOBUS. Each existing interim status burn pan has a threaded, 2-inch outer diameter carbon steel discharge pipe that can be capped to prevent discharge of diesel fuel, munitions, or donor charge from the pan. The interim status HWOBUS are capable of withstanding the temperatures experienced during thermal treatment and are designed to contain the waste pyrotechnics and residual ash.

The bottom of each interim status pan is constructed of 0.5-inch boiler plate carbon steel. The four sides are constructed of 0.25-inch boiler plate carbon steel. Carbon steel was chosen because it is inexpensive, readily available, and of sufficient thickness to support burning, based on Kilgore's past experience. The interim status HWOBUS are unlined due to the lack of readily available materials that can withstand 5,000-degree-Fahrenheit temperatures generated during open burning. Each pan rests on two parallel 0.25-inch boilerplate carbon steel fork lift guides.

D-11(b) Engineering Drawings of the Fabricated Devices

Figure D-1 presents the location of the existing, interim status HWOBUs. See Figures D-2 through D-6 in Appendix D-2 for engineering drawings showing as-built details for the existing, interim status HWOBUs.

D-11(c) Leak Detection Provisions

As outlined in WI EMS-332D, before loading a pan for a burn, the trained operator inspects the integrity of the pan to ensure no munitions or donor charge will escape the pan during open burning. Aside from the diesel fuel that is used to stabilize the material during transport, no liquid wastes are treated in the burn pans and treatment is not conducted during periods of precipitation.

D-11(d) Control of Releases of Ashes and Residue during Open Burning

Because of the high temperatures (5,000 degrees Fahrenheit) generated during open burning, no covers or other equipment are used to minimize effects of wind dispersion of residues or to prevent precipitation from contacting residual material during or within 72 hours following open burning.

After burning, approximately 1.5 inches or less of ash typically remains in the pan and, after 72 hours (an established Kilgore safety procedure), the ash is containerized for disposal. These basic procedures were designed to limit the effects of wind dispersion and precipitation accumulation.

D-11(e) Methods to Control Deterioration of Fabricated Burn Pans

All existing, interim status HWOBUs are thoroughly inspected before each use for structural damage, cleanliness, and structural support. If the inspection determines that a burn pan is damaged and not suitable for use, it will not be used until the recognized deficiency is either repaired or is replaced with a new pan.

D-11(f) Management of Precipitation Accumulated Inside an Existing, Interim Status Burn Pan

Currently, any precipitation that is collected inside of an existing, interim status burn pan is removed at the same time, and in the same manner, as the residual ash. Collected precipitation is transferred into containers and disposed of at the Bolivar-Hardeman County landfill, according to the TDEC Special Waste Agreement included in Appendix C-3 (Section C of this Part B Permit Application).

D-11(g) Controls to Prevent Wind Dispersion of Ash and Other Residues

Burns are not conducted during inclement weather conditions, such as high winds, which reduces the potential for spread of ash and residues (see Section D-1(d) for description of inclement weather conditions). The burn pans are in a depression with slight rises to the south and west, which also reduces the impact of prevailing winds.

D-11(h) Inspection, Monitoring, and Maintenance Plan

All equipment at the HWOBA is inspected before and after each use. Visual assessments are made of the existing, interim status HWOBUs on a daily basis, in accordance with WI EMS-332D, Inspection of Hazardous Waste Open Burn (OB) Unit (Appendix F-2 of Section F). All observations made requiring repair will be reported immediately to the Environmental Manager or designee. The procedures for remediating problems (beyond minor repairs) associated with the deterioration or malfunction of the HWOBA and associated equipment and structures identified during an inspection are as follows.

- A Maintenance Work Order Request Form (pre-printed form in Appendix F-4 in Section F) is completed which identifies the location of the problem, work/problem description, type of request (i.e., emergency, safety, routine, project specific), parts/materials required, date ordered, and estimated costs.
- A copy of this form is retained by the Environmental Manager or designee, and the original and second copies are forwarded to Kilgore's Maintenance Department.
- Appropriate main facility personnel or hazardous waste technicians make the necessary repairs and modifications, depending on the actual problem.

As directed by TDEC, replacement in kind of an existing interim status burn pan does not constitute partial (or final) closure of the interim status unit. TDEC DSWM (both the Nashville Central Office and the Jackson Environmental Field Office) are notified via email or letter (or both) at least five days prior to replacement should replacement of a pan be needed.

Prior to replacement, any ash/residue within the burn pan to be replaced is swept clean, collected, and disposed of offsite as appropriate based on the existing TDEC Special Waste Agreement (Appendix C-1 in Section C). Following removal of the ash/residue, the burn pan is disposed offsite as solid waste at the Bolivar-Hardeman County Landfill under the TDEC Special Waste Agreement.

D-11(i) Partial Closure of Existing, Interim status HWOBUs

Partial closure of the existing, interim status HWOBUs will be conducted according to the schedule described in Section D-10(e)(2) and the procedures presented in Section I-1(a).

Appendix D-1
Construction Plans and Specifications

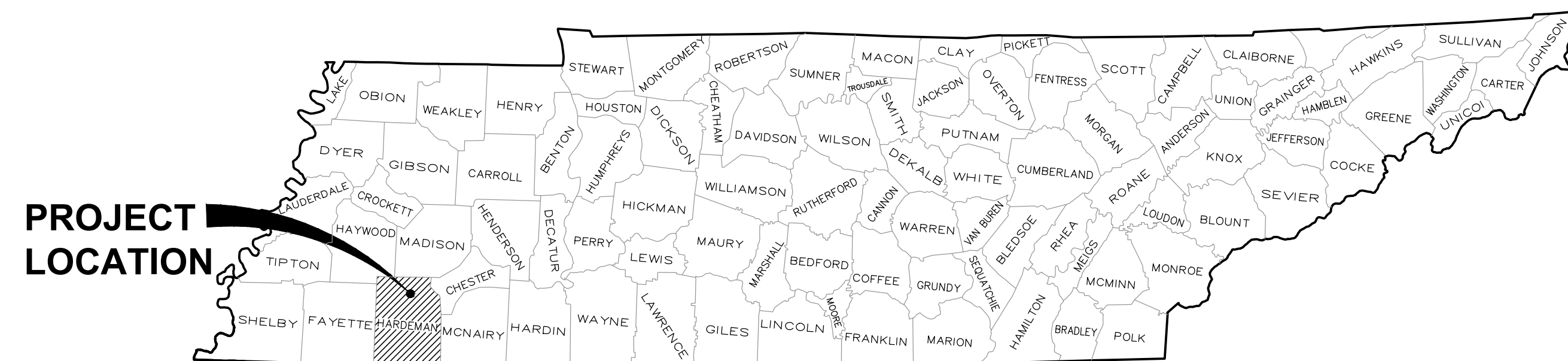
HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS

FOR

KILGORE FLARES COMPANY, LLC

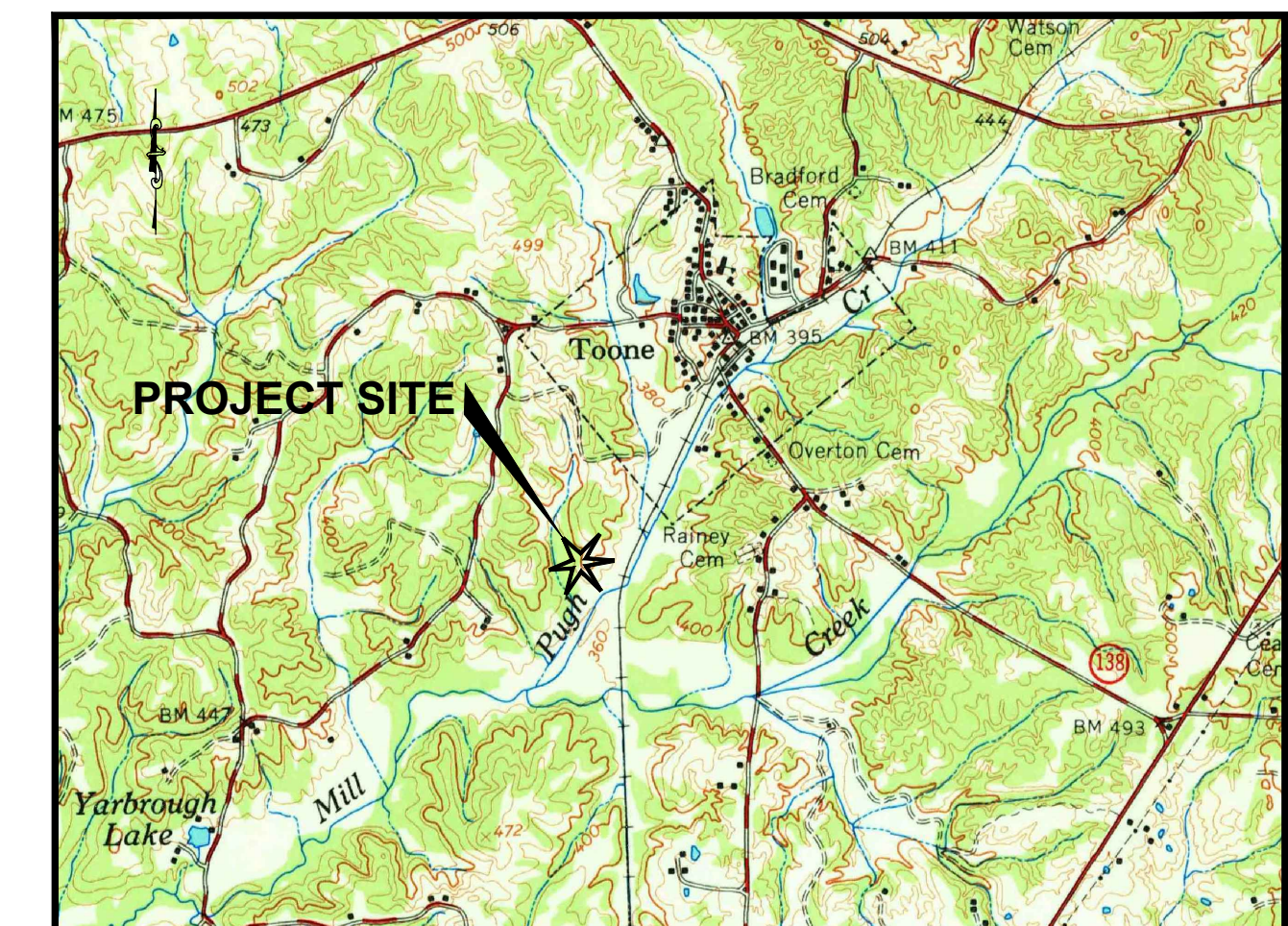
TOWN OF TOONE, HARDEMAN COUNTY, TENNESSEE

MAY 2015



PROJECT
LOCATION

TENNESSEE LOCATION MAP
NTS



SOURCE: U.S.G.S. 7.5 Minute Topo Quad of: Teague, TN 1969,
photo-revised 1971

AREA TOPOGRAPHICAL MAP
SCALE: 1" = 3000'

CLIENT: KILGORE FLARES COMPANY, LLC
155 KILGORE DRIVE
TOONE, TN 38381

ENGINEERING COMPANY: ENSAFE INC.
220 ATHENS WAY SUITE 410
NASHVILLE, TN 37228

ENGINEERING CONTACTS: GEOFF POPE, P.E.
(901)372-7962
BRIAN MARTIN, P.E.
(615)255-9300

SHEET INDEX

- C-0 COVER SHEET
- C-1.0 EXISTING CONDITIONS SITE PLAN
- C-2.0 SITE PLAN
- C-3.0 GRADING PLAN
- C-4.0 EROSION CONTROL PLAN
- C-5.0 CONCRETE BURN PAD DETAILS
- C-6.0 BURN PAN AND GENERAL DETAILS
- C-7.0 EROSION CONTROL DETAILS



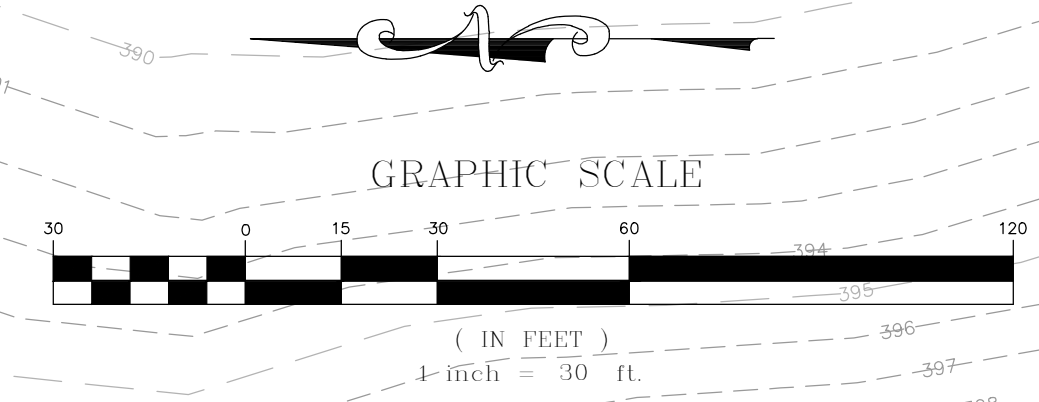
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SHEET NUMBER

DATE: MAY 12, 2015
JOB NO. 0888815139

C-0



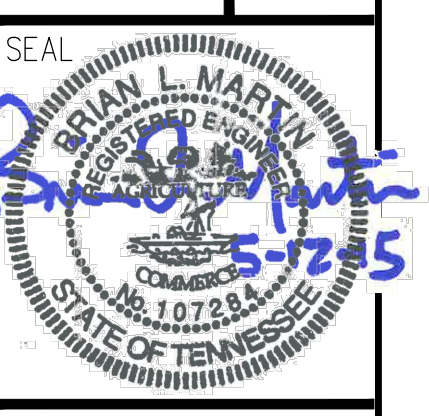
NO.	DATE	DESCRIPTION
1		

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HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS
 FOR
KILGORE FLARES COMPANY, LLC
 TOWN OF TOONE, HARDEMAN COUNTY, TENNESSEE
 FEBRUARY 2015



SHEET NAME
EXISTING CONDITIONS SITE PLAN

SHEET NUMBER
C-1.0

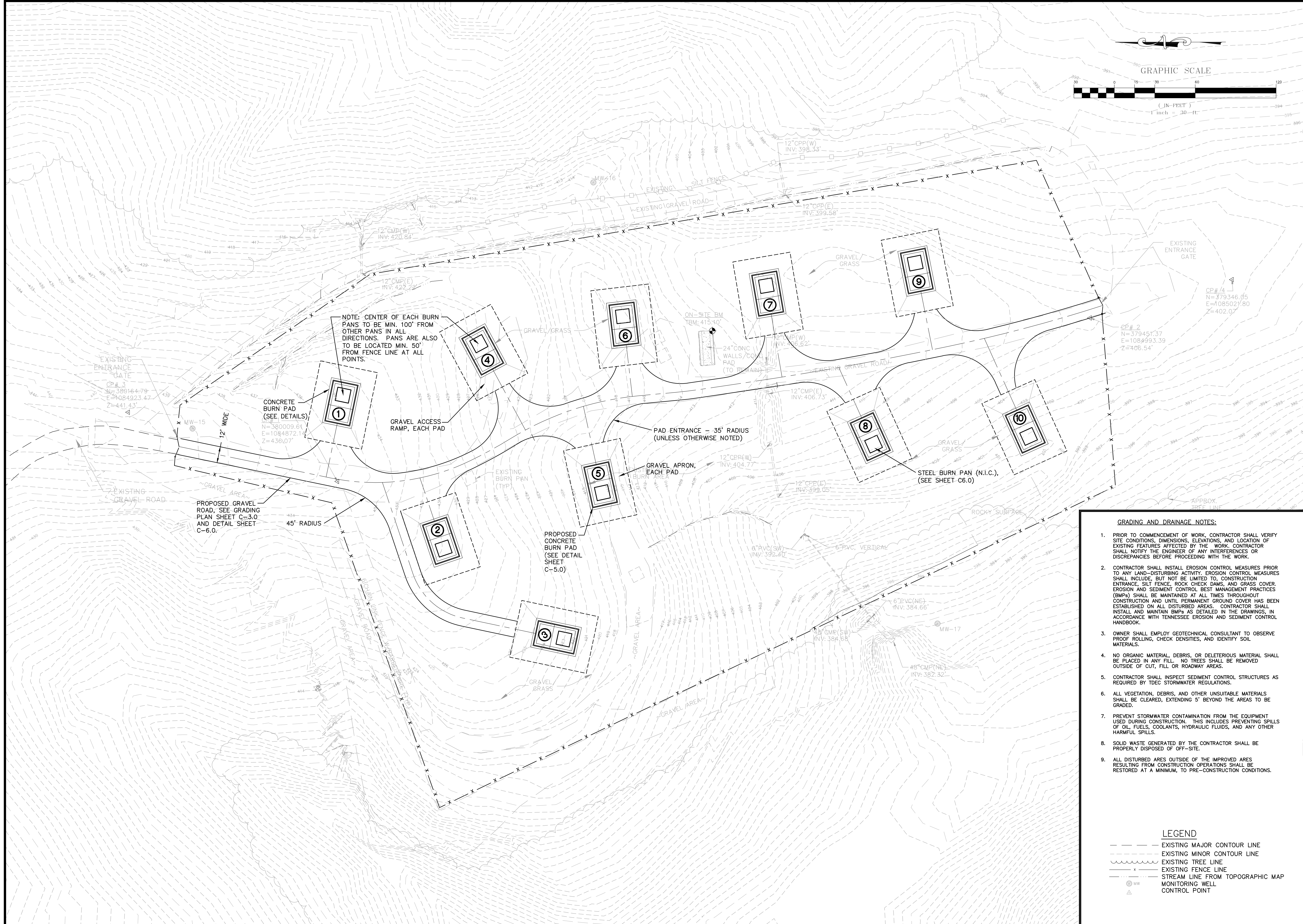
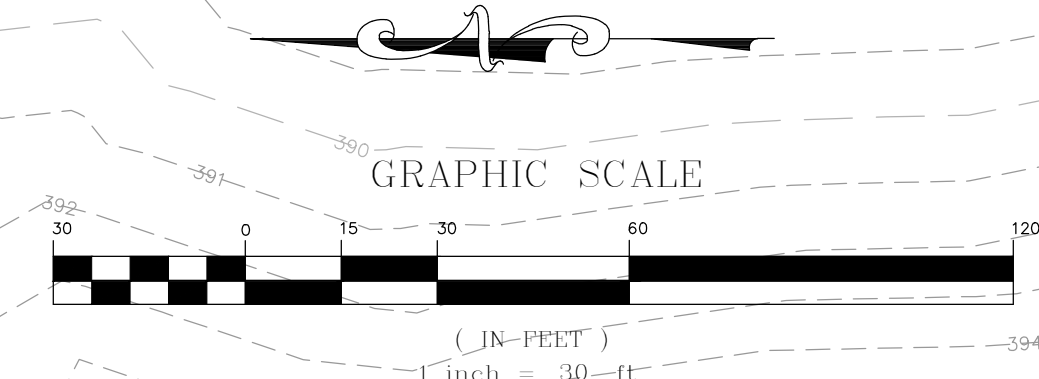
NOTES:

1. TOPOGRAPHIC INFORMATION TAKEN FROM SURVEY BY ALLEN AND HOSHALL, INC. SURVEYS CONDUCTED ON NOVEMBER 17, 2014 AND DECEMBER 03, 2014.
2. AERIAL TOPOGRAPHIC SURVEY PROVIDED BY KILGORE FLARES, LCC.
3. NO PORTION OF THE PROJECT SITE IS LOCATED WITHIN FLOOD ZONE "A" OR "AE" AS DETERMINED BY THE NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP FOR HARDEMAN COUNTY, TN. (FIRM PANEL 47069C0155C DATED 09/28/07).
4. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION. IN THE EVENT EXISTING CONDITIONS DIFFER FROM THOSE SHOWN IN THIS DRAWING, THEN THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND ENGINEER.

LEGEND

	EXISTING BOUNDARY LINE
	EXISTING MAJOR CONTOUR LINE
	EXISTING MINOR CONTOUR LINE
	EXISTING TREE LINE
	EXISTING FENCE LINE
	STREAM LINE FROM TOPOGRAPHIC MAP
	MONITORING WELL
	CONTROL POINT

153014 PROJECTS 8611515139 ALGORE CONSTRUCTION DOCUMENTS 1515139 ALGORE FLARE WASTE BURN AREA IMPROVEMENTS 5-12-15DWG



NOTE: CENTER OF EACH BURN PANS TO BE MIN. 100' FROM OTHER PANS IN ALL DIRECTIONS. PANS ARE ALSO TO BE LOCATED MIN. 50' FROM FENCE LINE AT ALL POINTS.

- GRADING AND DRAINAGE NOTES:**
1. PRIOR TO COMMENCEMENT OF WORK, CONTRACTOR SHALL VERIFY SITE CONDITIONS, DIMENSIONS, ELEVATIONS, AND LOCATION OF EXISTING FEATURES AFFECTED BY THE WORK. CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY INTERFERENCES OR DISCREPANCIES BEFORE PROCEEDING WITH THE WORK.
 2. CONTRACTOR SHALL INSTALL EROSION CONTROL MEASURES PRIOR TO ANY LAND-DISTURBING ACTIVITY. EROSION CONTROL MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, CONSTRUCTION ENTRANCE, SILT FENCE, ROCK CHECK DAMS, AND GRASS COVER. EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMPs) SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION AND UNTIL PERMANENT GROUND COVER HAS BEEN ESTABLISHED ON ALL DISTURBED AREAS. CONTRACTOR SHALL INSTALL AND MAINTAIN BMPs AS DETAILED IN THE DRAWINGS, IN ACCORDANCE WITH TENNESSEE EROSION AND SEDIMENT CONTROL HANDBOOK.
 3. OWNER SHALL EMPLOY GEOTECHNICAL CONSULTANT TO OBSERVE PROOF ROLLING, CHECK DENSITIES, AND IDENTIFY SOIL MATERIALS.
 4. NO ORGANIC MATERIAL, DEBRIS, OR DELETERIOUS MATERIAL SHALL BE PLACED IN ANY FILL. NO TREES SHALL BE REMOVED OUTSIDE OF CUT, FILL OR ROADWAY AREAS.
 5. CONTRACTOR SHALL INSPECT SEDIMENT CONTROL STRUCTURES AS REQUIRED BY TDEC STORMWATER REGULATIONS.
 6. ALL VEGETATION, DEBRIS, AND OTHER UNSUITABLE MATERIALS SHALL BE CLEARED, EXTENDING 5' BEYOND THE AREAS TO BE GRADED.
 7. PREVENT STORMWATER CONTAMINATION FROM THE EQUIPMENT USED DURING CONSTRUCTION. THIS INCLUDES PREVENTING SPILLS OF OIL, FUELS, COOLANTS, HYDRAULIC FLUIDS, AND ANY OTHER HARMFUL SPILLS.
 8. SOLID WASTE GENERATED BY THE CONTRACTOR SHALL BE PROPERLY DISPOSED OF OFF-SITE.
 9. ALL DISTURBED AREAS OUTSIDE OF THE IMPROVED AREAS RESULTING FROM CONSTRUCTION OPERATIONS SHALL BE RESTORED AT A MINIMUM, TO PRE-CONSTRUCTION CONDITIONS.

LEGEND

—	EXISTING MAJOR CONTOUR LINE
- - -	EXISTING MINOR CONTOUR LINE
~~~~~	EXISTING TREE LINE
x	EXISTING FENCE LINE
---	STREAM LINE FROM TOPOGRAPHIC MAP
⊙ MW	MONITORING WELL
△	CONTROL POINT

NO.	DATE	DESCRIPTION
1		

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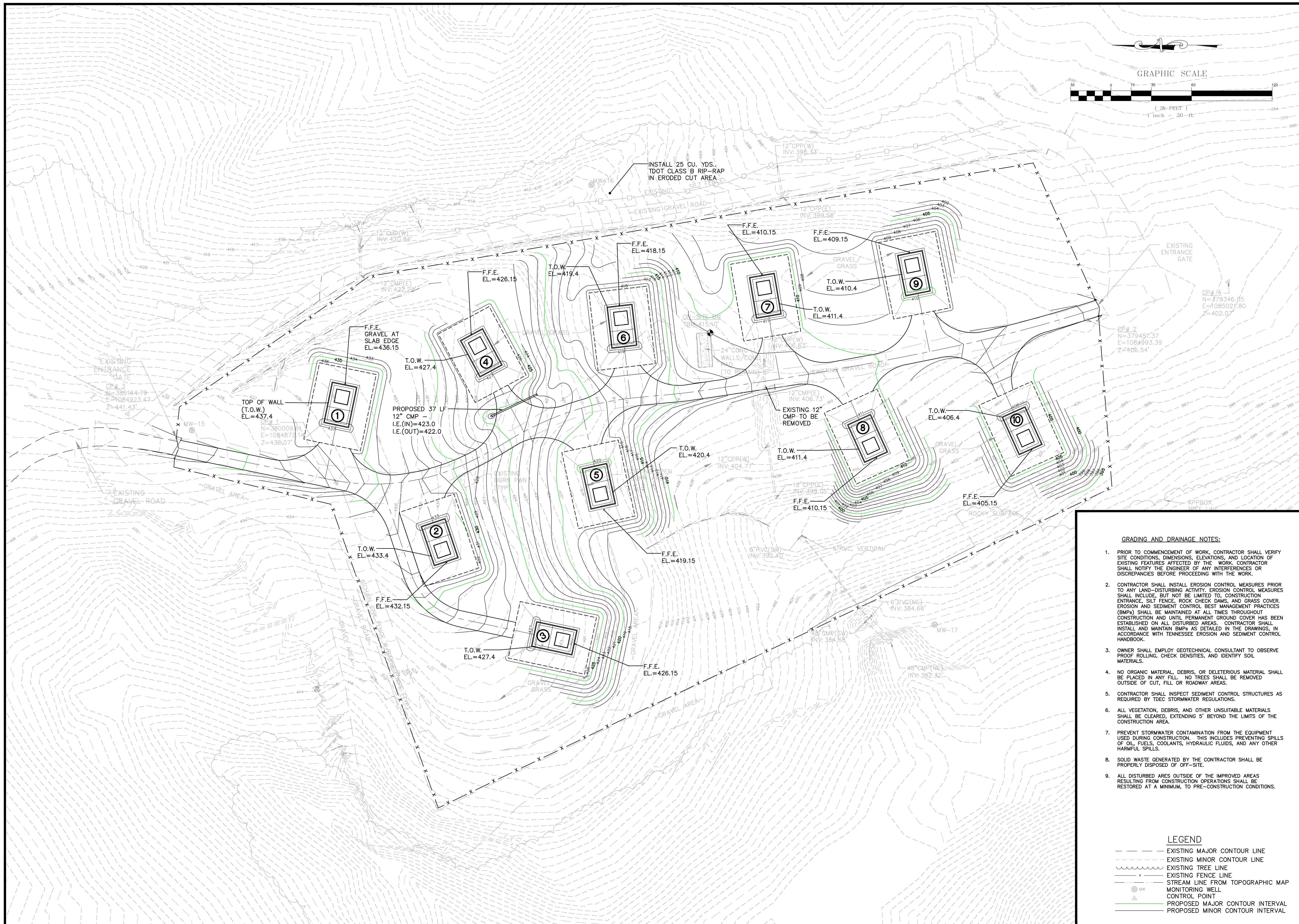
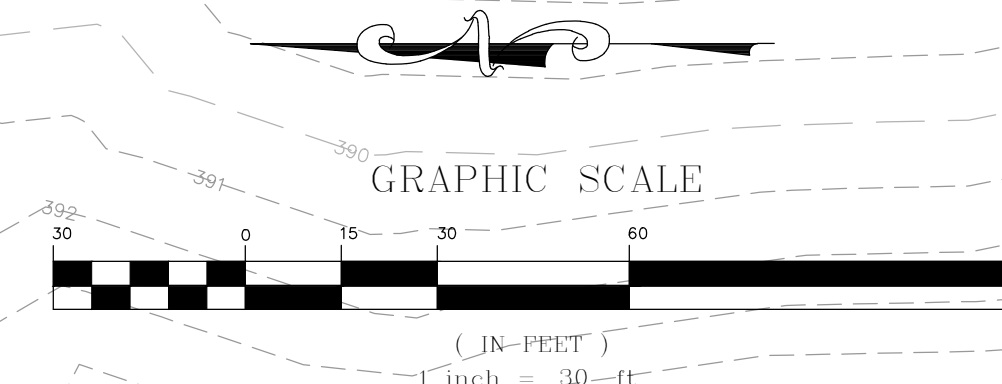
**HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS**  
 FOR  
**KILGORE FLARES COMPANY, LLC**  
 TOWN OF TOONE, HARDEMAN COUNTY, TENNESSEE  
 FEBRUARY 2015



SHEET NAME  
**SITE PLAN**

SHEET NUMBER  
**C-2.0**





**GRADING AND DRAINAGE NOTES:**

1. PRIOR TO COMMENCEMENT OF WORK, CONTRACTOR SHALL VERIFY SITE CONDITIONS, DIMENSIONS, ELEVATIONS, AND LOCATION OF EXISTING FEATURES AFFECTED BY THE WORK. CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY INTERFERENCES OR DISCREPANCIES BEFORE PROCEEDING WITH THE WORK.
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5. CONTRACTOR SHALL INSPECT SEDIMENT CONTROL STRUCTURES AS REQUIRED BY TDEC STORMWATER REGULATIONS.
6. ALL VEGETATION, DEBRIS, AND OTHER UNSUITABLE MATERIALS SHALL BE CLEARED, EXTENDING 5' BEYOND THE LIMITS OF THE CONSTRUCTION AREA.
7. PREVENT STORMWATER CONTAMINATION FROM THE EQUIPMENT USED DURING CONSTRUCTION. THIS INCLUDES PREVENTING SPILLS OF OIL, FUELS, COOLANTS, HYDRAULIC FLUIDS, AND ANY OTHER HARMFUL SPILLS.
8. SOLID WASTE GENERATED BY THE CONTRACTOR SHALL BE PROPERLY DISPOSED OF OFF-SITE.
9. ALL DISTURBED AREAS OUTSIDE OF THE IMPROVED AREAS RESULTING FROM CONSTRUCTION OPERATIONS SHALL BE RESTORED AT A MINIMUM, TO PRE-CONSTRUCTION CONDITIONS.

**LEGEND**

- EXISTING MAJOR CONTOUR LINE
- EXISTING MINOR CONTOUR LINE
- EXISTING TREE LINE
- x EXISTING FENCE LINE
- STREAM LINE FROM TOPOGRAPHIC MAP
- ⊙ MW MONITORING WELL
- △ CONTROL POINT
- PROPOSED MAJOR CONTOUR INTERVAL
- PROPOSED MINOR CONTOUR INTERVAL

NO.	DATE	DESCRIPTION
1		

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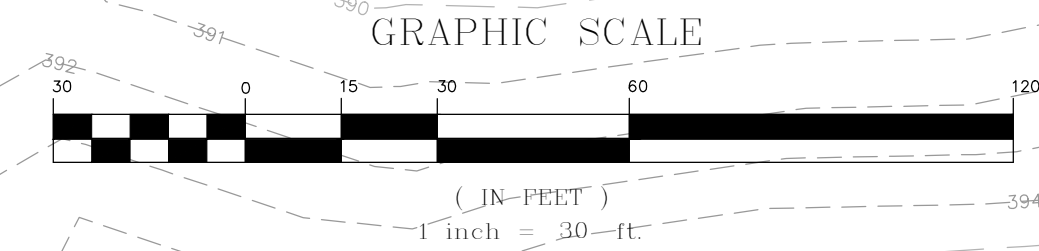
**HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS**  
 FOR  
**KILGORE FLARES COMPANY, LLC**  
 TOWN OF TOONE, HARDEMAN COUNTY, TENNESSEE  
 FEBRUARY 2015



SHEET NAME  
**GRADING PLAN**

SHEET NUMBER  
**C-3.0**





**EROSION CONTROL NOTES:**

- CONTRACTOR SHALL INSTALL EROSION CONTROL MEASURES PRIOR TO ANY LAND-DISTURBING ACTIVITY. EROSION CONTROL MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, CONSTRUCTION ENTRANCE, SILT FENCE, ROCK CHECK DAMS, AND GRASS COVER. EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMPs) SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION AND UNTIL PERMANENT GROUND COVER HAS BEEN ESTABLISHED ON ALL DISTURBED AREAS. CONTRACTOR SHALL INSTALL AND MAINTAIN BMPs AS DETAILED IN THE DRAWINGS, IN ACCORDANCE WITH TENNESSEE EROSION AND SEDIMENT CONTROL HANDBOOK.
- SOLID WASTE GENERATED BY THE CONTRACTOR SHALL BE PROPERLY DISPOSED OF OFF-SITE.
- ALL DISTURBED AREAS OUTSIDE OF THE IMPROVED AREAS RESULTING FROM CONSTRUCTION OPERATIONS SHALL BE RESTORED AT A MINIMUM, TO PRE-CONSTRUCTION CONDITIONS.
- EROSION CONTROLS SHOWN ARE SUGGESTIONS ONLY. CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING EROSION CONTROLS, OBTAINING CONSTRUCTION STORMWATER PERMIT, AND PREPARING AND IMPLEMENTING SWPPP.

**LEGEND**

- EXISTING MAJOR CONTOUR LINE
- EXISTING MINOR CONTOUR LINE
- EXISTING TREE LINE
- x-x- EXISTING FENCE LINE
- STREAM LINE FROM TOPOGRAPHIC MAP
- ⊙ MW MONITORING WELL
- △ CONTROL POINT
- PROPOSED MAJOR CONTOUR INTERVAL
- PROPOSED MINOR CONTOUR INTERVAL
- o-o- SILT FENCE OR MULCH SOCKS

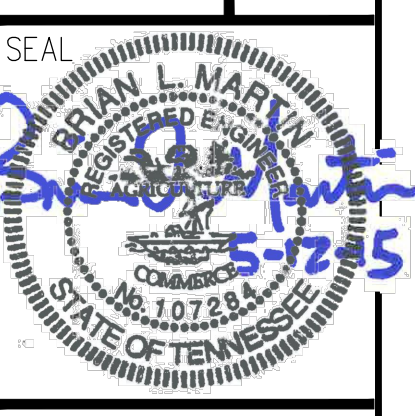
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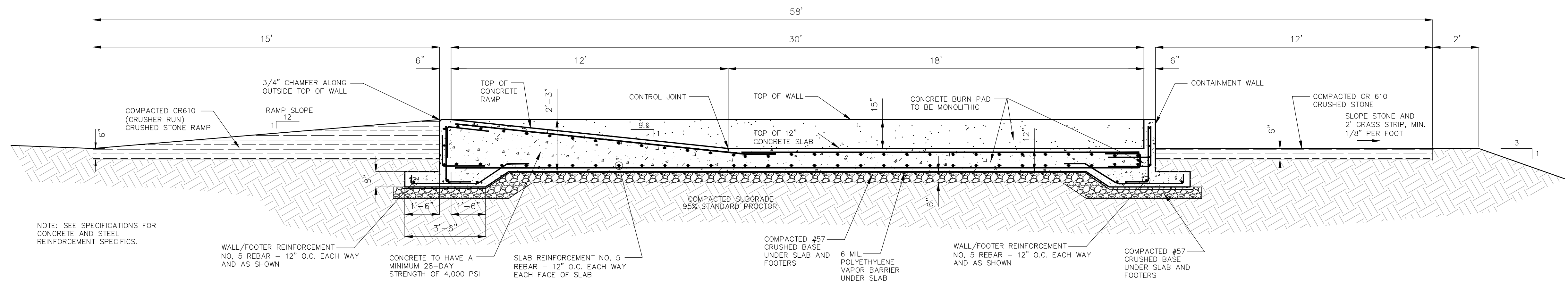
**HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS**  
 FOR  
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 TOWN OF TOONE, HARDEMAN COUNTY, TENNESSEE  
 FEBRUARY 2015



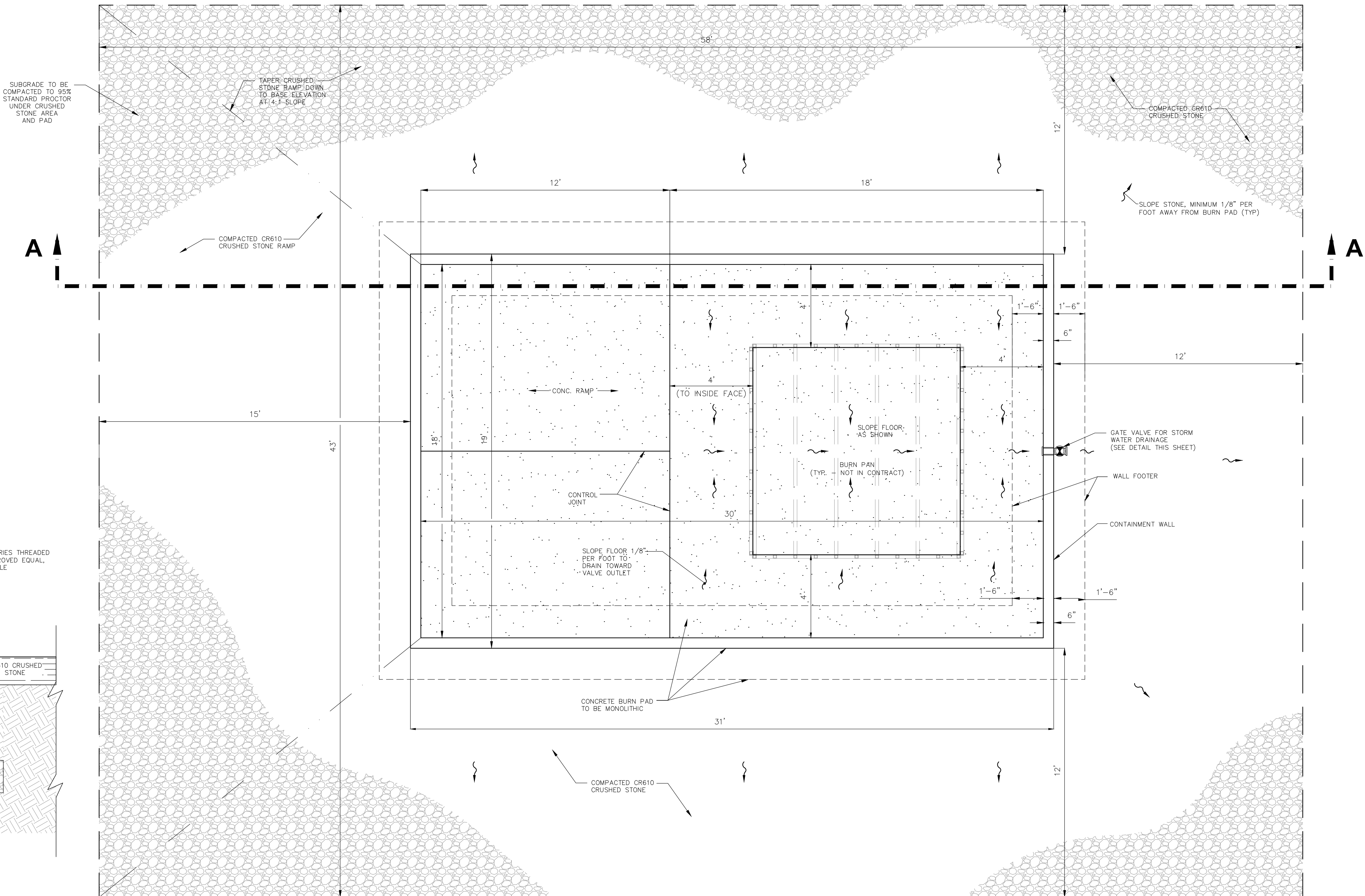
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**EROSION CONTROL PLAN**

SHEET NUMBER  
**C-4.0**

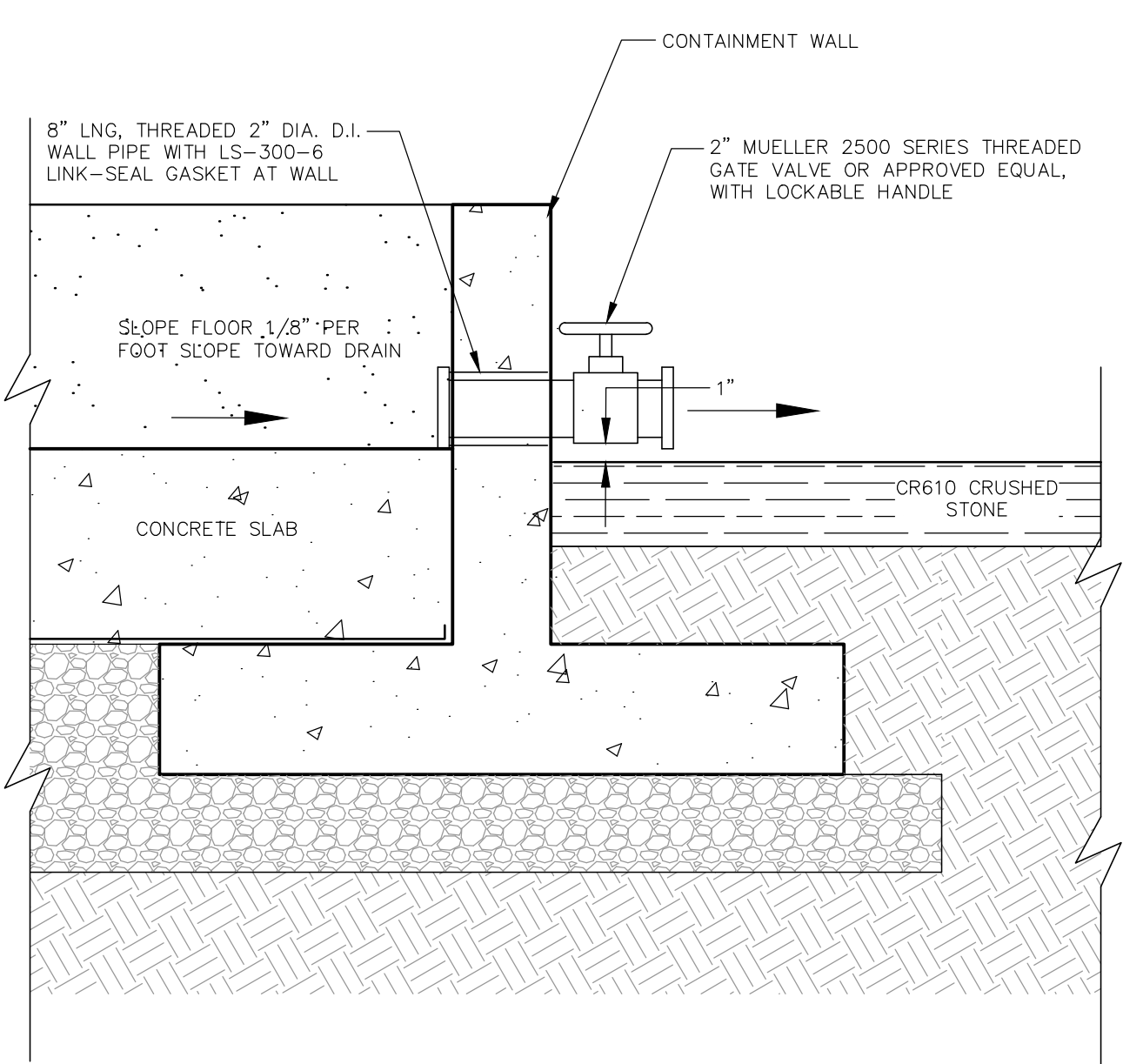




**CONCRETE BURN PAD - SECTION A-A**  
 SCALE: 3/8" = 1'-0"



**CONCRETE BURN PAD - PLAN VIEW**  
 SCALE: 3/8" = 1'-0"



**DRAINAGE DETAIL**  
 SCALE: NTS

NO.	DATE	DESCRIPTION
1		

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**HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS**  
 FOR  
**KILGORE FLARES COMPANY, LLC**  
 TOWN OF TOONE, HARDEMAN COUNTY, TENNESSEE  
 FEBRUARY 2015



SHEET NAME  
**CONCRETE BURN PAD DETAILS**

SHEET NUMBER  
**C-5.0**



REVISIONS	DESCRIPTION
NO.	DATE
1	

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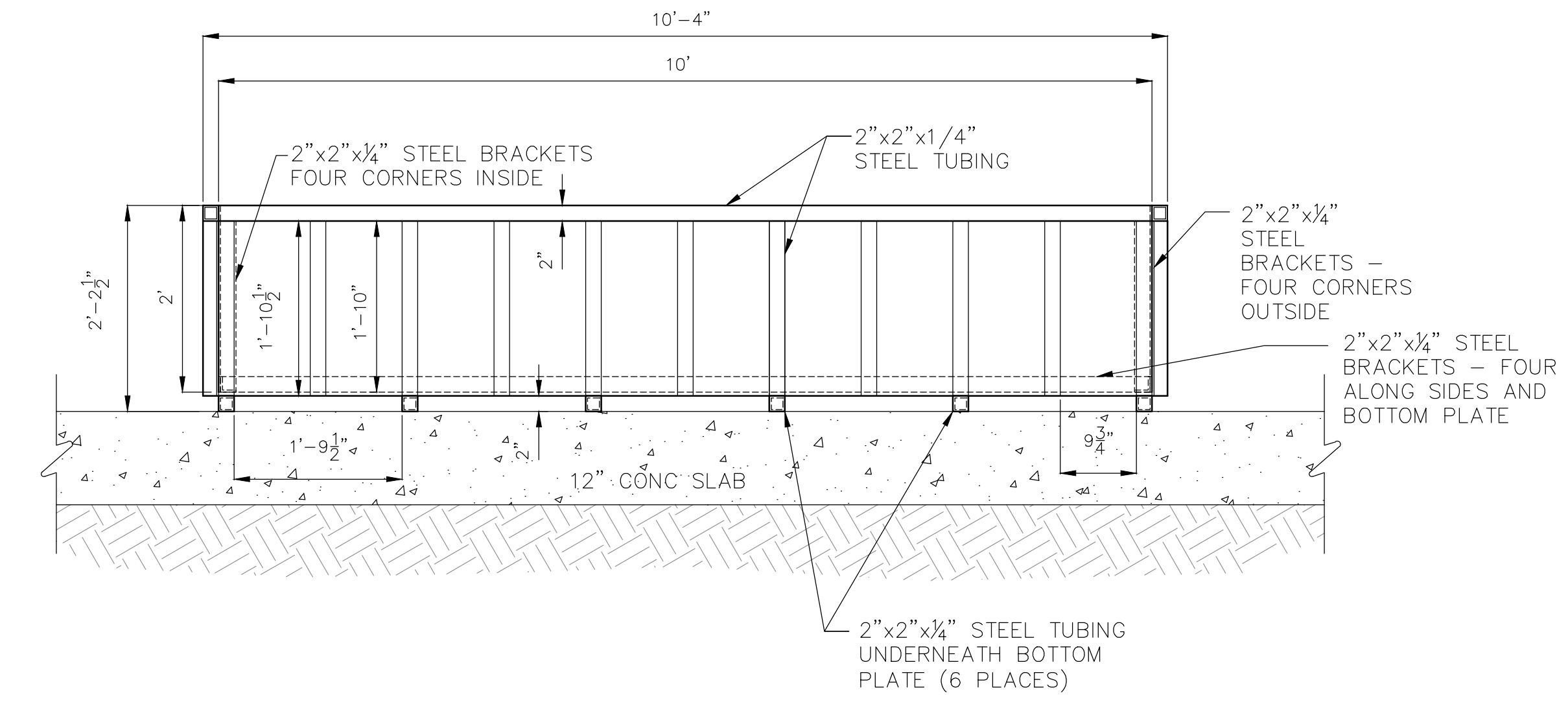
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**HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS**  
 FOR  
**KILGORE FLARES COMPANY, LLC**  
 TOWN OF TOONE, HARDEMAN COUNTY, TENNESSEE  
 FEBRUARY 2015



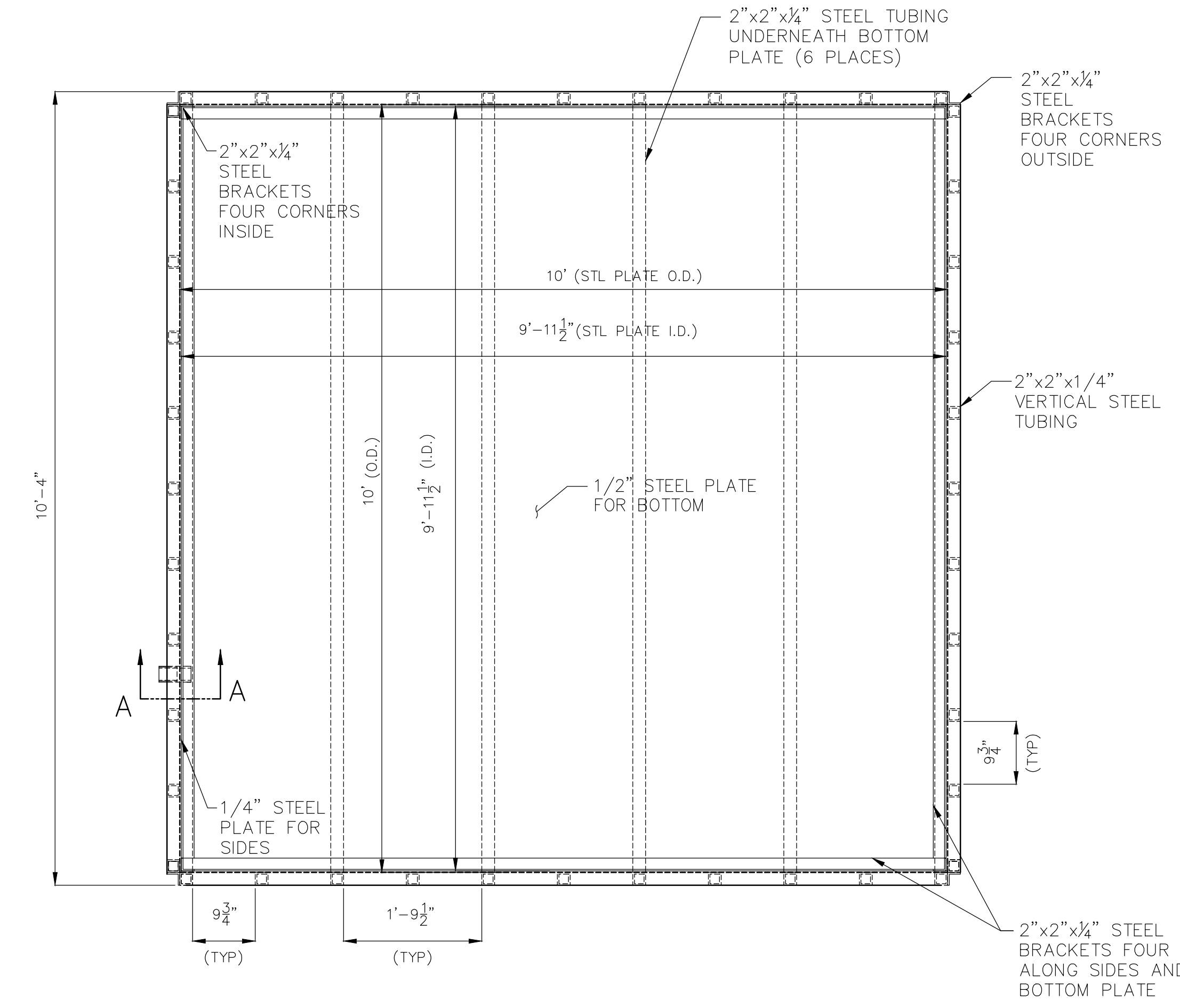
SHEET NAME  
**BURN PAN AND GENERAL DETAILS**

SHEET NUMBER  
**C-6.0**



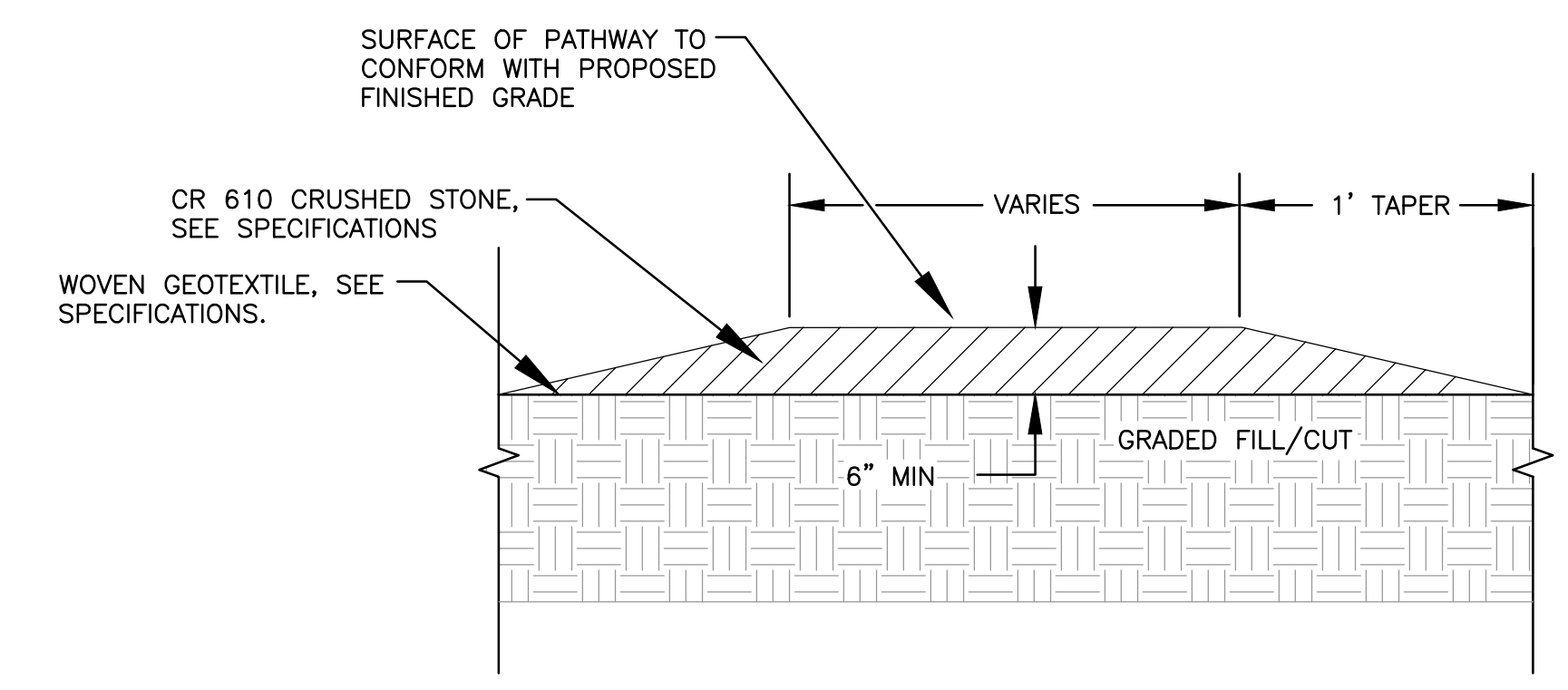
**ELEVATION VIEW**  
 SCALE: 3/4" = 1'-0"

NOTE:  
 1. STEEL BURN PAN NOT IN CONTRACT;  
 SHOWN FOR INFORMATIONAL PURPOSES ONLY.

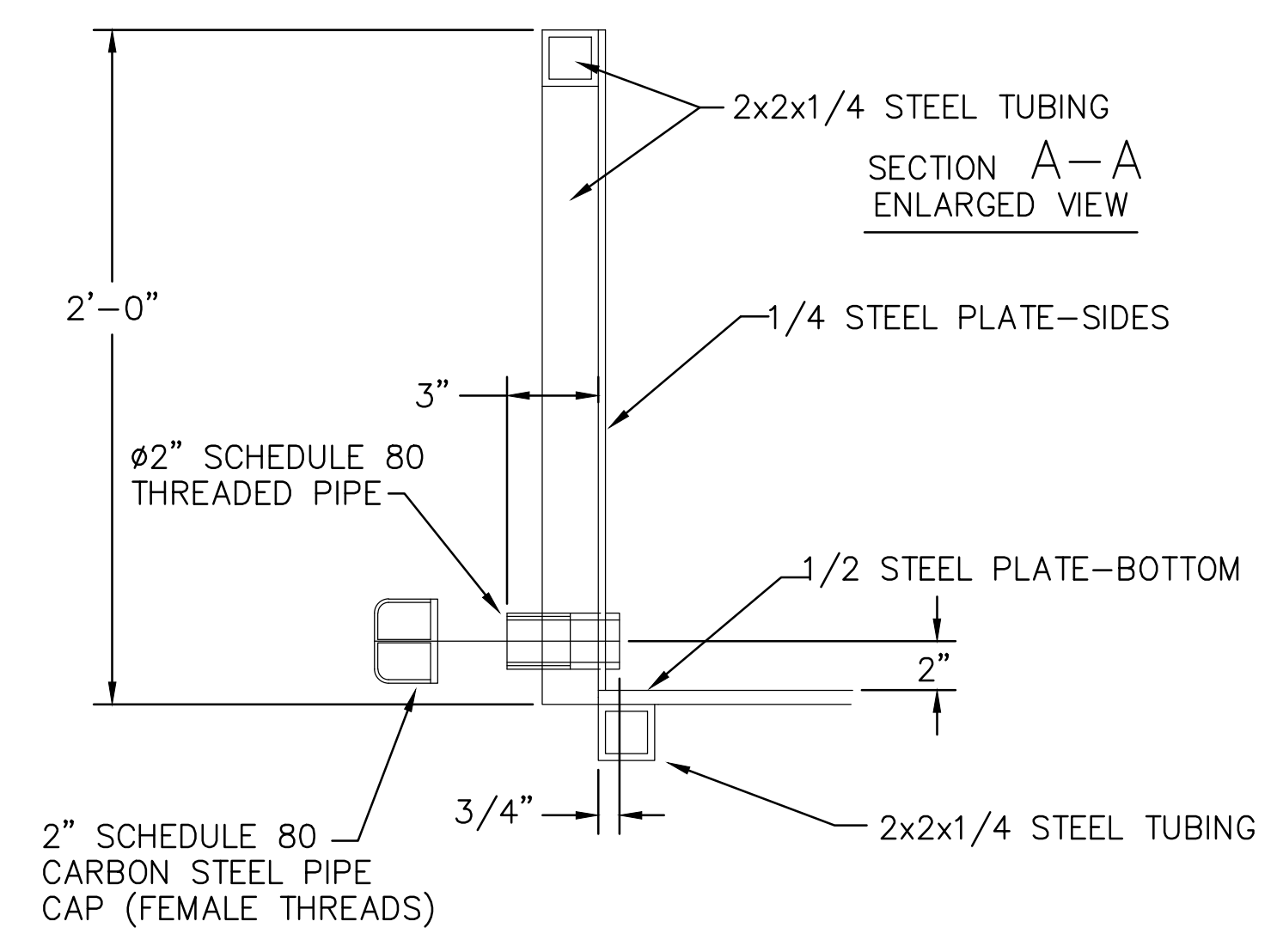


**PLAN VIEW**  
 SCALE: 3/4" = 1'-0"

**HAZARDOUS WASTE BURN PAN**



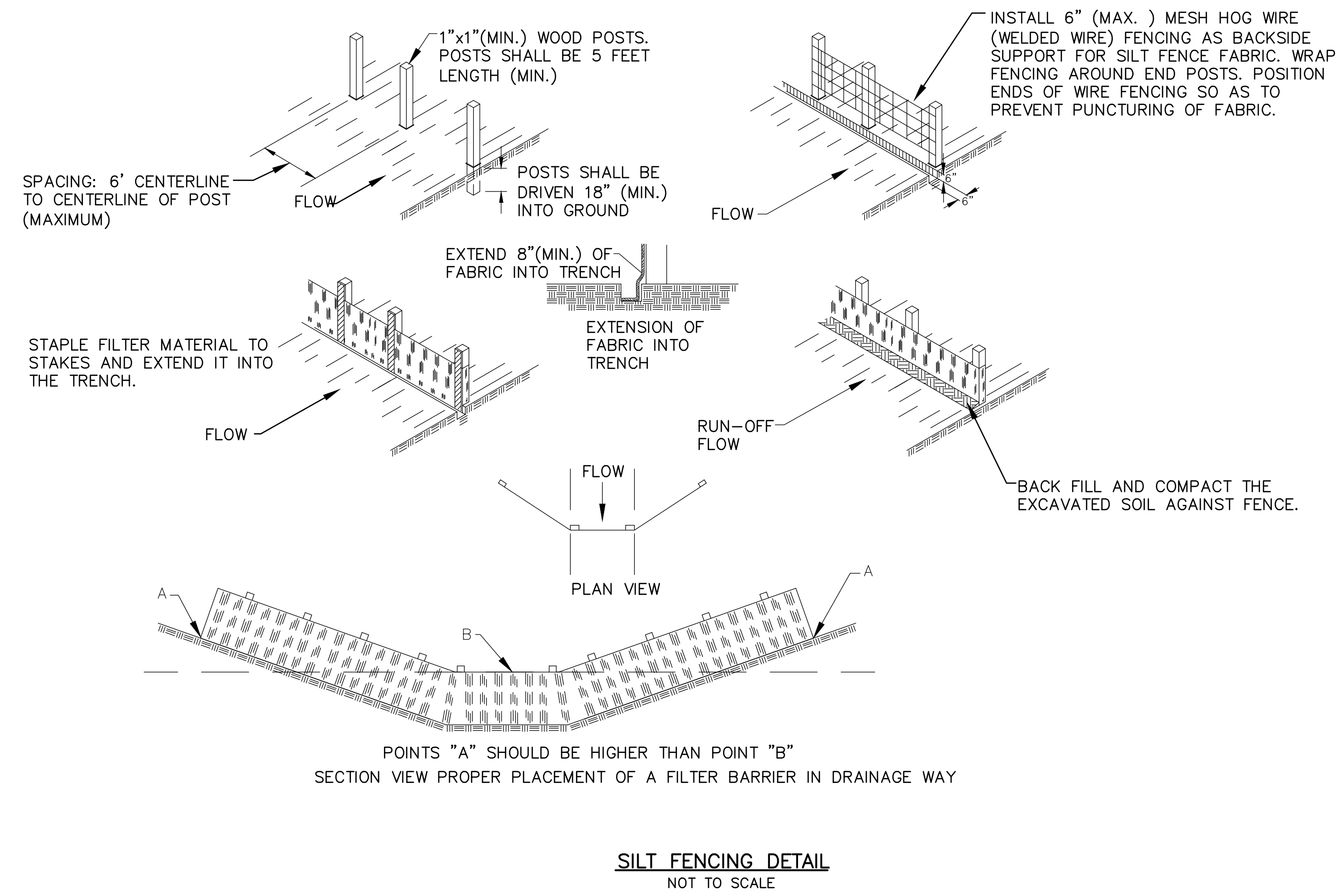
**ACCESS ROAD TYPICAL SECTION**  
 SCALE: NTS



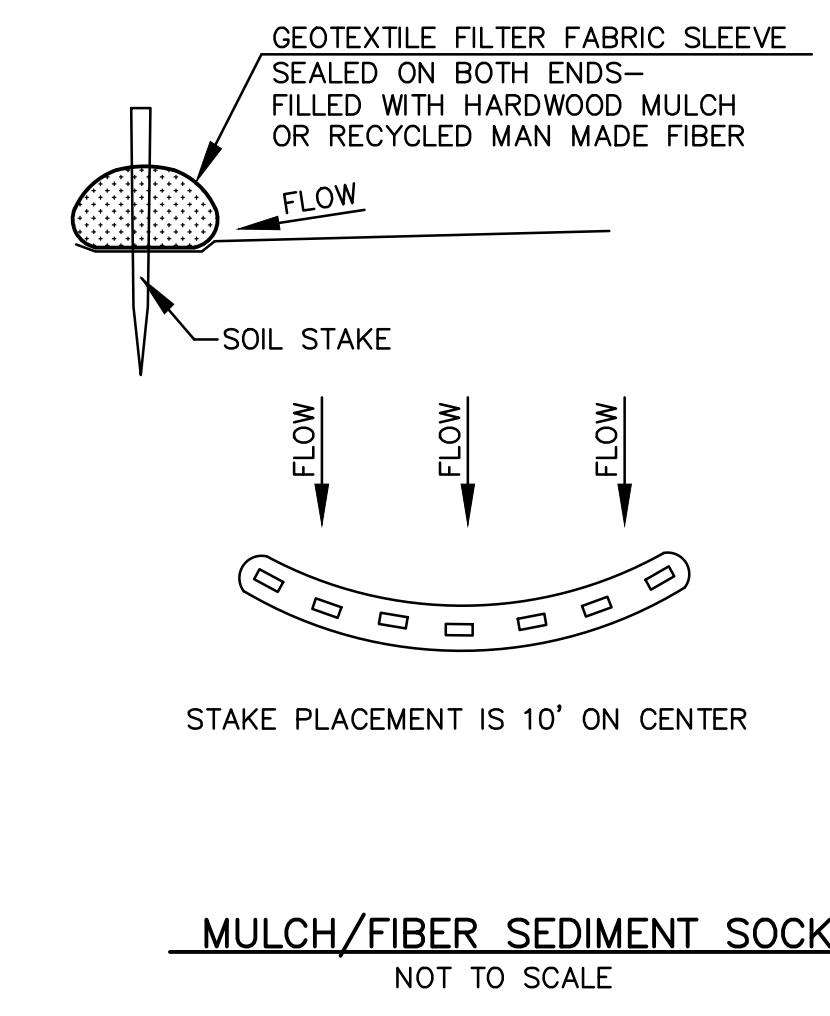
**HAZARDOUS WASTE BURN PAN SECTION A-A**  
 SCALE: NTS

NOTE:  
 1. STEEL BURN PAN NOT  
 IN CONTRACT; SHOWN  
 FOR INFORMATIONAL  
 PURPOSES ONLY.



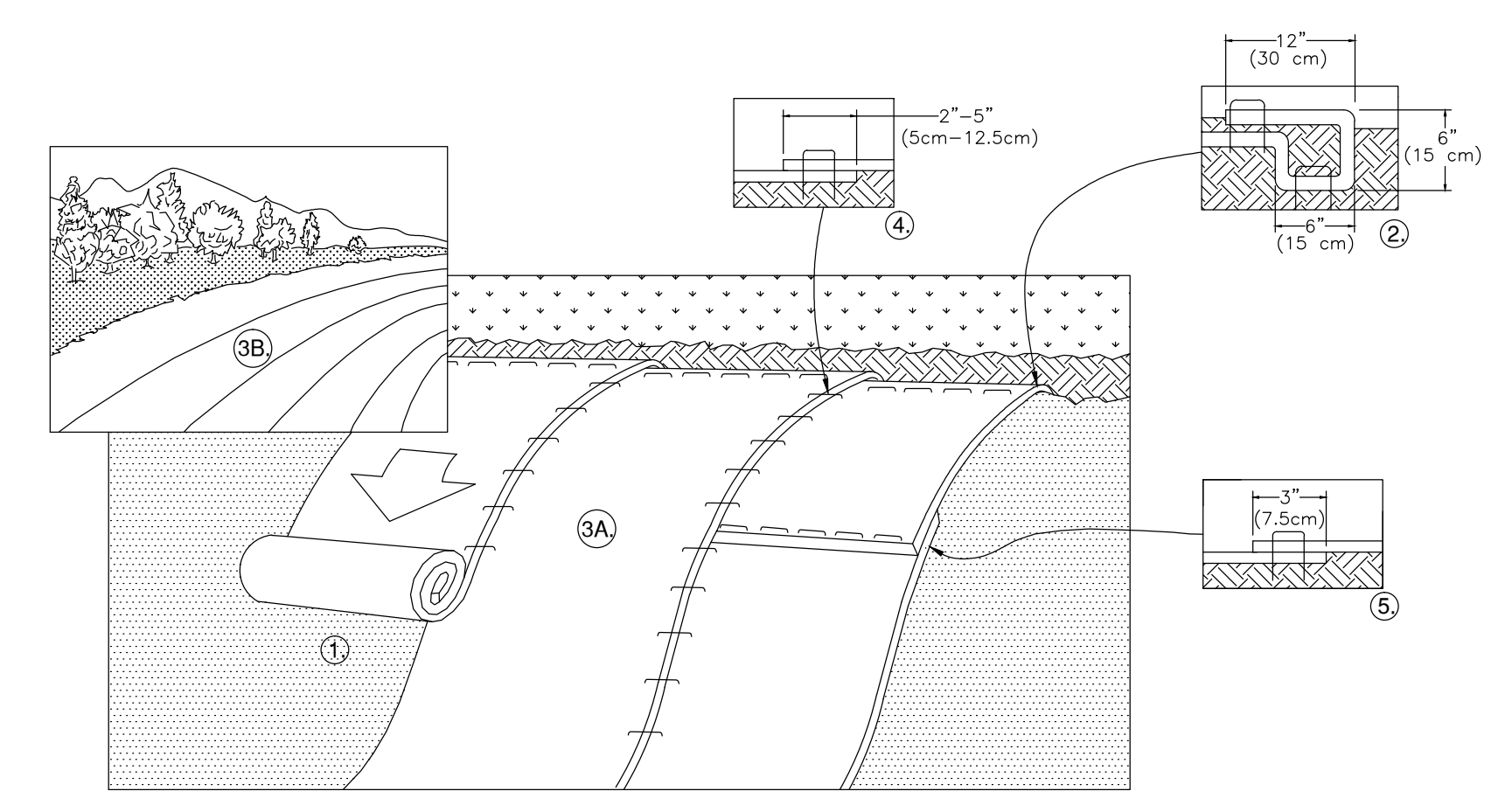


**CONSTRUCTION NOTES FOR MULCH SOCK**  
 PROVIDE CONTINUOUS MULCH SOCK WHERE PLACEMENT WILL REMAIN. PROVIDE 10-LF TO 15-LF LONG MULCH SOCKS WHERE PORTABLE SOCKS ARE NEEDED TO PLACE AND RELOCATE FOR EASE OF TRAFFIC MOVEMENT, TO PLACE PERPENDICULAR TO THE CONTINUOUS MULCH SOCK EVERY 100-LF, AND TO REINFORCE OTHER LOCATIONS AS NEEDED. MULCH SOCKS AND/OR SILT FENCE SHALL BE PLACED SO AS TO PROTECT THE PROJECT SITE FROM SEDIMENT LOSS DURING RAINFALL EVENTS.



1. EROSION CONTROLS ARE NOT LIMITED TO WHAT IS SHOWN ON THE PLANS. ADDITIONAL EROSION CONTROL STRUCTURES OR MEASURES MAY BE NEEDED AS CONDITIONS WARRANT OR AS DIRECTED BY THE DESIGN PROFESSIONAL, EROSION CONTROL SPECIALIST, OR OWNER.
2. EROSION CONTROL STRUCTURES SHALL BE MAINTAINED AND MONITORED THROUGHOUT THE ENTIRE PERIOD OF CONSTRUCTION OPERATIONS AND UNTIL PERMANENT VEGETATION IS ESTABLISHED ON DISTURBED AREAS.
3. SILT/SEDIMENT IS TO BE REMOVED FROM EROSION CONTROL STRUCTURES WHEN THEY REACH 1/2 CAPACITY. SILT/SEDIMENT TO BE DISPOSED OF ON-SITE AT LOCATION TO BE DETERMINED BY OWNER.
4. KEEP CONSTRUCTION DEBRIS, MUD/SILT FROM ENTERING DITCH CHANNELS OR LEAVING THE SITE.
5. USE SAND BAGS IN CONJUNCTION WITH MULCH SOCKS AS NEEDED FOR ADDED RUNOFF PROTECTION.
6. USE MULCH SOCKS IN AREAS WHERE LARGE AMOUNTS OF SILT CAN BE EXPECTED TO ACCUMULATE.
7. SITE GRADING SHALL BE PERFORMED IN A MANNER TO ASSURE STORM WATER RUNOFF IS NOT BLOCKED OR DIVERTED.
8. DISTURBED AREAS SHALL BE GRADED TO DRAIN AS INDICATED ON THE PLANS DURING AND UPON COMPLETION OF CONSTRUCTION. NO DRAINAGE SHALL BE DAMMED OR TRAPPED UNLESS SPECIFICALLY DIRECTED BY THE PLANS.
9. ESTABLISH PERMANENT VEGETATION ON DISTURBED AREAS.

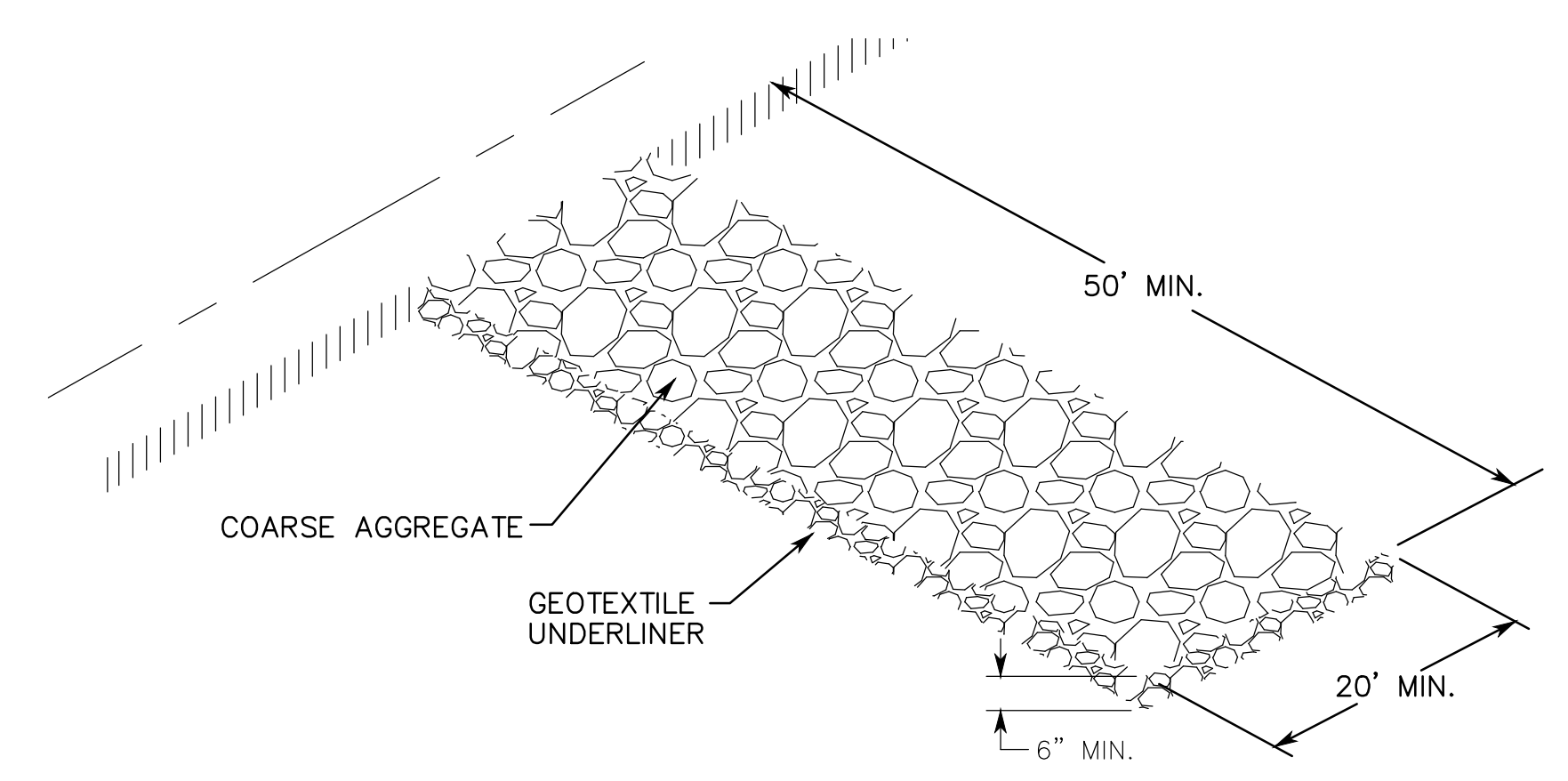
**EROSION CONTROL NOTES**



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF LIME, FERTILIZER, AND SEED, AS NECESSARY.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLOING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM*, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"-5" (5cm-12.5cm) OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH* ON THE PREVIOUSLY INSTALLED BLANKET.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE BLANKET WIDTH.
6. EROSION CONTROL BLANKET SHALL BE NORTH AMERICAN GREEN 5150BN OR APPROVED EQUAL.

NOTE:  
 *IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15cm) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.

**EROSION CONTROL BLANKETS DETAIL**  
 NOT TO SCALE



**CRUSHED STONE CONSTRUCTION ENTRANCE/EXIT**  
 NOT TO SCALE

NO.	DATE	DESCRIPTION
1		

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**HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS**  
 FOR  
**KILGORE FLARES COMPANY, LLC**  
 TOWN OF TOONE, HARDEMAN COUNTY, TENNESSEE  
 FEBRUARY 2015



SHEET NAME  
**EROSION CONTROL DETAILS**

SHEET NUMBER  
**C-7.0**

**CONTRACT DOCUMENTS AND SPECIFICATIONS  
HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS**

**KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE**

Prepared for:



**Kilgore Flares Company, LLC  
155 Kilgore Drive  
Toone, Tennessee**

Prepared by:



**EnSafe Inc.  
220 Athens Way, Suite 410  
Nashville, Tennessee 37228  
(615) 255-9300  
(800) 588-7962  
[www.ensafe.com](http://www.ensafe.com)**



**May 2015**

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00150	Instructions to Proposers
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00810	Supplementary General Conditions
00850	Drawing Index
	Proposal Bond
	Notice of Award
	Construction Payment Bond
	Construction Performance Bond
	Notice to Proceed
	Contract Change Order Form
	Contractor's Application for Payment

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01090	Reference Standards
01150	Measurement and Basis for Payment
01152	Application for Payment
01153	Change Order Procedures
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01560	Temporary Facilities and Controls
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02200	Site Grading and Filling
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02222	Common Excavation for Utilities
02223	Subgrade Construction and Preparation
02225	Aggregate Surface Course
02290	Topsoil
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02930	Seeding and Mulching

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**END OF INDEX**

## SECTION 00010

### REQUEST FOR PROPOSAL

Sealed proposals for construction of the Hazardous Waste Open Burn Area Modifications at the Kilgore Flares Company, LLC (hereafter also referred to as "Kilgore" or "Kilgore Flares") facility in Toone, Tennessee, will be received at the Kilgore facility at 155 Kilgore Drive, Toone, Tennessee on _____, **2015 at 2:00 p.m. local time.**

The Owner reserves the right to reject any and all proposals, to waive any informalities or irregularities in the proposals received, negotiate with any or all proposers, and to accept any proposal which is deemed most favorable to the Owner at the time and under the conditions stipulated.

The work on this project shall be substantially completed within 360 days after the Notice to Proceed, with final completion 20 days thereafter. The intended Notice to Proceed date is _____, 2015.

Proposals must be sealed, addressed, and submitted to:

Richard Saut  
Environmental Manager  
Kilgore Flares Company, LLC  
155 Kilgore Drive  
Toone, Tennessee 38381

And designated in the lower left hand corner:

#### **Proposal – Kilgore Flares Hazardous Waste Open Burn Area Modifications**

All envelopes are to contain the Contractor's license number and license expiration date.

Proposals in the case of a corporation not chartered in Tennessee must be accompanied by proper certificate evidencing that such corporation is authorized to do business in the State of Tennessee.

Before award is made to a Proposer not a resident of the State where the Project is located, such Proposer shall designate a proper agent in the State where the Project is located on whom service can be made in the event of litigation.

No Proposer may withdraw his proposal within **sixty (60) days** after the actual date of the opening thereof.

A Bid Bond will be required in the amount of 5% of the proposal. A Performance Bond and Payment Bond in the amount of 100 percent of the contract amount will be also be required.

**By: Kilgore Flares Company, LLC**

**END OF SECTION**

## **SECTION 00140**

### **INFORMATION AVAILABLE TO PROPOSERS**

#### **1. DESIGN ENGINEERS**

EnSafe Inc.  
220 Athens Way, Suite 410  
Nashville, Tennessee 37228

#### **2. SITE INSPECTION PRE-PROPOSAL CONFERENCE**

Proposers are encouraged to conduct site visits prior to submitting a proposal. Such visits must be scheduled with Mr. Richard Saut, Kilgore Environmental Manager.

#### **3. CONTRACTOR TRAILER AND STAGING AREA**

An area for Contractor trailers and staging areas shall be designated by the Owner's Representative. It will be the Contractor's decision on whether or not to utilize a trailer on the site. Contractor shall provide security for all onsite trailers and staging areas.

**END OF SECTION**

## SECTION 00150

### INSTRUCTIONS TO PROPOSERS

#### 1. INTRODUCTION

- 1.1 These instructions are provided to assist the Proposer in the preparation and submission of its response to the Request for Proposal.
- 1.2 These instructions are not, and should not be taken to be fully comprehensive or exhaustive. The Proposer is expected to make all necessary inquiries that may affect the Proposal, before its submission.
- 1.3 The Proposal is to be made strictly in accordance with the requirements of this Request for proposal which is referred to as the RFP.

#### 2. INDEPENDENT PROPOSAL

- 2.1 By submission of a Proposal, the Proposer warrants that:
  - 2.1.1 The prices in the Proposal have been arrived at independently, without consultation, communication, agreement or understanding for the purpose of restricting competition, as to any matter relating to such prices, with any other Proposers or with any competitor.
  - 2.1.2 Unless otherwise required by law, the prices that have been quoted in the Proposal have not knowingly been disclosed by the Proposer, directly or indirectly, to any other Proposer or competitor, nor will they be so disclosed.
  - 2.1.3 No attempt has been made or will be made by the Proposer to induce any other person or firm to submit or not to submit a Proposal for the purpose of restricting competition.

#### 3. INSURANCE

- 3.1 Prior to commencement of any Work, the successful Proposer shall provide certificates of insurance attesting that the policies required by the Contract Documents for the purpose of executing the Work subject of this Proposal have been obtained.

#### 4. QUERIES

- 4.1 All queries regarding this Request for proposal shall be submitted as they arise, in writing or by facsimile only, to: Mr. Richard Saut, Kilgore Environmental Manager, at the address given in Document 00010.

4.2 Each communication must state clearly the Proposer's company name, RFP title and shall be referenced accordingly.

4.3 No contact shall be made with any other person or persons associated with this project. Such unauthorized contact may be cause for disqualification of the Proposer.

## 5. RESERVATIONS

5.1 The offer made by the Proposer in the Proposal Form is intended to be made in strict accordance with the Request for Proposal and to be made without reservations.

5.2 Reservation may only be made in relation to requirements that the Proposer feels unable to comply with at any price. If the Proposer wishes to make any qualifications, full details of each qualification shall be provided in written form attached to the Proposal.

5.3 If the Proposal is qualified, the rates, prices, and percentages stated in the Proposer's schedule of prices are to be calculated on the assumption that the reservations will be accepted.

## 6. PREPARATION OF PROPOSAL

6.1 In accordance with the general conditions attached hereto the Proposer is deemed to have satisfied itself as to the correctness and sufficiency of the Proposal rates and prices to cover all obligations under a proposed contractual agreement.

6.2 The Proposal shall be submitted in the English language.

6.3 All rates and monetary amounts contained in the Proposal shall be in U.S. dollars.

6.4 The Proposer shall be responsible for all costs or expenses incurred by the Proposer in connection with this Request for Proposal and formation of a contractual agreement, should the Proposer be successful.

6.5 The Proposal shall be prepared in the manner described herein to allow full and efficient evaluation of Proposal.

6.6 The Proposal shall comprise the following documents in separate Sections in the order listed:

Section 1 - The Executed Proposal Form  
Section 2 - List of Proposed Subcontractors  
Section 3 - Proposed Work Schedule

7. SIGNATURE

7.1 All copies of the Proposal shall give the full legal name and registered office of the Proposer. The Proposal shall be dated and signed by persons authorized to legally bind the Proposer.

8. TREATMENT OF RFP

8.1 The information supplied in the Request for Proposal is confidential. Proposer shall only distribute such information to its own personnel directly concerned with the preparation of the Proposal.

9. MODIFICATIONS

9.1 The Owner may modify or amend any part of the Request for proposal prior to the Closing Date.

9.2 Any modification will be issued simultaneously to all Proposers and will be deemed to constitute part of the RFP.

10. TREATMENT OF PROPOSAL

10.1 No undertaking is given to accept the lowest Proposal, or part or all of any Proposal. The acknowledgment or receipt of any submitted Proposal shall not constitute any actual or implied agreement to enter into a contractual agreement with the Proposer.

10.2 No part of the submitted Proposal will be returned to the Proposer.

11. FURTHER INFORMATION

11.1 The right is reserved to request any further information deemed necessary to evaluate the Proposal.

11.2 During Proposal evaluation, the Proposer shall provide any required information and attend meetings as may be required for any reasonable purposes, including verification of the levels and types of facilities and services to be provided by the Proposer.

12. SUBMISSION OF PROPOSAL

12.1 All Proposal documents must be securely packaged and sealed to avoid inadvertent opening or damage in transit.



12.2 The Proposal shall be remitted to the address stated in the Request for Proposal and delivered by the time referred to therein.

13. CLOSING DATE

13.1 It is the sole responsibility of the Proposer to ensure that its Proposal is delivered by the Closing Date and time stated in the RFP.

13.2 Any Proposal not received by the Closing Date and time will be disqualified.

14. VALIDITY OF PROPOSAL

14.1 All details of the Proposal are to remain valid for the period of **sixty (60) days**, after the Closing Date and time stated in the Letter of Invitation or such other date and time as may be advised.

15. CONFLICT OF INTEREST

15.1 Proposer shall promptly notify Engineer and Owner of the potential or actual existence of any conflict of interest associated with the work being performed under this contract.

**END OF SECTION**

**DOCUMENT 00311**

**PROPOSAL FORM**

Kilgore Flares Company, LLC  
155 Kilgore Road  
Toone, Tennessee 38381

Attention: Mr. Richard Saut

Re: HAZARDOUS WASTE OPEN BURN AREA MODIFICATIONS  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

Dear Sir:

In compliance with your Request for Proposal for the above-named project, having examined the Drawings and Specifications and related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, we hereby propose to furnish all labor, materials, and supplies and to construct the project in accordance with the Contract Documents, Specifications, and Drawings, as prepared by EnSafe Inc. within the time and prices stated below.

We acknowledge the receipt of Addenda numbered ____ through ____.

We acknowledge the right of the Owner to accept any proposal, to reject any or all proposals, and to waive any informalities in the proposal process.

If notice of acceptance of proposal is delivered within **60 days** from date of proposal opening, we will promptly execute and deliver a contract in accordance with proposal, as accepted by the Owner, in the form designated.

After Notice to Proceed is received, we will begin work immediately and be substantially completed within the time schedule described herein. We further agree to pay as liquidated damages to the Owner the sum of \$500.00 for each consecutive calendar day of delay in achieving substantial completion and \$200.00 for each consecutive day of delay in achieving final completion on the various portions of the Work as specified in the Agreement.

PROPOSER understands that a price for each item in each Proposal Form must be filled in as stated in Instructions to Proposers. Failure to indicate price for alternates, if any, may be grounds for considering the Proposal irregular.

In submitting this Proposal, PROPOSER represents as more fully set forth in the Agreement, that:

- a. PROPOSER has given ENGINEER written notice of all conflicts, errors, or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to PROPOSER.
- b. This Proposal is genuine and not made in the interest or on behalf of any undisclosed person, firm or corporation and is not submitted to conformity with any agreement or rules of any group, association, organization or corporation; PROPOSER has not directly or indirectly induced or solicited any other PROPOSER to submit a false or sham PROPOSAL; PROPOSER has not solicited or induced any person, firm or corporation to refrain from proposing; and PROPOSER has not sought by collusion to obtain for himself any advantage over any other PROPOSER or over OWNER.

PROPOSER hereby agrees to perform the work associated with the **Hazardous Waste Open Burn Area Modifications**, as defined in these Contract Documents and Specifications and as indicated on the Plans, including all incidentals and appurtenances thereto, and all applicable taxes and fees for the following lump sum price:

**For substantial completion within 360 calendar days and final completion within 20 days thereafter:**

_____ dollars	\$ _____
(In Words)	(In Figures)
and _____ cents.	
(In Words)	

(The remainder of this page is intentionally left blank.)

Amount shall be shown in both figures and words. In case of discrepancy, the amount shown in words shall govern.

Quantities are not guaranteed. Final payment will be based on actual quantities.

The above prices shall include overhead, field engineering, mobilization, profit, insurance, etc., to cover the finished work of the several kinds called for. Proposal shall include sales tax and all other applicable taxes and fees.

We certify that we have examined and are fully familiar with all of the provisions of the conditions, that we have carefully reviewed the accuracy of all statements in this Proposal and attachments hereto; and have by careful examination of the Request for proposal, and by consideration of the nature of the Project and statutory requirements, satisfied ourselves as to the nature and location of the Work and all other matters which can in any way effect the Work or cost thereof.

We agree to bear all costs incurred by us in connection with the preparation and submission of this Proposal whether or not successful and to bear any further cost incurred by us prior to award of any contractual agreement irrespective of whether such agreement is awarded to ourselves or a third party.

By: _____  
Title Date

_____  
Firm Name Legal Entity

_____  
State of Incorporation Telephone Number

Mailing Address:

_____  
P. O. Box or Street Address

_____  
City State Zip Code

Contractor's License No.: _____ Date of Expiration: _____

License Classification Applying to Proposal: _____

Affix Corporate Seal

**END OF SECTION**

## SECTION 00511

### AGREEMENT FORM

THIS AGREEMENT is dated as of the ____ day of _____ in the year 2015 by and between Kilgore Flares Company, LLC (hereinafter called OWNER) and _____ (hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

#### **Article 1. WORK.**

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

**Furnishing and installing ten concrete burn pads, a gravel access road, and associated earthwork and grading.**

The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

**Kilgore Flares Hazardous Waste Open Burn Area Modifications**

#### **Article 2. ENGINEER.**

The Project has been designed by EnSafe Inc. who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

#### **Article 3. CONTRACT TIME.**

- 3.1. From the date when the Contract Time commences to run as provided in paragraph 2.3 of the General Conditions, each designated portion of the Work will be substantially completed within the respective number of calendar days identified in the Proposal accepted by the OWNER, and the entire Work will be completed and ready for final payment in accordance with paragraph 14.13 of the General conditions within the number of calendar days identified in the Proposal accepted by the OWNER.
- 3.2. *Liquidated Damages.* OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. (They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time.) Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay

(but not as a penalty) CONTRACTOR shall pay OWNER **five hundred dollars (\$500.00)** for each day that expires after the respective time specified in paragraph 3.1 for Substantial Completion until the designated portion of the Work is substantially complete. After Substantial Completion if CONTRACTOR shall neglect, refuse or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER **two hundred dollars (\$200.00)** for each day that expires after the time specified in paragraph 3.1 for final completion and readiness for final payment.

**Article 4. CONTRACT PRICE.**

- 4.1. OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents in current funds as follows:

\$_____.

**Article 5. PAYMENT PROCEDURES.**

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for payment will be processed by ENGINEER AND OWNER as provided in the General Conditions.

- 5.1. *Progress Payments.* OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER AND OWNER, on or about the thirtieth day of each month during construction as provided below. All progress payments will be on the basis of the progress of the work through the last working day of the previous month as measured by the schedule of values established in paragraph 2.05 of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Conditions.

- 5.1.1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below, but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER AND OWNER shall determine, or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions.

90% of Work completed. If Work has been 50% completed as determined by ENGINEER and OWNER, and if character and progress of the Work have been satisfactory to OWNER and ENGINEER, OWNER on recommendation of ENGINEER, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no additional retainage on account of Work completed in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed.



90% of materials and equipment not incorporated in the Work (but delivered, suitably stored and accompanied by documentation satisfactory to OWNER as provided in paragraph 14.02 of the General Conditions).

5.1.2. Upon Substantial Completion, in an amount sufficient to increase total payments to CONTRACTOR to 97.5% of the Contract Price, less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions.

5.2. *Final Payment.* Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER and OWNER as provided in said paragraph 14.07.

#### **Article 6. INTEREST**

Not Used.

#### **Article 7. CONTRACTOR'S REPRESENTATIONS.**

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

7.1. CONTRACTOR has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the Work.

7.2. Not used.

7.3. CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in paragraph 7.2 above) which pertain to the subsurface or physical conditions at or contiguous to the site or otherwise may affect the cost, progress, performance or furnishing of the Work as CONTRACTOR considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.02 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by CONTRACTOR for such purposes.

7.4. CONTRACTOR has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect of said Underground Facilities are or will be required by CONTRACTOR in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with other terms and conditions of the Contract

Documents, including specifically the provisions of paragraph 4.03 of the General Conditions.

- 7.5. CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- 7.6. CONTRACTOR has given ENGINEER and OWNER written notice of all conflicts, errors, or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by ENGINEER and OWNER is acceptable to CONTRACTOR.

**Article 8. CONTRACT DOCUMENTS.**

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the Work consist of the following:

- 8.1. This Agreement.
- 8.2. Performance and other Bonds.
- 8.3. Notice of Award.
- 8.4. General Conditions.
- 8.5. Supplementary General Conditions.
- 8.6. Specifications bearing the title Hazardous Waste Open Burn Area Modifications, and consisting of 4 divisions, as listed in the index thereof.
- 8.7. Drawings, as listed in the index thereof.
- 8.8. Addenda numbers ___to___, inclusive.
- 8.9. CONTRACTOR's Proposal.
- 8.10. Documentation submitted by CONTRACTOR prior to Notice of Award.
- 8.11. The following which may be delivered or issued after the Effective Date of the Agreement and are not attached hereto: All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents pursuant to paragraph 3.04 of the General Conditions.
- 8.12. The documents listed in paragraphs 8.2 et seq. above are attached to this Agreement (except as expressly noted otherwise above).
- 8.13. OWNERS' purchase order to CONTRACTOR.

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be amended, modified or supplemented as provided in paragraph 3.04 of the General Conditions.

**Article 9. MISCELLANEOUS**

- 9.1. Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 9.2. No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 9.3. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.
- 9.4. The OWNER will issue a purchase order to the CONTRACTOR for the work.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in triplicate. One counterpart each has been delivered to OWNER, CONTRACTOR and ENGINEER and OWNER. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or by ENGINEER on their behalf.

This Agreement will be effective on _____, 2015.

OWNER

CONTRACTOR

By _____

By _____

Title _____

Title _____

Attest _____

Attest _____

**END OF SECTION**

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

**ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE**

and

Issued and Published Jointly By



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These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor Nos. C-520 or C-525 (2002 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the EJCDC Construction Documents, General and Instructions (No. C-001) (2002 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. C-800) (2002 Edition).

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## GENERAL CONDITIONS

### ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

---

#### 1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*--The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*--The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*--A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*-- Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*--The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*--The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*--See Paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*--The individual or entity named as such in the Agreement.

20. *Field Order*--A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

22. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

23. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*--The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*--A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*--The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*--Polychlorinated biphenyls.

31. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*--A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Related Entity* -- An officer, director, partner, employee, agent, consultant, or subcontractor.

37. *Resident Project Representative*--The authorized representative of Engineer who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Schedule of Submittals*--A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

40. *Schedule of Values*--A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

41. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

42. *Site*--Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

43. *Specifications*--That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain

administrative requirements and procedural matters applicable thereto.

44. *Subcontractor*--An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

45. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

46. *Successful Bidder*--The Bidder submitting a responsive Bid to whom Owner makes an award.

47. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

48. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

49. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. *Unit Price Work*--Work to be paid for on the basis of unit prices.

51. *Work*--The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

52. *Work Change Directive*--A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times

but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

## 1.02 Terminology

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

### B. Intent of Certain Terms or Adjectives

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

### C. Day

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

### D. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

- a. does not conform to the Contract Documents, or
- b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or
- c. has been damaged prior to Engineer's - recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

### *E. Furnish, Install, Perform, Provide*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## ARTICLE 2 - PRELIMINARY MATTERS

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### *2.01 Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

### *2.02 Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

### *2.03 Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement

or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

### *2.04 Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

### *2.05 Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule; indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

### *2.06 Preconstruction Conference*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

### *2.07 Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.



1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

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3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or

responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of, their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work

(unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

### 3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

### 3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing all of the Work under a direct or indirect contract with Contractor, shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or
2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

B. The prohibition of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

### 3.06 *Electronic Data*

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's

sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party..

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

## ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

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### 4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

#### 4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

#### 4.03 *Differing Subsurface or Physical Conditions*

A. *Notice*: If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

#### C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

#### 4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

#### B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will

promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

#### 4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

#### 4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to

entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06. G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 5 - BONDS AND INSURANCE

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### 5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified

in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

#### 5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

#### 5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

#### 5.04 *Contractor's Liability Insurance*

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection

from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insured (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;



3. include completed operations insurance;

4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

#### 5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

#### 5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, (other than caused by flood) and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any

deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

#### 5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

#### 5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order .

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

#### 5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract

Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

#### 5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

### ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

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#### 6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or

received from the superintendent shall be binding on Contractor.

#### 6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

#### 6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

#### 6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

#### 2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;

b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change,

**B. Substitute Construction Methods or Procedures:** If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

**C. Engineer's Evaluation:** Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

**D. Special Guarantee:** Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

**E. Engineer's Cost Reimbursement:** Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract

Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

**F. Contractor's Expense:** Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

#### 6.06 Concerning Subcontractors, Suppliers, and Others

**A.** Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

**B.** If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

**C.** Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual

or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

#### 6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

#### 6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.



6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Draw-

ings or Specifications or to the acts or omissions of Owner or Engineer or , or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

#### 6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

#### 6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

##### 1. Shop Drawings

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples*: Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals , any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

##### C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents

with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

#### *D. Engineer's Review*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

#### *E. Resubmittal Procedures*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

#### *6.18 Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or

disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

#### *6.19 Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

#### *6.20 Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or

arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

#### 6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal

shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

## ARTICLE 7 - OTHER WORK AT THE SITE

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### 7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and
2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and

properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

#### 7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

#### 7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

## ARTICLE 8 - OWNER'S RESPONSIBILITIES

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### 8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

### 8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

### 8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### 8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

### 8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

### 8.06 *Insurance*

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

### 8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

### 8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

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9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep

Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.



9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show

partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to, the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

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10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall

promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

#### 10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

#### 10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

#### 10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

#### 10.05 *Claims*

A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim, shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,

2. approve the Claim, or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 - COST OF THE WORK;  
ALLOWANCES; UNIT PRICE WORK

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11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and

Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have

resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expresses, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

**B. Costs Excluded:** The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

**C. Contractor's Fee:** When all the Work is performed on the basis of cost-plus, Contractor's fee shall

be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

**D. Documentation:** Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

## 11.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

### B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

### C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

## 11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

## ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

### 12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an

allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

### 12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted

by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

### 12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

## ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

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### 13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

### 13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

### 13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to



be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

#### 13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

#### 13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### 13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

#### 13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
2. correct such defective Work; or
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications .

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

#### 13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

#### 13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

### ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

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#### 14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress

payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

#### 14.02 *Progress Payments*

##### A. Applications for Payments

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

##### B. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent

inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

#### *C. Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

#### *D. Reduction in Payment*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

- a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
- b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
- c. there are other items entitling Owner to a set-off against the amount recommended; or
- d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

#### *14.03 Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

#### *14.04 Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, , Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial

Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

#### 14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

#### 14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals

that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 14.07 *Final Payment*

##### A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;

b. consent of the surety, if any, to final payment;

c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

##### B. *Engineer's Review of Application and Acceptance*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations

under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

#### C. Payment Becomes Due

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and , will be paid by Owner to Contractor.

#### 14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

#### 14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance

with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

## ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

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### 15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

### 15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety ) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and



3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

#### 15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

#### 15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

## ARTICLE 16 - DISPUTE RESOLUTION

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### 16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be

governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or

2. agrees with the other party to submit the Claim to another dispute resolution process, or

3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

## ARTICLE 17 - MISCELLANEOUS

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### 17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

### 17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### 17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

### 17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

### 17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

### 17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

**SPECIFICATION 00810**

**SUPPLEMENTARY GENERAL CONDITIONS**

**GENERAL**

These Supplementary Conditions amend or supplement the "Standard General Conditions of the Construction Contract" (2002 edit.) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect. These Supplementary Conditions are arranged in the same order as the paragraphs in the General Conditions and the paragraphs herein bear comparable numbers to those of the General Conditions but with the prefix "SC".

**SC-2.01 INSURANCE CERTIFICATES**

Delete paragraph 2.01.B of the General Conditions in its entirety and insert the following in its place:

- B. Evidence of Insurance. Before any work at the site is started, CONTRACTOR shall deliver to Owner, with a copy to Engineer, certificates (and other evidence of insurance requested by owner) which CONTRACTOR is required to purchase and maintain in accordance with paragraphs 5.03 through 5.09.

**SC-5.01.B PERFORMANCE AND OTHER BONDS**

Add the following language at the end of Paragraph 5.01.B of the General Conditions:

Contractor may furnish irrevocable letters of credit, each in an amount at least equal to the Contract Price, in place of performance and payment bonds. Such letters of credit shall remain in effect for the same terms as those required for the bonds.

**SC-5.04 CONTRACTOR'S LIABILITY INSURANCE**

The limits of liability for the insurance required by Paragraph 5.04.A of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

Worker's Compensation, etc., under Paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:

- 1. State: Statutory
- 2. Applicable Federal (e.g., Longshoreman's): Statutory
- 3. Employer's Liability: Statutory  
(\$1,000,000 minimum)

Comprehensive General Liability (under Paragraphs 5.04.A.2 through 5.04.A.5 of the General Conditions):

1. A general liability insurance policy for personal injury, including death, and damages to property, both real and personal, in the amounts of not less than One Million Dollars (\$1,000,000) per person and One Million Dollars (\$1,000,000) per occurrence for personal injury, and One Million Dollars (\$1,000,000) per occurrence for property damage. Such policies of insurance shall name the Owner and EnSafe Inc. and their respective agents and employees as named insureds.
2. Property Damage Liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.

5.04.A.6 COMPREHENSIVE AUTOMOBILE LIABILITY:

1. Bodily Injury:
 

\$1,000,000	Each Person
\$1,000,000	Each Accident
2. Property Damage:
 

\$1,000,000	Each Occurrence
-------------	-----------------

SC-5.04.B.4 CONTRACTUAL LIABILITY INSURANCE

The Contractual Liability required by Paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:

1. Bodily Injury:
 

\$1,000,000	Each Person
-------------	-------------
2. Property Damage:
 

\$1,000,000	Each Occurrence
\$5,000,000	Annual Aggregate

SC-5.05.A OWNER'S LIABILITY INSURANCE

Delete Paragraph 5.05.A of the General Conditions in its entirety and insert the following in its place:

5.05.A The CONTRACTOR shall provide for additional liability coverage for OWNER as will protect OWNER against claims which may arise from operations under the Contract Documents.

Such insurance coverage shall be provided by endorsement as additional insureds on CONTRACTOR'S General Liability Policy or by a separate "Owner's Protection Policy."

SC-5.06.A PROPERTY DAMAGE

Delete Paragraph 5.06.A of the General Conditions in its entirety and insert the following in its place.

5.06.A Unless otherwise provided in these Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement value thereof (subject to such deductible amounts as may be provided in these Supplementary Conditions or required by law). The amount of insured value shall be so indicated in the certificates submitted by CONTRACTOR in accordance with the Paragraph 2.01.B. The insurance shall include the interest of OWNER, CONTRACTOR, and Subcontractors in the Work, shall insure against the perils of fire and extended coverage, shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in these Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all risk" insurance or otherwise provided in these Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the work stored on or off the site or in transit when such portions of the work are to be included in an Application for Payment. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with Paragraphs 5.06.A and 5.06.B shall contain a provision that the coverage afforded will not be canceled or materially changed until at least thirty days prior written notice has been given to OWNER.

SC-5.06.B BOILER AND MACHINERY INSURANCE

Delete Paragraph 5.06.B of the General Conditions in its entirety and insert the following in its place.

5.06.B CONTRACTOR shall purchase and maintain such boiler and machinery insurance as may be required and shall include the interests of OWNER, CONTRACTOR, and Subcontractors in the Work.

SC-5.06.C Delete Paragraph 5.06.C of the General Conditions in its entirety.

SC-5.06.D INSURANCE DEDUCTIBLES

Delete Paragraph 5.06.D of the General Conditions in its entirety and insert the following in its place:

5.06.D CONTRACTOR shall be responsible for protection of the interests of OWNER, Subcontractors and himself in the Work to the extent of any deductible amounts that are provided in the property insurance policy. The maximum deductible amount shall be \$500.00 or less where required by law.

SC-5.08.A RECEIPT AND APPLICATION OF PROCEEDS

Delete Paragraph 5.08.A of the General Conditions in its entirety and insert the following in its place:

5.08.A Any insured loss under the policies of insurance required by Paragraph 5.06 shall be adjusted with OWNER and CONTRACTOR and made payable to OWNER and CONTRACTOR as trustees for the insurers, as their interests may appear, subject other requirements of any applicable mortgage clause and of Paragraph 5.08.B. OWNER and CONTRACTOR shall deposit in a separate account any money so received, and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damage Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof, and the Work and the cost thereof covered by an appropriated Change Order.

SC-5.08.B OBJECTIONS TO RECEIPT AND APPLICATION OF PROCEEDS

Delete Paragraph 5.08.B of the General Conditions in its entirety and insert the following in its place:

5.08.B OWNER and CONTRACTOR as trustees shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to OWNER'S and CONTRACTORS exercise of this power. If such objection be made, OWNER and CONTRACTOR as trustees shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If required in writing by any party in interest, OWNER and CONTRACTOR as trustees shall upon the occurrence of an insured loss, give bond for the proper performance of their duties.

SC-5.09.A ACCEPTANCE OF BONDS OR INSURANCE

Delete Paragraph 5.09.A of the General Conditions in its entirety and insert the following in its place:

5.09.A If OWNER has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by CONTRACTOR in accordance with Paragraphs 5.01 through 5.06.D on the basis of its not complying with the Contract Documents, OWNER will notify CONTRACTOR in writing thereof within ten days of the date of delivery of such certificates to OWNER in accordance with Paragraph 2.01.B. CONTRACTOR will provide to OWNER such additional information in respect of insurance provided by him as OWNER may reasonably request. Failure by OWNER to give any such notice of objection within the time provided shall constitute acceptance of such insurance purchased by CONTRACTOR as complying with the Contract Documents.



SC-6.05.G. EXPERIENCE CLAUSE

Add the following subparagraph 6.05.G:

- G. When experience clauses have been required in the technical specifications, submission of a bond or deposit is permitted in lieu of a specified experience period, and the period of time for which such bond or deposit is required shall be the same as the experience period specified.

SC-6.06 CONCERNING SUBCONTRACTORS

Delete Paragraph 6.06.B of the General Conditions in its entirety and insert the following in its place:

With its proposal, the Proposer will submit to Owner a list of all Subcontractors and other persons or organizations (including those who are to furnish the principal items of material and equipment) proposed for any portion of the Work having a value in excess of \$25,000. Such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of qualification for each such Subcontractor, person and organization if requested by the Owner. If Owner or Engineer after due investigation has reasonable objection to any proposed Subcontractor, other person or organization, either may, before giving the Notice of Award, request the apparent Successful Proposer to submit an acceptable substitute without an increase in Proposal price. If the apparent Successful Proposer declines to make any such substitution, the contract shall not be awarded to such Proposer, but this declining to make any such substitution will not constitute grounds for sacrificing his Proposal Security. Any Subcontractor, other person or organization so listed and to whom Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer.

SC-6.13 SAFETY AND PRECAUTION

Add the following language immediately after last paragraph of Section 6.13 of the General Conditions:

"Tennessee Public Chapter No. 692 (Senate Bill 1726) of the Public Acts of 1978 passed on April 18, 1978 requires CONTRACTORS to notify utilities 3-10 days prior to starting any work operation that includes but is not limited to boring, pile driving, blasting or digging, which might affect any adjacent utility. The designated toll free number for the State of Tennessee is 1-(800)-845-2594. A penalty of \$1,000.00 may be assessed for non-compliance with this law. Obtaining a permit does not relieve CONTRACTOR of the responsibility of complying with this law.

SC-13.03 TEST AND INSPECTIONS

Organizations proposed for inspections, test and approvals shall also be acceptable to ENGINEER and OWNER.

SC-14.02.A. Add the following sentence:

Application for payments shall be submitted as an original and four (4) copies. Each copy shall be notarized.

SC-17 MISCELLANEOUS

Add the following paragraphs:

SC-17.07 PROTECTION OF THE WORK

In the event of temporary suspension of work, or during inclement weather, or whenever the Engineer and Owner shall direct, the CONTRACTOR will, and will cause his subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Engineer and Owner, any work or materials shall have been damaged or injured by reason of failure on the part of the CONTRACTOR of any of his subcontractors so as to protect his work, such materials shall be removed and replaced at the expense of the CONTRACTOR.

SC-17.08 NON-LIABILITY OF OFFICIALS

No recourse under or upon any obligation, covenant, or agreement contained in the Contract Documents, or any other agreements or documents pertaining to the Work to be performed hereunder, as such Work may, from time to time, be altered or amended in accordance with the provisions hereof, or under any judgment obtained against the Owner, or by the enforcement of any assessment or by any legal or equitable proceeding by virtue of any statute or otherwise, under or independent of the contract Documents, shall be had against any official, as such past, present, or future, of the OWNER, either directly or through the OWNER, or otherwise, for any sum that may be due and unpaid by the OWNER for, or by reason of, the Work, as such may from time to time be amended. Any and all personal liability of every nature, whether at common law or in equity, or by statute or by constitution or otherwise, of any such official, as such, to respond by reason of any act or omissions on his or her part or otherwise for the payment for, or to, the OWNER is hereby expressly waived and released as a condition of and consideration for the execution of this Agreement.

SC-17.09 TIME FOR COMPLETION AND LIQUIDATED DAMAGES

Add the following subparagraph:

It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this contract: and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the "Notice to Proceed".

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the

work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

If the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part of consideration for the awarding of this contract, to pay to the Owner the amount of the sum stated in the Agreement, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the times stipulated in the contract for substantial and final completion of the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever: and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner: Provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

1. To any preference, priority or allocation order duly issued by the Government:
2. To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather: and
3. To any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (1) and (2) of this article:

Provided, further, that the Contractor shall, within ten (10) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

SC-17.10 ASSIGNMENTS

Add the following subparagraph:

The Contractor shall not assign the whole or any part of this contract or any moneys due or to become due hereunder without written consent to the Owner. In case the Contractor assigns all or any part of any moneys due or to become due under this Contract, the instrument or assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior claims if all persons, firms and corporations of services rendered or materials supplied for the performance of the work called for in this contract.

**END OF SECTION**

**DOCUMENT 00850**

**INDEX OF DRAWINGS**

<b><u>Sheet No.</u></b>	<b><u>Description</u></b>
C-0	Cover Sheet
C-1.0	Existing Conditions Site Plan
C-2.0	Site Plan
C-3.0	Grading Plan
C-4.0	Erosion Control Plan
C-5.0	Concrete Burn Pad Details
C-6.0	Burn Pan and General Details
C-7.0	Erosion Control Details

**END OF SECTION**

**PROPOSAL BOND**

KNOW ALL MEN BY THESE PRESENTS: that we, the undersigned,  
_____ as Principal, and  
_____ as Surety, are hereby held and firmly bound unto  
_____ as OWNER in the penal sum of  
_____ for payment of which, well and truly to be made, we  
hereby jointly and severally bind ourselves, successors and assigns.

Signed, this _____ day of _____, 2015.

The condition of the above obligation is such that whereas the Principal has submitted to  
_____ a certain  
PROPOSAL, attached hereto and hereby made a part hereof to enter into a contract in writing, for  
the  
Kilgore Flares Hazardous Waste Open Burn Area Modifications.

NOW, THEREFORE,

- (a) If said PROPOSAL shall be rejected, or
- (b) If said PROPOSAL shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said PROPOSAL) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said PROPOSAL, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for all and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such PROPOSAL; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF; the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____(L.S.)  
Principal

_____  
Surety

By: _____

IMPORTANT - Surety companies executing BONDS must appear on the Treasury Department most current list (Circular 570 as amended) and be authorized to transact business in the State where the project is located.

**END OF SECTION**



**NOTICE OF AWARD**

To: _____

PROJECT DESCRIPTION: Kilgore Flares Hazardous Waste Open Burn Area Modifications

The OWNER has considered the PROPOSAL submitted by you for the above described WORK in response to its Advertisement for Proposals dated _____, 2015, and information for Proposers.

You are hereby notified that your PROPOSAL has been accepted in the amount of \$_____.

You are required by the Instruction for Proposers to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND, and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your PROPOSAL as abandoned and as a forfeiture of your PROPOSAL BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this ____ day of _____ 2015.

_____  
Owner

By _____

Title _____

**ACCEPTANCE OF NOTICE**

Receipt of the above NOTICE OF AWARD is hereby acknowledged

By _____

this the _____ day of _____, 20_____

By _____

Title _____

# Construction Payment Bond

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Principal Place of Business):

OWNER (Name and Address):

## CONSTRUCTION CONTRACT

Date:

Amount:

Description (Name and Location):

## BOND

Date (Not earlier than Construction Contract Date):

Amount:

Modifications to this Bond Form:

## CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

## SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

## CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

## SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

EJCDC No. C-700 (2002 Edition)

Prepared through the joint efforts of the Surety Association of America, Engineers' Joint Contract Documents Committee, The Associated General Contractors of America, American Institute of Architects, American Subcontractors Association, and the Associated Specialty Contractor.

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference.
2. With respect to the Owner, this obligation shall be null and void if the Contractor:
  - 2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and
  - 2.2. Defends, indemnifies and holds harmless the Owner from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 12) of any claims, demands, liens or suites and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.
4. The Surety shall have no obligation to Claimants under this Bond until:
  - 4.1. Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and, with substantial accuracy the amount of the claim.
  - 4.2. Claimants who do not have a direct contract with the Contractor:
    1. Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and
    2. Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and
    3. Not having been paid within the above 30 days, have sent a written notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.
5. If a notice required by Paragraph 4 is given by the Owner to the Contractor or the Surety, that is sufficient compliance.
6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:
  - 6.1. Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
  - 6.2. Pay or arrange for payment of any undisputed amounts.
7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
8. Amounts owned by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to

- satisfy claims, if any, under any Construction Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use funds for the completion of the work.
9. The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
  10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
  11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Subparagraph 4.1 or Clause 4.2 (iii), or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
  12. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the Owner or the Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
  13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory bond and not as a common law bond.
  14. Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
  15. DEFINITIONS
    - 15.1. Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.
    - 15.2. Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.
    - 15.3. Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

(FOR INFORMATION ONLY--Name, Address and Telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE (Architect, Engineer or other party):

# Construction Performance Bond

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Principal Place of Business):

OWNER (Name and Address):

CONSTRUCTION CONTRACT

Date:

Amount:

Description (Name and Location):

BOND

Date (Not earlier than Construction Contract Date):

Amount:

Modifications to this Bond Form:

CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

EJCDC No. C-700 (2002 Edition)

Prepared through the joint efforts of the Surety Association of America, Engineers' Joint Contract Documents Committee, The Associated General Contractors of America, American Institute of Architects, American Subcontractors Association, and the Associated Specialty Contractor.

Construction Payment Bond

Page 1 of 2

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Subparagraph 3.1.
3. If there is no Owner Default, the Surety's obligation under this Bond shall arise after:
  - 3.1. The Owner has notified the Contractor and the Surety at its address described in Paragraph 10 below, that the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. If the Owner, the Contractor and Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; and
  - 3.2. The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and Surety have received notice as proved in Subparagraph 3.1; and
  - 3.3. The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Construction Contract or to a contractor selected to perform the Construction Contract in accordance with the terms of the contract with the Owner.

When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

- 4.1. Arrange for the Contractor, with consent of the Owner, to perform and complete the Construction Contract; or
- 4.2. Undertake to perform and complete the Construction Contract itself, through its agents or through independent contractors; or
- 4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and the contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or
- 4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:
  1. After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or
  2. Deny liability in whole or in part and notify the Owner citing reasons therefor.
5. If the Surety does not proceed as provided in Paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Subparagraph 4.4, and the Owner refuses the payment tendered or the

Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

6. After the owner has terminated the Contractor's right to complete the Construction Contract, and if the Surety elects to act under Subparagraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Construction Contract, the Surety is obligated without duplication for:
  - 6.1. The responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
  - 6.2. Additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 4; and
  - 6.3. Liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
7. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, or successors.
8. The surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
10. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page.
11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
12. Definitions.
  - 12.1. Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
  - 12.2. Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.
  - 12.3. Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.
  - 12.4. Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

(FOR INFORMATION ONLY--Name, Address and Telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE (Architect, Engineer or other party):

**NOTICE TO PROCEED**

To: _____

Date: _____

Project: _____

You are hereby notified to commence work in accordance with the Agreement dated _____, on or before _____, and you are to substantially complete the WORK within _____ consecutive calendar days thereafter and finally complete the WORK within _____ consecutive calendar days after substantial completion. Therefore the date of substantial completion is _____, and the date of final completion of all WORK is _____.

_____  
(Owner)

By: _____

Name & Title: _____

ACCEPTANCE OF NOTICE:

Receipt of the above NOTICE TO PROCEED is hereby acknowledged

By _____

this the ____ day of _____, 2015

By: _____

Name & Title: _____

# CONTRACT CHANGE ORDER FORM

(Instructions on reverse side)

No. _____

PROJECT: _____

DATE OF ISSUANCE: _____ EFFECTIVE DATE _____

OWNER: _____

OWNER's Contract No. _____

CONTRACTOR: _____ ENGINEER: _____

You are directed to make the following changes in the Contract Documents.

Description:

Reason for Change Order:

Attachments: (List documents supporting change)

CHANGE IN CONTRACT PRICE:	CHANGE IN CONTRACT TIME:
Original Contract Price \$ _____	Original Contract Times Substantial Completion: _____ Ready for final payment: _____ days or date
Net changes from previous Change Orders No. _____ to No. _____ \$ _____	Net change from previous change Orders No. _____ to No. _____ _____ days
Contract Price prior to this Change Order \$ _____	Contract Times Prior to this Change Order Substantial Completion: _____ Ready for final payment: _____ days or date
Net Increase (decrease) of this Change Order \$ _____	Net Increase (decrease) of this Change Order _____ days
Contract Price with all approved Change Orders \$ _____	Contract Times with all approved Change Orders Substantial Completion: _____ Ready for final payment: _____ days or date

RECOMMENDED:

APPROVED:

ACCEPTED:

By _____  
Engineer (Authorized Signature)

By _____  
Owner (Authorized Signature)

By _____  
Contractor (Authorized Signature)

Date: _____

Date: _____

Date: _____

EJCDC No. 1910-8-B (1990 Edition)

Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America.



## **CHANGE ORDER**

### **INSTRUCTIONS**

#### **A. GENERAL INFORMATION**

This document was developed to provide a uniform format for handling contract changes that affect Contract Price or Contract Time. Changes that have been initiated by a Work Directive Change must be incorporated into a subsequent Change Order if they affect Price or Time.

Changes that affect Contract Price or Contract Time should be promptly covered by a Change Order. The practice of accumulating change order items to reduce the administrative burden may lead to unnecessary disputes.

For supplemental instructions and minor changes not involving a change in the Contract Price or Contract Time, a Field Order may be used.

#### **B. COMPLETING THE CHANGE ORDER FORM**

Engineer initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer has completed and signed the form, all copies should be sent to Contractor for approval. After approval by Contractor, all copies should be sent to Owner for approval. Engineer should make distribution of executed copies after approval by Owner.

If a change only applies to price or to time, cross out the part of the tabulation that does not apply.

CONTRACTOR'S APPLICATION FOR PAYMENT  
Request No. _____

From: _____ (CONTRACTOR)

To: _____ (OWNER)

Description of Job: _____

ENGINEER's Project No. _____ 0888816224 _____

Date of Completion: _____ Amount of Contract: _____ Dates of Estimates: _____  
 Original _____ Original _____ From: _____  
 Revised _____ Revised _____ To: _____

Item No.*	Item Description	Bid Quantity	Unit Price	This Period Quantity	This Period Amount	Total to Date Quantity	Total to Date Amount
Total (Original Contract)							
C.O. No. 1							
C.O. No. 2							

TOTAL ESTIMATED CONTRACT PRICE \$ _____  
 APPROVED CHANGE ORDERS \$ _____  
 TOTAL ESTIMATED CONTRACT PRICE (Including Change Orders) \$ _____

AMOUNT	THIS PERIOD	TOTAL TO DATE
Amount Earned	\$ _____	\$ _____
Material Stored	\$ _____	\$ _____
Amount Retained (10%)	\$ _____	\$ _____
Less Previous Payments	\$XXXXXXXXXXXXX \$ _____	
Balance Due This Payment	\$ _____	\$ _____

ESTIMATED % JOB COMPLETED

Time _____ %

Value _____ %

CONTRACTOR's Certification:

The undersigned CONTRACTOR certifies that (1) all previous progress payments received from OWNER on account of Work done under the Contract referred to above have been applied to discharge in full all obligations of CONTRACTOR incurred in connection with Work covered by prior Applications for Payment numbered 1 through _____ inclusive; and (2) title to all materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all liens, claims, security interests and encumbrances (except such as covered by Bond acceptable to OWNER).

Dated _____, 20____ _____

Contractor

By _____

Payment of the above AMOUNT DUE THIS APPLICATION is recommended.

Dated _____, 20____ _____

Resident Project Representative

Dated _____, 20____ _____

EnSafe Inc. Project Engineer

APPROVED BY:

Dated _____, 20____ _____

Manager

Item No.*	Item Description	Bid Quantity	Unit Price	This Period Quantity	Amount	Total to Date Quantity	Amount
<p>Total (Original Contract)</p> <p>C.O. No. 1 C.O. No. 2</p>							

NOTE: LIST CHANGE ORDERS SEPARATELY

## SECTION 01010

### SUMMARY OF WORK

#### PART 1 — GENERAL

##### 1.01 SCOPE OF WORK

- A. Without effect on the specific requirements stipulated herein, the Scope of Work can be summarized as follows:
  - 1. Borrowing from offsite, hauling, placing, and compacting clean soil as required to achieve final contours as shown in the Drawings.
  - 2. Installing gravel road for access to burn pads.
  - 3. Construction of ten (10) concrete burn pads as shown in the Drawings. Steel burn pans are to be provided by others.
  - 4. Seeding, fertilizing, and mulching vegetative soil and disturbed soil.
  - 5. Preparing site-specific Stormwater Pollution Prevention Plan and obtain TDEC General Permit for Stormwater Discharges Associated with Construction Activity.
  - 6. Implementing and maintaining the erosion and sediment controls that are referenced in the SWPPP prepared by the Contractor.

##### 1.02 PRESENCE OF HAZARDOUS MATERIALS

- A. The Work could involve exposure to hazardous materials. The Contractor shall be required to attend site-specific training course by Kilgore Flares regarding the presence of these materials. Documentation shall be provided to the Engineer demonstrating that the personnel working on the affected areas of this Project are properly trained and will have the proper personal protective equipment for their Work. Contractor personnel shall be 30-hour OSHA trained in Construction Safety.

##### 1.03 RELATED REQUIREMENTS

- A. Section 01410: Testing Laboratory Services

##### 1.04 WORK SEQUENCE

- A. Coordinate the work with the construction schedules of Subcontractors on the Site, the Engineer, and the independent testing laboratory, if necessary.
- B. Comply with the general sequence of Work described on the Drawings.

- C. Fulfill the Contractor's Responsibilities pertaining to testing laboratory services, particularly with respect to proper advance notification.
- D. Maintain reasonable access to all property.

#### 1.05 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall limit use of the premises for Work and for storage to allow for Work by Subcontractors
- B. Assume full responsibility for protecting and safekeeping Products under this Contract.
- C. Move any stored Products, under Contractor's control, which interfere with operations of a Subcontractor.
- D. Obtain and pay for the use of additional storage or work areas needed for operations.

#### 1.06 OTHER ITEMS AFFECTING THE EXECUTION OF THE WORK

- A. Attention to Work

The Contractor shall give personal attention to and shall supervise the Work to the end that it shall be prosecuted faithfully; and, when not personally present on the Site, shall at all times be represented by a competent superintendent or foreman who shall be present at the Site and who shall receive and obey all instructions or orders given under this Contract, and who shall have full authority to execute the same, and to supply materials, tools, and labor without delay, and who shall be the legal representative of the Contractor. The Contractor shall be liable for the faithful observance of any instructions delivered to him or to his authorized representatives.

- B. Access to Work

The Contractor shall at all times provide proper facilities for access and inspection of the Work by representatives of the Owner and of such official Governmental agencies as may be designated by the Engineer as having jurisdictional rights to inspect the Work.

### **PART 2 — PRODUCTS**

(Not Used)

### **PART 3 — EXECUTION**

(Not Used)

**END OF SECTION 01010**

**SECTION 01050  
FIELD ENGINEERING**

**PART 1 – GENERAL**

1.01            REQUIREMENTS INCLUDED

- A.    Provide and pay for field engineering services required for the Project.
  - 1.    Survey work required in execution of Project.
  - 2.    Civil, structural or other professional engineering services specified, or required to execute Contractor's construction methods.
- B.    Owner's Representative will identify existing control points and property line corner stakes indicated on the drawings, as required.

1.02            RELATED REQUIREMENTS

- A.    Conditions of the Contract
- B.    Section 01010: Summary of Work
- C.    Section 01720: Project Record Documents

1.04            SURVEY REFERENCE POINTS

- A.    Existing basic horizontal and vertical control points for the Project are those designated on drawings.
- B.    Locate and protect control points prior to starting site work, and reserve all permanent reference points during construction.
  - 1.    Make no changes or relocations without prior written notice to Engineer and Owner.
  - 2.    Report to Engineer and Owner when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
  - 3.    Require surveyor to replace project control points which may be lost or destroyed.
    - a.    Establish replacements based on original survey control.

1.05            PROJECT SURVEY REQUIREMENTS

- A.    Provide field engineering services using recognized engineering survey practices.



- B. Establish elevations, lines and levels for:
  - 1. Site improvements: stakes for grading, fill and cut, utility locations, slopes and inverts.
  - 2. Grids for structure location.
  - 3. Batter boards and corners for foundations, slabs, columns, and floors.
- C. The Contractor shall be responsible for setting all grade stakes, lines and levels, and preparation of cut sheets. The Contractor shall provide level, level rod and tripod on the job site at all times for the purpose of checking grades as deemed necessary by the Engineer and Owner.

The requirement for this work to be performed by a registered land surveyor may be waived by the Engineer and Owner in the event that the Contractor desires to utilize his own personnel who are qualified to set grade and alignment stakes.

- D. Periodically verify all layouts.

#### 1.06 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.

#### 1.07 SUBMITTALS

- A. On request of Engineer and Owner, submit documentation to verify accuracy of field engineering work.

### **PART 2 - PRODUCTS**

(Not used)

### **PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## SECTION 01090

### REFERENCE STANDARDS

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

##### 1.02 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents or applicable codes establish stricter standards.
- B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

##### 1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

- A. Obtain copies of referenced standard direct from publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents.

###### AASHTO

American Association of State Highway and Transportation Officials  
444 North Capital Street, Northwest  
Washington, D.C. 20001

###### ACI

American Concrete Institute  
P. O. Box 19150  
Detroit, Michigan 48219

ANSI American National Standards Institute  
(Formerly American Standards Association - ASA)  
1430 Broadway  
New York, New York 10018

AREA American Railroad Engineering Association  
2000 "L" Street, Northwest  
Washington, D.C. 20036

ASCE American Society of Civil Engineers  
345 East 47th Street  
New York, New York 10017

ASTM American Society for Testing and Materials  
1916 Race Street  
Philadelphia, Pennsylvania 19103

AWWA American Water Works Association  
6666 West Quincy Avenue  
Denver, Colorado 80235

CRSI Concrete Reinforcing Steel Institute  
180 North LaSalle Street  
Chicago, Illinois 60601

FHWA Federal Highway Administration  
Federal Building, U.S. Courthouse  
Nashville, Tennessee 37202

FSS Federal Specification and Standards  
General Services Administration  
Specifications and Consumer Information Distribution  
Section (WFSIS)  
Washington Navy Yard, Building 197  
Washington, D.C. 20407

TDEC Tennessee Department of Environment and Conservation  
401 Church Street  
L&C Tower  
Nashville, Tennessee 37243

TDOT Tennessee Department of Transportation  
James K. Polk Building  
505 Deaderick Street  
Nashville, Tennessee 37219

## **PART 2 - PRODUCTS**

(Not used)

## **PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## **SECTION 01150**

### **MEASUREMENT AND BASIS OF PAYMENT**

#### **PART 1 – GENERAL**

##### 1.01 ITEMS INCLUDED

- A. Those items included in the proposal which have been installed in accordance with the Plans and Specifications and which have been approved by the Engineer and Owner shall be measured and paid for in the manner presented hereinafter. Payment shall be compensation in full for furnishing all materials and equipment and performing all labor and services necessary for constructing complete all of the work, ready for operation as shown on the Plans and as specified herein. Any work specified but not included in the Proposal shall be considered incidental and shall not be a separate pay item.

##### 1.02 RELATED REQUIREMENTS

- A. Section 00311: Proposal Form
- B. Section 00511: Agreement Form
- C. Section 01152: Applications for Payment
- D. Section 01700: Contract Closeout

##### 1.03 MEASUREMENT AND BASIS OF PAYMENT

- A. Measurement under this contract shall be by the lump sum.
- B. The Contract Lump Sum Price shall be full compensation for the work under this contract.

#### **PART 2 - PRODUCTS**

(Not Used)

#### **PART 3 – EXECUTION**

(Not used)

**END OF SECTION**

## SECTION 01152

### APPLICATIONS FOR PAYMENT

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Submit Applications for Payment to Engineer and Owner in accord with the schedule established by Conditions of the Contract and Agreement Between Owner and Contractor.

##### 1.02 RELATED REQUIREMENTS

- A. Agreement Between Owner and Contractor: Lump Sum and Unit Prices.
- B. Conditions of the Contract: Progress Payments, Retainages and Final Payment.
- C. Section 01700: Contract Closeout.

##### 1.03 FORMAT AND DATA REQUIRED

- A. Submit applications typed on the Application for Payment form included herein, with itemized data typed on 8-1/2" x 11" white paper continuation sheets.
- B. Provide itemized data on continuation sheet:
  - 1. Format, schedules, line items and values: Those of the Schedule of Values accepted by Engineer and Owner.

##### 1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Application Form:
  - 1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
  - 2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.
  - 3. Execute certification with signature of a responsible officer of Contract firm.
- B. Continuation Sheets:
  - 1. Fill in total list of all scheduled component items of Work, with item number and scheduled dollar value for each item.
  - 2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored.
    - a. Round off values to nearest dollar, or as specified for Schedule of Values.

3. List each Change Order executed prior to date of submission, at the end of the continuation sheets.
  - a. List by Change Order Number, and description, as for an original component item of work.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:
  1. Project
  2. Application number and date
  3. Detailed list of enclosures
  4. For stored products:
    - a. Item number and identification as shown on application.
    - b. Description of specific material.
- B. Submit one copy of data and cover letter for each copy of application.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in Application form as specified for progress payments.
- B. Use continuation sheet for presenting the final statement of accounting as specified in Section 01700 - Contract Closeout.

1.07 SUBMITTAL PROCEDURE

- A. Submit Application for Payment to Engineer and Owner at the times stipulated in the Agreement.
- B. Number: Five copies of each Application.
- C. When Engineer and Owner finds Application properly completed and correct, he will transmit certificate for payment to Owner, with copy to Contractor.

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## SECTION 01153

### CHANGE ORDER PROCEDURES

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Promptly implement change order procedures.
  - 1. Provide full written data required to evaluate changes.
  - 2. Maintain detail records of work done on a time-and-material/force account basis.
  - 3. Provide full documentation to Engineer and Owner on request.
- B. Designate in writing the member of Contractor's organization:
  - 1. Who is authorized to accept changes in the Work.
  - 2. Who is responsible for informing others in the Contractor's employ of the authorization of changes in the Work.
- C. Owner will designate in writing the person who is authorized to execute Change Orders.

##### 1.02 RELATED REQUIREMENTS

- A. Agreement: The amount of established lump sum prices.
- B. Conditions of the Contract:
  - 1. Methods of determining cost or credit to Owner resulting from changes in Work made on a time and material basis.
  - 2. Contractor's claims for additional costs.
- C. Section 01152: Applications for Payment
- D. Section 01720: Project Record Documents

##### 1.03 DEFINITIONS

- A. Change Order: See General Conditions
- B. Engineer's Supplemental Instructions: A written order, instructions, or interpretations, signed by Engineer making minor changes in the Work not involving a change in Contract Sum or Contract Time.



1.04 PRELIMINARY PROCEDURES

- A. Owner or Engineer may initiate changes by submitting a Proposal Request to Contractor. Request will include:
1. Detailed description of the Change, Products, and location of the change in the Project.
  2. Supplementary or revised Drawings and Specifications.
  3. The projected time span for making the change, and a specific statement as to whether overtime work is, or is not authorized.
  4. A specific period of time during which the requested price will be considered valid.
  5. Such request is for information only, and is not an instruction to execute the changes, nor to stop Work in progress.
- B. Contractor may initiate changes by submitting a written notice to Engineer and Owner containing:
1. Description of the proposed changes.
  2. Statement of the reason for making the changes.
  3. Statement of the effect on the Contract Sum and the Contract Time.
  4. Statement of the effect on the work of separate contractors.
  5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.05 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Engineer and Owner to evaluate the quotation.
- B. On request, provide additional data to support time and cost computations:
1. Labor required
  2. Equipment required
  3. Products required
    - a. Recommended source of purchase and unit cost.
    - b. Quantities required
  4. Taxes, insurance and bonds
  5. Credit for work deleted from Contract, similarly documented.
  6. Overhead and profit.
  7. Justification for any change in Contract Time.

- C. Support each claim for additional costs, and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal, plus additional information:
  - 1. Name of the Owner's authorized agent who ordered the work, and date of the order.
  - 2. Dates and times work was performed, and by whom.
  - 3. Time record, summary of hours worked, and hourly rates paid.
  - 4. Receipts and invoices for:
    - a. Equipment used, listing dates and times of use.
    - b. Products used, listing of quantities.
    - c. Subcontracts.

1.06 PREPARATION OF CHANGE ORDERS

- A. Engineer and Owner will prepare each Change Order.
- B. Form: Contract Change Order form included herein.
- C. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
- D. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

1.07 LUMP-SUM/FIXED PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
  - 1. Engineer's Proposal Request and Contractor's responsive Proposal as mutually agreed between Owner and Contractor.
  - 2. Contractor's Proposal for a change, as recommended by Engineer and Owner.
- B. Owner and Engineer will sign and date the Change Order as authorization for the Contractor to proceed with the changes.
- C. Contractor will sign and date the Change Order to indicate agreement with the terms therein.

1.08 UNIT PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
  - 1. Engineer's definition of the scope of the required changes.
  - 2. Contractor's Proposal for a change, as recommended by Engineer and Owner.
  - 3. Survey of completed work.

- B. The amounts of the unit prices to be:
  - 1. Those stated in the Agreement.
  - 2. Those mutually agreed upon between Owner and Contractor.
- C. When quantities of each of the items affected by the Change order can be determined prior to start of the work:
  - 1. Owner and Engineer will sign and date the Change Order as authorization for Contractor to proceed with the changes.
  - 2. Contractor may sign and date the Change Order to indicate agreement with the terms therein.
- D. When quantities of the items cannot be determined prior to start of the work:
  - 1. Engineer or Owner will issue a construction change authorization directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.
  - 2. At completion of the change, Engineer and Owner will determine the cost of such work based on the unit prices and quantities used.
    - a. Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.
  - 3. Engineer will sign and date the Change Order to indicate his agreement with the terms therein.
  - 4. Owner and Contractor will sign and date the Change Order to indicate their agreement with the terms therein.

1.09 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. Periodically revise Request for Payment forms to record each change as a separate item of Work and to record the adjusted Contract Sum.
- B. Periodically revise the Construction Schedule to reflect each change in Contract Time.
- C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## **SECTION 01200**

### **PROJECT MEETINGS**

#### **PART 1 - GENERAL**

##### 1.01 REQUIREMENTS INCLUDED

- A. Within twenty (20) days after the delivery of the executed Agreement and prior to commencing work on the project, the Contractor shall meet with the Engineer and the Owner for a Preconstruction Conference. The time and place shall be designated by the Owner and Engineer.
- B. As he sees fit, the Engineer and Owner may periodically request that the Contractor meet with the Owner and the Engineer to discuss the progress of the Work. The Contractor shall attend such meetings.

##### 1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Notice of Award
- C. Section 01310: Construction Schedules

##### 1.03 RECORD OF DISCUSSION

- A. The Engineer shall prepare a written record of the discussions conducted during such meetings and shall distribute a copy to each party in attendance or affected by the discussions.
- B. Any party whose understanding of a discussion or action differs from that presented by the Engineer and Owner in the written record shall promptly notify the Engineer and Owner of the difference.

#### **PART 2 - PRODUCTS**

(Not used)

#### **PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## SECTION 01310

### CONSTRUCTION SCHEDULES

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Within ten (10) days after the delivery of the Notice to Proceed, prepare and submit to Engineer and Owner estimated construction progress scheduled for the Work, with subscheduled of related activities which are essential to its progress.
- B. Submit revised progress schedules periodically.

##### 1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Section 01010: Summary of Work
- C. Section 01200: Project Meetings
- D. Section 01340: Shop Drawings, Product Data and Samples

##### 1.03 FORM OF SCHEDULES

- A. Prepare schedules in the form of a horizontal bar chart.
  - 1. Provide separate horizontal bar for each trade or operation.
  - 2. Horizontal time scale: Identify the first work day of each week.
  - 3. Scale and spacing: To allow space for notations and future revisions.
  - 4. Minimum sheet size: 8-1/2" x 11"
- B. Format of listings: The chronological order of the start of each item of work.
- C. Identification of listings: By major specifications section numbers.

##### 1.04 CONTENT OF SCHEDULES

- A. Construction Progress Schedule:
  - 1. Show the complete sequence of construction by activity.
  - 2. Show the dates for the beginning and completion of each major element of construction.
  - 3. Show projected percentage of completion for each item, as of the first day of each month.
  - 4. Consider the following requirements in preparing the schedule:

- B. Submittals Schedule for Shop Drawings, Product Data Samples. Show:
    - 1. The dates for Contractor's submittals.
    - 2. The dates approved submittals will be required from the Engineer and Owner. Allow a minimum of three weeks.
  - C. Provide and submit subschedules for each state of work specified in Section 01010.
  - D. Provide subschedules to define critical portions of prime schedules.
- 1.05 PROGRESS REVISIONS
- A. Indicate progress of each activity to date of submission.
  - B. Show changes occurring since previous submission of schedule:
    - 1. Major changes in scope.
    - 2. Activities modified since previous submission.
    - 3. Revised projections of progress and completions.
    - 4. Other identifiable changes.
  - C. Provide a narrative report as needed to define:
    - 1. Problem areas, anticipated delays, and the impact on the schedule.
    - 2. Corrective action recommended, and its effect.
    - 3. The effect of changes on schedule of other prime contractors.
- 1.06 SUBMISSIONS
- A. Submit initial schedule within 10 days after Notice to Proceed.
    - 1. Engineer and Owner will review schedule and return review copy within 14 days after receipt.
    - 2. If required, resubmit within 7 days after return of review copy.
  - B. Submit revised progress schedules with each application for payment.
  - C. Submit the number of opaque reproductions which the Contractor requires, plus three copies which will be retained by the Engineer and Owner.
- 1.07 DISTRIBUTION
- A. Distribute copies of the reviewed schedule to:
    - 1. Job site files.
    - 2. Subcontractors.
    - 3. Other concerned parties.
  - B. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

(Not used)

**END OF SECTION**



## SECTION 01340

### SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Submit Shop Drawings, Product Data, and Samples required by Contract Documents.

##### 1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: Definitions, and Additional Responsibilities of Parties.
- B. Bid Form Items
- C. Section 01720: Project Record Documents

##### 1.03 SHOP DRAWINGS

- A. Drawings shall be presented in a clear and thorough manner.
  - 1. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
- B. Minimum sheet size: 8-1/2" x 11"

##### 1.04 PRODUCT DATA

- A. Preparation:
  - 1. Clearly mark each copy to identify pertinent products or models.
  - 2. Show performance characteristics and capacities.
  - 3. Show dimensions and clearances required.
  - 4. Show wiring or piping diagrams and controls.
- B. Manufacturer's standard schematic drawings and diagrams:
  - 1. Modify drawings and diagrams to delete information which is not applicable to the Work.
  - 2. Supplement standard information to provide information specifically applicable to the Work.

1.05 SAMPLES

- A. Office samples shall be of sufficient size and quantity to clearly illustrate:
  - 1. Functional characteristics of the product, with integrally related parts and attachment devices.
  - 2. Full range of color, texture, and pattern.

1.06 CONTRACTOR RESPONSIBILITIES

- A. Review Shop Drawings, Product Data, and Samples prior to submission.
- B. Determine and verify:
  - 1. Field measurements
  - 2. Field construction criteria
  - 3. Catalog numbers and similar data
  - 4. Conformance with specifications
- C. Coordinate each submittal with requirements of the Work and of the Contract Documents.
- D. Notify the Engineer and Owner in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.
- E. Begin no fabrication or work which requires submittals until return of submittals with Engineer and Owner approval.

1.07 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor.
- B. Number of submittals required:
  - 1. Shop Drawings: Submit the number of opaque reproductions which the Contractor requires, plus four copies which will be retained by the Engineer and Owner.
  - 2. Product Data: Submit the number of copies which the Contractor requires, plus four which will be retained by the Engineer and Owner.
  - 3. Samples: Submit the number stated in each specification section.
- C. Submittals shall contain:
  - 1. The date of submission and the dates of any previous submissions.
  - 2. The project title and number.
  - 3. Contract identification.

4. The names of:
  - a. Contractor
  - b. Supplier
  - c. Manufacturer
5. Identification of the project, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the Work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8" x 3" blank space for Contractor and Engineer stamps.
12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements, and field construction criteria, and coordination of the information within the submittal with requirements of the Work.

1.08 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by the Engineer and Owner and resubmit until approved.
- B. Shop Drawings and Product Data:
  1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
  2. Indicate any changes which have been made other than those requested by the Engineer and Owner.
- C. Samples: Submit new samples as required for initial submittal.

1.09 DISTRIBUTION

- A. Distribute reproductions of Shop Drawings and copies of Product Data which carry the Engineer stamp of approval to:
  1. Job site file
  2. Record documents file
  3. Other affected contractors
  4. Subcontractors
  5. Supplier or fabricator
- B. Distribute samples which carry the Engineer stamp of approval as directed by Engineer.

1.10 ENGINEER DUTIES

- A. Review submittals with reasonable promptness and in accord with schedule.
- B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or approval of submittal.
- C. Return submittals to Contractor for distribution, or for resubmission.

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## SECTION 01410

### TESTING LABORATORY SERVICES

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. The Owner will employ, and pay for, services of an independent testing laboratory to perform specified services. See respective specification sections for required services.

##### 1.02 RELATED DOCUMENTS

- A. Section 03300: Cast-in-Place Concrete
- B. Section 02200: Site Grading and Filling
- C. Section 02225: Aggregate Surface Course

##### 1.03 QUALIFICATION OF LABORATORIES

- A. Meet "Recommended Requirements for Independent Laboratory Qualifications," edition which is current when Agreement is signed by Owner and Contractor, published by American Council of Independent Laboratories.
- B. Meet basic requirements of ASTM E 329-72 "Standards for Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction."
- C. Be licensed to operate in the State of Tennessee.
- D. Have properly calibrated equipment, calibrated within the past 12 months by devices of accuracy traceable to either:
  - 1. National Bureau of Standards; or
  - 2. Accepted values of natural physical constants.

##### 1.04 LABORATORY DUTIES

- A. Cooperate with Engineer, Owner, and Contractor and provide qualified personnel promptly on notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction:
  - 1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
  - 2. Ascertain compliance with requirements of Contract Documents.

- C. Promptly notify Engineer, Owner, and Contractor of irregularities or deficiencies in Work which are observed during performance of duties.
- D. Promptly submit three copies of reports of inspections and tests to Engineer and Owner, and submit two copies of those reports to Contractor at the project site. Each report shall show:
  - 1. Date issued;
  - 2. Project title, number, and location;
  - 3. Testing laboratory name and address;
  - 4. Name and signature of inspector;
  - 5. Date of inspection and sampling;
  - 6. Date of test;
  - 7. Identification of product and specifications section;
  - 8. Type of inspection or test; and
  - 9. Observations regarding compliance with Contract Documents.

1.05 LIMITATIONS OF AUTHORITY

- A. Laboratory is not authorized to:
  - 1. Release, revoke, alter, or enlarge on, requirements of Contract Documents.
  - 2. Approve or accept any portion of the Work.
  - 3. Perform any duties of the Contractor.

1.06 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Laboratory personnel and provide access to Work.
- B. Provide to Laboratory, representative samples of materials to be tested, in required quantities.
- C. Furnish copies of mill test reports.
- D. Furnish casual labor and facilities:
  - 1. To provide access to work to be tested;
  - 2. To obtain and handle samples at the site;
  - 3. To facilitate inspections and tests; and
  - 4. For Laboratory's exclusive use for storage and curing of test samples.
- E. Notify Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

(Not used)

**END OF SECTION**



## SECTION 01560

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The Contractor shall furnish, install and maintain required construction aids and barriers as required to prevent public entry, and to protect the Work, existing facilities and other temporary facilities, trees and plants from construction operations required to complete the Work.
- B. The Contractor shall provide and maintain methods, equipment and temporary construction, as necessary to provide controls over environmental conditions at the construction site and related areas under Contractor's control.
- C. The Contractor shall remove all physical evidence of temporary facilities at completion of Work or when no longer necessary.

##### 1.02 DUST CONTROL

- A. The Contractor shall provide positive methods and apply dust control materials, such as water to minimize raising dust from construction operations, and provide positive means to prevent airborne dust from dispersing into the atmosphere. Dust suppressants shall be approved by the Engineer and Owner prior to use.

##### 1.03 WATER CONTROL

- A. The Contractor shall provide methods to control surface water to prevent damage to the Project, the site, or adjoining properties. The Contractor shall control fill, grading and storm water conveyances to direct surface drainage away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff locations.
- B. The Contractor shall comply with applicable Tennessee rules.
  - 1. The Contractor shall develop and implement a construction site storm water control plan that complies with the permit referenced above.
  - 2. The Contractor shall submit the construction site storm water control plan to Engineer and Owner for approval.
  - 3. The Contractor, whose activities at the site may impact storm water discharges or controls, shall affirm, by signature of one who meets signatory requirements of Tennessee's applicable rules.
- C. The Contractor shall provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and groundwater.

- D. The Contractor shall dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas.

1.04 DEBRIS CONTROL

- A. All areas under Contractor's control shall be maintained free of extraneous debris.
- B. The Contractor shall initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.
  - 1. Containers shall be provided for deposit of debris as specified in Section 01710 - Cleaning.
  - 2. The Contractor shall prohibit overloading of trucks to prevent spillages on access and haul routes. Traffic areas shall be periodically inspected to enforce requirements.
- C. The Contractor shall schedule periodic collection and disposal of debris as specified in Section 01710 - Cleaning. Additional collections and disposals of debris shall be provided whenever the periodic schedule is inadequate to prevent accumulation.

1.05 POLLUTION CONTROL

- A. The Contractor shall provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.
- B. The Contractor shall provide equipment and personnel to perform emergency measures required to contain any spillages and to remove contaminated soils or liquids. Replace previously contaminated soil areas with suitable compacted fill, topsoil and vegetation types as directed by the Engineer and Owner or the Owner.
- C. The Contractor shall take special measures to prevent harmful substances from entering public waters; and, shall prevent disposal of wastes, effluents, chemicals, sediments, or other such substances adjacent to streams, or in sanitary or storm sewers.
- D. The Contractor shall provide systems for control of atmospheric pollutants and shall:
  - 1. Prevent toxic concentrations of chemicals;
  - 2. Prevent harmful dispersal of pollutants into the atmosphere; and
  - 3. Take the necessary steps to minimize odors associated with waste relocation activities.

1.06 SILTATION AND EROSION CONTROL

- A. The Contractor shall plan and execute construction and earthwork using methods to control surface drainage from cuts and fills and from borrow and waste disposal areas in order to prevent erosion and sedimentation, and shall:
  - 1. Hold the number and size of areas of bare soil exposed at one time to a minimum; and
  - 2. Provide temporary control measures such as silt fences, etc., as shown on the Drawings or as directed by the Engineer and Owner.
- B. The Contractor shall implement erosion/sediment control measures meeting the Engineer and Owner's approval. Measures shall be maintained to the satisfaction of the Engineer and Owner and shall be removed only when the site is appropriately stabilized, as determined by the Engineer and Owner.
- C. The Contractor shall periodically inspect earthwork to detect any evidence of the start of erosion, and apply corrective measures as required to control erosion.
- D. Siltation-control structure locations may be added and adjusted at the discretion of the Engineer and Owner throughout the construction period.
- E. The Contractor shall frequently inspect sediment-control structures, including immediately following each rainfall event and at least once per day. The structures shall be repaired or replaced as needed in a prompt manner.
- F. The Contractor shall remove excess, accumulated sediments existing along the sediment-control structures and shall transport to areas designated by the Engineer and Owner or Owner.

**PART 2 - PRODUCTS**

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 CONSTRUCTION AIDS

- A. The Contractor shall provide any and all construction aids, equipment and materials required to facilitate execution of the Work, including but not limited to: scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

The Contractor shall consult with Engineer and Owner and review site conditions and factors which affect construction procedures and construction aids, including adjacent properties and public facilities which may be affected by execution of the Work.

### **3.02 GENERAL**

- A. The Contractor shall comply with applicable requirements specified in sections of Divisions 2-3.
- B. Installation of facilities shall be of a neat and reasonable uniform appearance, structurally adequate for required purposes.
- C. The Contractor shall maintain barriers during entire construction period.
- D. The Contractor shall relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements of Owner and other contractors employed at the site.

### **3.03 TREE AND PLANT PROTECTION**

- A. The Contractor shall preserve and protect existing trees and plants at the site which are designated to remain, and those adjacent to the site.
- B. The Contractor shall consult with Owner and remove agreed-upon roots and branches which interfere with construction. The Contractor shall employ a qualified tree surgeon to remove roots and branches, and to treat cuts.
- C. The Contractor shall provide temporary barriers to a height of six feet around each tree or plant or around each group of trees or plants which are designated to remain in the area of the Work.
- D. The Contractor shall protect root zones of trees and plants and shall perform the following in areas of protected trees and plants:
  - 1. Not allow vehicular traffic or parking;
  - 2. Not store materials or products;
  - 3. Prevent dumping of refuse or chemically injurious materials or liquids; and
  - 4. Prevent puddling or continuous running water.
- E. The Contractor shall carefully supervise excavating, grading and filling, and subsequent construction operations, to prevent damage.

- F. The Contractor shall replace, or suitably repair, trees and plants which have been designated to remain and which are damaged or destroyed due to construction operations.

3.04 REMOVAL

- A. The Contractor shall completely remove temporary barriers, materials, equipment, and services:
  - 1. When construction needs can be met by use of permanent construction; or
  - 2. At completion of Project.
- B. The Contractor shall clean and repair damage caused by installation or by use of temporary facilities including:
  - 1. Removal of foundations and underground installations used for construction aids, if any;
  - 2. Grading areas of site affected by temporary installations to required elevations and slopes; and
  - 3. Cleaning of the area.
- C. The Contractor shall restore existing facilities used for temporary purposes to specified or original condition.
- D. The Contractor shall restore permanent facilities, if any, used for temporary purposes to specified condition.

**END OF SECTION**

## SECTION 01567

### NONPOINT SOURCE POLLUTION ABATEMENT

#### PART 1 — GENERAL

##### 1.01 STORM WATER QUALITY

- A. The work covered hereunder is the work necessary to insure that construction activities do not temporarily or permanently harm the waters of the State of Tennessee. There are several activities over which neither the Owner nor the Engineer have control. Since the Contractor is responsible for the construction means and methods which in turn are responsible for insuring that construction does not harm the Waters of Tennessee, the Contractor is solely responsible for insuring that the above-mentioned laws and regulations are met.

#### PART 2 — PRODUCTS

(Not Used)

#### PART 3 — EXECUTION

##### 3.01 STORM WATER QUALITY MANAGEMENT

- A. The project Drawings show the typical details of the erosion and siltation control measures required for this job. If the Contractor desires to stockpile construction materials, stone, earth, etc., the location of same and protection thereof shall be outlined in an Erosion and Siltation Control Plan to be submitted to the Engineer for review.
- B. No fuel nor lubricants in bulk quantities are to be stored on site, either temporarily in vehicular tanks or in skid or trailer mounted tanks. The Subcontractor shall train all employees in the proper procedures to be followed should a spill occur.
- C. Under no circumstance will spent oil wastes be discharged anywhere on the site.
- D. Construction activities, including mobilization, shall not begin until the measures required by the project are submitted to and accepted by the Engineer.
- E. All erosion control methods shall comply with the document *Tennessee Erosion and Sediment Control Handbook* published by the Tennessee Department of Environment and Conservation.

**END OF SECTION**

**SECTION 01568**  
**EROSION CONTROL**

**PART 1 – GENERAL**

1.01 DESCRIPTION

- A. This work shall consist of erosion control on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging, the pumping of water, and any other means appropriate to restrain flooding of plant and equipment. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control. In case of abnormally cold weather, any construction such as excavation work may be delayed until warmer weather or covered to prevent freezing. See erosion control plan attached to this Section.
- B. The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features, to ensure economical, effective, and continuous erosion control throughout the construction and post-construction period.
- C. The erosion control measures must be in place prior to the ENGINEER approving any requests for payment from the Contractor.

**PART 2 – PRODUCTS**

2.01 SEDIMENT STRUCTURES

- A. Sediment basins, ponds, and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation. Silt fence is also a sediment structure that is utilized to prevent sediment from leaving the site.

2.02 CHECK DAMS

- A. Check dams are barriers composed of large stones, sand bags, or other noncorrodible materials placed across or partially crossing a natural or constructed drainway.

2.03 TEMPORARY SEEDING AND MULCHING

- A. Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion.



## **PART 3 – EXECUTION**

### **3.01 PROJECT REVIEW**

- A. Prior to the preconstruction conference the Contractor shall meet with the Engineer and go over in detail the expected problem areas in regard to the erosion control work. Different solutions should be discussed so that the best method might be determined. It is the basic responsibility of the Contractor to develop an erosion control plan acceptable to the Engineer.
- B. The project drawings show the minimum erosion and siltation control measures required for this job. If the Contractor desires to stockpile construction materials, stone, earth, etc., the location of same and protection thereof shall be outlined in an Erosion and Siltation Control Plan to be submitted to the Engineer for review.

### **3.02 PRECONSTRUCTION CONFERENCE**

- A. At the preconstruction conference, the Contractor shall submit for acceptance his schedule for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing, grading, bridges, and other structures at watercourses, construction, and paving. He shall also submit for acceptance his proposed method of erosion control on haul roads and borrow pits and his plan for disposal of waste materials. No work shall be started until the erosion control schedules and methods of operations have been accepted by the ENGINEER.

### **3.03 CONSTRUCTION REQUIREMENTS**

- A. The ENGINEER has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched (covered with geomat as given in the Specifications) as the excavation proceeds to the extent directed by the ENGINEER.
- B. The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during the preconstruction stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control

erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

- D. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages.
- E. The ENGINEER will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.
- F. The ENGINEER may increase or decrease the amount of surface area of erodible earth material to be exposed at 1 time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.
- G. In the event of conflict between these requirements and pollution control laws, rules or regulations, or other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

### 3.06 CONSTRUCTION OF STRUCTURES

#### A. Sediment Structures

- 1. Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditchlines atop waste sites; in the ditchlines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.
- 2. When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

#### B. Check Dams

- 1. Check dams shall be utilized to retard stream flow or restrict stream flow within the channel. Materials utilized to construct check dams are varied and should be clearly illustrated or explained in the Contractor's erosion control plan.
- 2. All check dams shall be keyed into the sides and bottom of the channel. A design is not needed for check dams.

- C. Temporary Seeding and Mulching: Temporary seeding and mulching shall be performed in accordance with the Section 02930, Seeding & Mulching.
- D. Under no circumstances will spent oil wastes be discharged anywhere on the site.

3.07 MAINTENANCE

- A. The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.

3.08 EROSION CONTROL OUTSIDE PROJECT AREA

- A. Temporary pollution control shall include construction work outside the project area where such work is necessary as a result of construction such as borrow pit operations, haul roads, and equipment storage sites.

**END OF SECTION**

## SECTION 01600

### MATERIAL AND EQUIPMENT

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

###### A. Material and equipment incorporated into the Work:

1. Conform to applicable specifications and standards
2. Comply with size, make, type and quality specified, or as specifically approved in writing by the Engineer and Owner.
3. Manufactured and Fabricated Products:
  - a. Design, fabricate and assemble in accord with the best engineering and shop practices.
  - b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
  - c. Two or more items of the same kind shall be identical, by the same manufacturer.
  - d. Products shall be suitable for service conditions.
  - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

##### 1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Section 01010: Summary of Work
- C. Section 01340: Shop Drawings, Product Data and Samples
- D. Section 01710: Cleaning

##### 1.03 REUSE OF EXISTING MATERIAL

- A. For material and equipment specifically indicated or specified to be reused in the Work:
  1. Use special care in removal, handling, storage and reinstallation, to assure proper function in the completed Work.

2. Arrange for transportation, storage and handling of products which require off-site storage, restoration or renovation. Pay all costs for such work.

#### 1.04 MANUFACTURER'S INSTRUCTIONS

- A. When Contract Documents required that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Engineer and Owner.
  1. Maintain one set of complete instructions at the job site during installation and until completion.
- B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
  1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer and Owner for further instructions.
  2. Do not proceed with work without clear instructions.
- C. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

#### 1.05 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of Products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.
  1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
  2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.
- B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

#### 1.06 STORAGE AND PROTECTION

- A. Store Products in accord with manufacturer's instructions with seals and labels intact and legible.

1. Store products subject to damage by the elements in weathertight enclosures.
  2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- B. Exterior Storage:
1. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
  2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.
- D. Protection after Installation:
1. Provide substantial coverings as necessary to protect installed Products from damage from traffic and subsequent construction operations. Remove when no longer needed.

#### 1.07 SUBSTITUTIONS AND PRODUCT OPTION

- A. Products List:
1. Within 10 days after Contract Date, submit to Engineer and Owner a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.
- B. Contractor's Options:
1. For Products specified only by reference standard, select any product meeting that standard.
  2. For Products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.
  3. For Products specified by naming one or more Products or manufacturers and "or equal", Contractor must submit a request for substitutions for any Product or manufacturer not specifically named.
  4. For Products specified by naming only one Product and manufacturer, there is no option.
  5. For Products specified by naming one or more products or manufacturers and "or equal" with a written specification, Contractor shall select a

named product or manufacturer or select any product or manufacturer or select any product or manufacturer which meets in substance the specifications. Final determination of the acceptability of the selected product shall be made by the Engineer and Owner.

C. Substitutions:

1. Major Equipment Items
  - a. For a period of 14 days after the Bid opening Engineer and Owner will consider written requests from Contractor for substitutions identified in the major equipment Schedule of the Bid Form.
2. Other Products
  - a. For a period of 30 days after Contract Date, Engineer and Owner will consider written requests from Contractor for substitution of Products.
3. Submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:
  - a. Comparison of qualities of the proposed substitution with that specified.
  - b. Changes required in other elements of the work because of the substitution.
  - c. Effect on the construction schedule.
  - d. Cost data comparing the proposed substitution with the Product specified.
  - e. Any required license fees or royalties.
  - f. Availability of maintenance service, and source of replacement materials.
4. Engineer and Owner shall be the judge of the acceptability of the proposed substitution.

D. Contractor's Representation:

1. The request for a substitution constitutes a representation that Contractor:
  - a. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.
  - b. Will provide the same warranties or bonds for the substitution as for the Product specified.
  - c. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
  - d. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.



- E. Engineer and Owner will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## SECTION 01700

### CONTRACT CLOSEOUT

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

##### 1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: Fiscal provisions, legal submittals and additional administrative requirements:
- B. Section 01720: Project Record Documents
- C. The respective sections of Specifications: Closeout Submittals Required of Trades.

##### 1.03 SUBSTANTIAL COMPLETION

- A. When Contractor considers the Work is substantially complete, he shall submit to Engineer and Owner:
  - 1. A written notice that the Work, or designated portion thereof, is substantially complete.
  - 2. A list of items to be completed or corrected.
- B. Within a reasonable time after receipt of such notice, Engineer and Owner will make an inspection to determine the status of completion.
- C. Should Engineer and Owner determine that the Work is not substantially complete:
  - 1. Engineer and Owner will promptly notify the Contractor in writing, giving the reasons therefor.
  - 2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Engineer and Owner.
  - 3. Engineer and Owner will reinspect the Work.
- D. When the Engineer and Owner finds that the Work is substantially complete, he will:
  - 1. Prepare and deliver to Owner a tentative Certificate of Substantial Completion on NSPE Form 1910-8-D, with a tentative list of items to be completed or corrected before final payment.

2. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when Engineer and Owner considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

#### 1.04 FINAL INSPECTION

- A. When Contractor considers the Work is complete, he shall submit written certification that:
  1. Contract Documents have been reviewed.
  2. Work has been inspected for compliance with Contract Documents.
  3. Work has been completed in accordance with Contract Documents.
  4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
  5. Work is completed and ready for final inspection.
- B. Engineer and Owner will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Engineer and Owner consider that the Work is incomplete or defective:
  1. Engineer and Owner will promptly notify the Contractor in writing, listing the incomplete or defective work.
  2. Contractor shall take immediate steps to remedy the stated deficiencies in the work and send a second written certification to the Engineer and Owner that the Work is complete.
  3. Engineer and Owner will reinspect the work.
- D. When the Engineer and Owner finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

#### 1.05 REINSPECTION FEES

- A. Should Engineer and Owner perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
  1. Owner will compensate Engineer and Owner for such additional services.
  2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

#### 1.06 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER AND OWNER

- A. Evidence of compliance with requirements of governing authorities.
- B. Project Record Documents: to requirements of Section 01720

- C. Evidence of Payment and Release of Liens: to requirements of Standard General Construction Contract Conditions and Supplementary Conditions
- D. Certificate of Insurance for Products and Completed Operations, as applicable.

1.07 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to Engineer and Owner.
- B. Statement shall reflect all adjustments to the Contract Sum:
  - 1. The original Contract Sum.
  - 2. Additions and deductions resulting from:
    - a. Previous Change Orders
    - b. Allowances
    - c. Unit Prices
    - d. Deductions for uncorrected work
    - e. Penalties and Bonuses
    - f. Deductions for liquidated damages
    - g. Deductions for reinspection payments
    - h. Other adjustments
  - 3. Total Contract Sum, as adjusted
  - 4. Previous payments
  - 5. Sum remaining due
- C. Engineer and Owner will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.08 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## SECTION 01710

### CLEANING

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by Standard General Construction Contract Conditions.

##### 1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Each Specification Section: Cleaning for specific Products or work.

##### 1.03 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

#### PART 2 - PRODUCTS

(Not Used)

#### PART 3 - EXECUTION

##### 3.01 DURING CONSTRUCTION

- A. Execute periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish.
- C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

##### 3.02 DUST CONTROL

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.03 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
- C. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- D. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire Work is clean.

**END OF SECTION**

## SECTION 01720

### PROJECT RECORD DOCUMENTS

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Maintain at the site for the Owner one record copy of:
  - 1. Drawings
  - 2. Specifications
  - 3. Addenda
  - 4. Change Orders and other Modifications to the Contract
  - 5. Engineer Field Orders or written instructions
  - 6. Approved Shop Drawings, Product Data and Samples
  - 7. Field Test records

##### 1.02 RELATED REQUIREMENTS

- A. Section 01340: Shop Drawings, Product Data and Samples

##### 1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
  - 1. Provide files and racks for storage of documents.
  - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with CSI/CSC format.
- C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by Engineer and Owner.

##### 1.04 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color code designated by Engineer and Owner.



1.05 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress.
  - 1. Do not conceal any work until required information is recorded.

1.06 SUBMITTAL

- A. At Contract closeout, deliver Record Documents to Engineer and Owner.
- B. Accompany submittal with transmittal letter in duplicate, containing:
  - 1. Date
  - 2. Project title and number
  - 3. Contractor's name and address
  - 4. Title and number of each Record Document
  - 5. Signature of Contractor or his authorized representative

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

(Not used)

**END OF SECTION**

## SECTION 02110

### CLEARING AND GRUBBING

#### PART 1 - GENERAL

##### 1.1 WORK INCLUDED

- A. Clearing, grubbing, removal and disposal of vegetation, rocks, roots and debris within the limits of the work except objects designated on the drawings to remain.
- B. Preserve from injury or defacement all vegetation and objects to remain.

##### 1.2 RELATED WORK

- A. Section 02200: Site Grading and Filling

##### 1.3 LIMITS OF WORK

- A. Rights-of-way area established by Engineer.
- B. Construction area including the area bounded by lines established by Engineer.
- C. Designated stockpiles of construction material other than borrow material.

##### 1.4 PROTECTION

- A. Protect living trees not marked for removal and outside the construction area. Treat cut or scarred surfaces of trees or shrubs with a paint prepared especially for tree surgery.
- B. Protect bench marks and existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic.
- C. Maintain designated temporary roadways, walkways and detours, for vehicular and pedestrian traffic.

#### PART 2 - PRODUCTS

(Not applicable)

#### PART 3 - EXECUTION

##### 3.1 PREPARATION

- A. Maintain benchmarks, monuments and other reference points. Re-establish if disturbed or destroyed at no cost to Owner.

### 3.2 CLEARING AND GRUBBING

- A. Clear rights-of-way and other areas of objectionable material to the ground surface except for trees and stumps.
- B. Cut trees and stumps outside the construction area marked for removal by the Engineer to within 6 inches of the ground surface.
- C. Remove low hanging, unsound or unsightly branches on trees or shrubs designated to remain.
- D. Grub construction area of protruding obstructions except sound undisturbed stumps and roots six inches or less above the ground which will be a minimum of 5' below subgrade or embankment slope provided undercutting, topsoil stripping or other corrective measures are not stipulated.
- E. Grub stockpile areas of all objectionable material. Strip overburden over the material to be obtained in stockpile areas.
- F. Perform clearing and grubbing well in advance of construction or material removal activities.

### 3.3 BACKFILLING AND SURFACE PREPARATION

- A. Backfill and compact all depressions resulting from clearing and grubbing with suitable materials in accordance with Section 02200.
  - 1. Backfill embankment areas to natural ground elevation.
  - 2. Backfill excavation areas below finished subgrade to finished subgrade.
- B. Perform backfilling a satisfactory distance ahead of construction operations.
- C. Prepare areas designated on the drawings to receive erosion control matting to smooth surfaces that have been shaped, fertilized, and seeded.

### 3.4 DEBRIS REMOVAL

- A. Promptly remove cleared debris from site to location on Owner's property to be determined by Owner.
- B. If required, obtain permission from applicable regulatory authority for disposal of debris to waste disposal site.

### 3.5 TEMPORARY EROSION AND SEDIMENT CONTROL

- A. Temporary erosion and sediment control will be by the Contractor.

**END OF SECTION**

## SECTION 02171

### EROSION CONTROL MATTING

#### PART 1 — GENERAL

##### 1.01 WORK INCLUDED

- A. This work shall consist of furnishing and placing protective coverings including associated seed, fertilizer, lime, topsoil, and water for erosion control, in accordance with these specifications and in reasonably close conformity to the dimensions, lines, and grades shown on the Drawings or as established by the Engineer.
- B. Erosion control matting with fiber matrix (S150BN) shall be installed on all finished areas having slopes equal to or steeper than 4 horizontal to 1 vertical.

##### 1.02 RELATED WORK

- A. Section 02930: Seeding and Mulching

##### 1.03 WARRANTY

The Manufacturer of the erosion-control matting shall warranty the matting to perform the stated objective of erosion control to the satisfaction of the Engineer.

#### PART 2 — PRODUCTS

##### 2.01 WHEAT STRAW FIBER TEMPORARY EROSION CONTROL MATTING

- A. Acceptable Manufacturers

Double Photodegradable Net Straw Fiber Erosion Control blankets as manufactured by North American Green, Inc., or an approved equal are acceptable. Product shall be equivalent or superior to the S150BN as manufactured by North American Green.

- B. Material Specifications

Blankets shall be constructed of an agricultural wheat straw fiber matrix sewn between a lightweight photodegradable polypropylene top and bottom net.

Material specifications shall be as follows:

<u>Component</u>	<u>Material Type</u>
Straw	0.50 pounds per square yard
Netting	biodegradable organic jute top and bottom
Thread	degradable thread on 1.50-inch centers

The material shall be shipped in rolls at a minimum of 6.7 feet wide and 108 feet long, with minimum coverage area per roll of 80 square yards.

Other acceptable blanket materials may be used after review and approval by the Engineer.

### **PART 3 — EXECUTION**

#### **3.01 EXECUTION OF WORK**

- A. **Equipment:** Equipment shall be that typically used for earthwork activities and as approved by the Engineer. Specialized equipment used for the installation of erosion control matting and blankets shall be utilized as per the Manufacturer's requirements.
- B. **Surface Preparation**
  - 1. Immediately after the completion of earthwork activities, all disturbed areas to be seeded shall be raked and all rubbish, sticks, roots, and stones larger than 2 inches shall be removed. The top layer of soil suitable for vegetation shall be spread and lightly compacted to the finished grade as specified on the Drawings and in these Specifications. No soils suitable for vegetation establishment shall be spread in water or while frozen or muddy.
  - 2. For disturbed areas to be seeded that have not been regraded and the existing soil remains, all rubbish, sticks, roots, and stones larger than 2 inches shall be raked and removed prior to seeding.
- C. **Fertilizing:** The fertilization for construction areas shall be carried out at the prescribed rates given in Specification 02930. Fertilizer shall be well pulverized and free of lumps and uniformly broadcast.
- D. **Seeding:** Seed shall be applied in accordance with Section 02930 of these Specifications. The seeding operations shall only be carried out when the soil and climatic conditions are suitable to ensure reasonable success. Seed shall not

be sown during windy weather or when the ground is frozen, excessively wet, or in a non-tillable condition.

- E. Installing Erosion Control Matting:
1. Matting shall be installed in accordance with the Drawings, Specifications, and Manufacturer's recommendations. For this installation, the channel installation configuration shall be used.
  2. Mat installation shall be in strict accordance with the Manufacturer's Specifications and the Engineer's approval. Regarding staple patterns for mat anchorage, Contractor shall place staples to anchor the temporary mat at a frequency of 0.7 staples per square yard of mat, and shall conform to North American Green's staple pattern "A" or equal. Check slots shall be constructed at 30- to 40-foot intervals down the side slopes. Each row of check slots shall be offset from the upslope row.
  3. Mat installation shall conform to the grades specified in the Drawings. Mat arrangement shall be inspected by the Engineer before final approval is given.
- F. Watering: After matting installation, seeded areas shall be watered, unless there is sufficient rainfall to eliminate the necessity of watering. The seeded and mat-covered area shall be watered immediately after the sowing/mulching with a second and third water application following the first at 48-hour intervals.
- G. Maintenance of seeded areas to establish a good, healthy, uniform growth over the erosion control matting locations will be the responsibility of the Contractor until a satisfactory stand of grass is established.

**END OF SECTION**

## SECTION 02200

### SITE GRADING AND FILLING

#### PART 1 — GENERAL

##### 1.01 GENERAL REQUIREMENTS

- A. Site grading and filling shall consist of supplying, placing, and compacting earthen fill material between the original ground line and the established finished grades.
- B. Conduct all earthwork operations in accordance with the applicable requirements of erosion control as given in the Drawings and Specifications and as required by local authorities.
- C. Complete all clearing and grubbing operations for a given excavation area before starting filling and grading operations. The Contractor shall be responsible for and shall take all necessary precautions to protect and preserve any and all existing structures, culverts, pipelines, conduits, wires, subdrains, or parts thereof that are to remain and which may be affected by his operations. He shall, at his own expense, satisfactorily repair or replace any damaged part of any such structure, culvert, pipeline, conduit, wire, or subdrain that may result from his operations or negligence during the life of the contract.
- D. Strip and stockpile all topsoil as directed by the Engineer.
- E. At all times during construction, maintain the area so that it will be well drained.
- F. No excess soil or waste material is to be transported off-site for disposal unless allowed by the Owner.

##### 1.02 RELATED SECTIONS

- A. Section 02110: Clearing and Grubbing
- B. Section 02223: Subgrade Construction and Preparation

##### 1.03 CLASSIFICATION

- A. Without regard to the materials encountered, all earthwork shall be common. It shall be distinctly understood that any reference to rock, earth, or any other material on the Drawings is not to be taken as an indication of classified excavation or the quantity of either rock, earth, or any other material involved.



#### 1.04 SUBMITTALS

- A. As required by the Engineer, the Contractor shall submit the following information and samples to the Engineer at least five (5) days prior to the start of construction of the fill, unless otherwise approved by the Engineer:
1. Identification of the proposed material source or sources.
  2. A representative 100-pound sample that will be collected by the Contractor at the direction of the Owner's representative for the constituents listed in Table 02200-1, Table 02200-2, and Section 2.01(C) of this Specification.

#### 1.05 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) standards:
1. ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils.
  2. ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
  3. ASTM D 1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
  4. ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
  5. ASTM D 2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.
  6. ASTM D 2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  7. ASTM D 2922, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  8. ASTM D 2937, Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
  9. ASTM D 3017, Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  10. ASTM D 4220, Standard Practices for Preserving and Transporting Soil Samples.
  11. ASTM D 4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

## 1.06 QUALITY ASSURANCE

- A. At a minimum, the Contractor shall account for these activities in the construction schedule.
  - 1. The proposed minimum testing frequencies for CQA are presented in Tables 02200-1 through 02200-2. Actual test frequencies may vary. CQA testing, or lack thereof, does not relieve the Contractor from its responsibility to complete the Work in accordance with the Specifications.
  - 2. Sampling locations shall be selected by the Engineer. If necessary, the location of routine in-place moisture content and dry unit weight tests shall be determined using a non-biased sampling plan. Any soil sampling requiring laboratory analysis will be conducted by the Owner's representative and results will be provided to the Contractor within ten (10) business days of taking the sample.
- B. Testing Laboratory and Soils Engineer:
  - 1. The Soils Engineer's and Testing Laboratory's fee will be paid for by the Owner except when the Soils Engineer or Testing Laboratory personnel are notified by Contractor that work will be in progress, and they (Soils Engineer or laboratory personnel) come to job site and work is not in progress. In that case, the Contractor shall pay for Soils Engineer's or laboratory personnel's time and mileage. Contractor shall pay for retesting as specified below.
  - 2. Until laboratory tests indicate otherwise, compact each layer of earthen fill to a minimum density of 95% of the maximum density as determined by Standard Proctor testing (ASTM D698).

## 1.07 PROTECTION

- A. Protect excavations and grounds from water ponding and water damage. Construct and maintain temporary drainage. Pump, if required to keep excavations free of water. Maintain site in well drained condition at all times.
- B. Protect, maintain and restore bench marks, monuments, and other reference points affected by this work. If bench marks, monuments or other permanent reference points are displaced or destroyed, points shall be re-established and markers reset under supervision of a licensed surveyor who shall furnish Engineer with certification of his work.
- C. Protect utilities and other construction designated to remain in place.
- D. Protect trees to remain in place.

## 1.08 LINES AND GRADES

- A. It is imperative that lines and grades established on drawings, except for allowance for installation of fill aggregate, pavement, concrete, and topsoil established below, be met when this work is completed.

## 1.09 TOLERANCES

- A. Construct earthwork in reasonably close conformity with the lines, grades, widths, elevations, slopes, dimensions, cross-sections, and details as given on the Drawings and in these Specifications. Tolerances for earthwork activities shall be as follows:

<u>Activity</u>	<u>Tolerance</u>
Fill and Embankments	+/- 0.1' (less req'd placement depth of aggregate, concrete, or topsoil, as applicable)
Finished Grading	+/- 0.1' in 10.0' (+/- 1.0%).
Common Excavation Elevations	+/- 3"

Reference stakes for fill and excavation area lines and grading shall be established by a qualified surveyor.

## PART 2 - PRODUCTS

### 2.01 EARTH FILL

- A. Clean earth (free from organic material, cinders, ice and rocks over 2 inches in their longest dimension) consisting of either low plasticity clay having a plasticity index of 30 or less and more than 5, and not classified as ML.
- B. On-site earth removed during cutting operations may be used if it meets the above requirements.
- C. Off-site borrow must meet the above requirements and be certified clean. Owner or Engineer will obtain representative samples and analyze for the U.S. EPA Contract Laboratory Program, Target Compound/Analyte List constituents to determine compliance with EPA's Regional Soil Screening levels (RSLs) for the residential scenario. Note that background concentrations of metals in the soil may exceed the residential RSLs, provided they meet the applicable background concentrations listed in the document "Hazardous Trace Elements in Tennessee Soils and Other Regolith" (Tennessee Department of Environment and Conservation, 2001). If proposed borrow soil is found to be contaminated, contractor shall propose another site. Offsite borrow area to be approved by Engineer.

## PART 3 - EXECUTION

### 3.01 DISPOSITION OF ABANDONED UTILITIES

- A. If abandoned underground utility lines and electric conduit are uncovered in the course of grading, then that part uncovered shall be removed and capped off at points of removal as well as at property lines.

### 3.02 REMOVAL AND STORAGE OF TOPSOIL

- A. Remove topsoil to its entire depth from areas within building lines and for a distance of 10'-0" beyond, under pavements, or other areas to be excavated, filled or graded.
- B. Mow grass, weeds and other annual-type growth, and brush close to ground.
- C. Scrape or rake area to remove brush, roots, loose grass, weeds and rocks before stripping topsoil.
- D. Topsoil to be stored for reuse shall meet requirements established above.
- E. Store topsoil in area designated by Engineer. Store so as to prevent erosion and mixture with debris and other materials.

### 3.03 SITE EXCAVATION AND PROOF-ROLLING

- A. After this stripping is done, proof-roll these areas with a heavily-loaded rubber-tired tandem axle dump truck. Operate the truck at a normal walking speed so that the Geotechnical Engineer may observe the ground while walking beside the truck.
- B. The Geotechnical Engineer will inspect the areas for soft spots.

### 3.04 REMEDIAL WORK

- A. During the course of proof-rolling and inspection, as the Geotechnical Engineer finds soft spots, he will direct cutting out of soft spots and backfilling with specified, compacted earth fill.
- C. Do not waste excavated material in excess of that required for normal embankment construction within construction limits except when and as specifically directed or approved by the Engineer.
- D. Soils designated as "soft" by the Engineer's on-site representative and other material wasted beyond the construction limits may be placed on site at locations to be coordinated with the Owner.

### 3.05 GENERAL SITEWORK

- A. Before depositing fill material, remove vegetation and other unsuitable materials. Do not place fill on a subgrade that contains frost, is muddy, or frozen.
- B. Fill and grade to attain elevations indicated +/- 0.1' less allowances for placement of aggregate, concrete, walks, drives and parking areas, and topsoil.
- C. In areas designated to receive topsoil, grade, or fill and compact specified earth, to bring areas to finished grade +/- 0.1' less 6" for placing topsoil.

- D. Where exterior walks are indicated, allow for placement of 6 inches of granular fill and 4" of concrete and finish +/- 0.1'.

### 3.06 GRADING

- A. Grade to uniform levels and slopes, without abrupt changes. Make transitions from levels to slopes smooth and with large radius cuts.
- B. Finish areas to a reasonably true and even plane at required elevations, less allowances for items specified above.
- C. Along the lines indicating the limits of work, taper finish grade to the existing grade at a slope matching the natural contour. Perform all of this work within the limit lines.

### 3.07 STOCKPILING

- A. Excavated materials classified as select and non-select shall be segregated and fill shall be stockpiled in designated areas free of incompatible soil, clearing debris, or other objectionable materials. Stockpile areas will be designated by the Owner or Engineer.
- B. Excess excavated soil and excavated material classified as spoil shall be segregated from fill, and disposed of in a manner and at an on-site location acceptable to the Owner and the Engineer.
- C. Excavated material classified as topsoil shall be segregated from fill and stockpiled in the manner as specified by the Owner or Engineer.
- D. Stockpiles of fill, spoil, or topsoil shall be no steeper than 3:1 (horizontal:vertical) without approval of the Engineer, graded to drain, sealed by tracking parallel to the slope with a dozer or other means approved by the Engineer, and dressed daily during periods when fill is taken from the stockpile. The Contractor may cover fill stockpiles with plastic sheeting or other material approved by the Engineer in order to preserve the moisture content of the fill.
- E. Stockpiles that will remain out of active use for a period greater than one (1) month shall be stabilized by revegetation in accordance with the requirements for revegetation.

### 3.08 FILLING

- A. Where soft spots are taken out at the direction of the Geotechnical Engineer, backfill with specified earth fill. Deposit fill in loose lifts not to exceed 8" and thoroughly compact each lift before placing succeeding lifts.
- B. Within fill and embankment areas, place specified earth fill in loose lifts not to exceed 8" and thoroughly compact each lift before placing succeeding lifts.

3.09           COMPACTION DENSITIES

- A.     Until laboratory tests indicate otherwise, compact each layer of earthen fill to a minimum density of 95% of the maximum density as determined by Standard Proctor testing (ASTM D698).

3.10           COMPACTION TESTING

- A.     While filling and compacting operations are in progress, Soils Engineer will make density tests at random depths and at random locations to determine adequacy of compaction. If compaction tests do not meet specified densities, take action to compact to required densities and pay for retesting to prove compaction densities.

3.11           OBSTRUCTIONS

- A.     Any obstructions shown on the Drawings are for information only and do not guarantee their exact locations nor exclude the presence of other obstructions.
- B.     The Contractor shall exercise due care in excavating adjacent to existing obstructions and shall not disturb same.
- C.     In the event obstructions are disturbed, the Contractor shall repair or replace them as quickly as possible to the condition existing prior to their disturbance. This repair or replacement will not be a pay item.
- D.     If desired by the utility Owner, the Contractor shall pay for the repair or replacement work performed by the forces of the utility Owner or other appropriate party.
- E.     If replacement or repair of disturbed obstructions is not performed after a reasonable period of time, the Owner may have the necessary work done and deduct the cost of same from payments to the Contractor.

3.12           CLEANUP

- A.     After all other work of this section is completed, leave area clean and free of any debris.

3.13           MEASUREMENT & PAYMENT

- A.     Earthen Fill
  - 1.     Measurement  
Approved earthen fill construction will be measured for payment by the lump sum.
  - 2.     Payment  
Approved earthen fill construction will be paid for at the contract lump sum price.

<b>TABLE 02200-1 SOIL TESTS TO BE PERFORMED ON BORROW SOILS</b>		
<b>TEST</b>	<b>METHOD</b>	<b>MINIMUM FREQUENCY OF TESTING</b>
Percent Fines (Note 1)	ASTM D1140	1 per 2,000 cu. yd. (Note 2)
Percent Gravel (Note 3)	ASTM D422	1 per 2,000 cu. yd. (Note 2)
Liquid and Plastic Limits	ASTM D4318	1 per 2,000 cu. yd.
Water Content	ASTM D4643 (Note 4)	1 per 500 cu. yd.
Water Content (Note 5)	ASTM D2216	1 per 2,000 cu. yd.
Moisture/Density	ASTM D698 ASTM D1557	1 per 5,000 cu. yd. or 1 per soil change
Permeability (Remolded)	ASTM D 5084	Not required

**Notes:**

1. Percent fines is defined as percent passing the Number 200 sieve.
2. In addition, at least one test should be performed each day that soil is excavated or placed, and additional tests should be performed on any suspect material observed by QA personnel.
3. Percent gravel is defined as percent retained on the Number 4 sieve.
4. This is a microwave oven drying method. Other materials may be used, if more appropriate.
5. Microwave oven drying, and other speedy methods, may involve systematic errors. Convection oven drying (ASTM D2216) is recommended on every fifth sample taken for rapid measurement. The intent is to document any systematic error in rapid water content measurement.
6. ASTM D5084 is a laboratory procedure for determining hydraulic conductivity of soil materials.

<b>TABLE 02200-2 SOIL TESTS TO BE PERFORMED DURING CONSTRUCTION OF EARTHEN FILL</b>		
<b>TEST</b>	<b>METHOD</b>	<b>MINIMUM FREQUENCY OF TESTING</b>
Water Content	ASTM D3017 Nuclear Density or ASTM D4643 Microwave	5/acre/lift (Note 2)
Water Content (Note 3)	ASTM D2216 Oven Dry	1/acre/lift (Note 3)
Density (Note 4)	ASTM D2922 Nuclear Density	5/acre/lift (Note 2)
Density (Note 5)	ASTM D1556 Nuclear Density	1/acre/lift (Note 2)
Permeability	Boutwell Permeameter	Not required
Permeability (Note 6)	Sealed Double Ring Infiltrometer	Not required
Number of Passes	Visual Observation	1/acre/lift (Note 2)

**Notes:**

1. ASTM D3017 is a nuclear method and D4643 is microwave oven drying.
2. In addition, at least one test should be performed each day soil is compacted and additional tests should be performed in areas for which CQA personnel have reason to suspect inadequate compaction.
3. Every fifth sample tested with ASTM D3017 or D4643 should also be tested by direct oven drying (ASTM D2216) to aid in identifying any significant, systematic calibration errors with D3017 or D4643.
4. ASTM D2922 is a nuclear method.
5. The sand cone (ASTM D1556) is required in the event that the liner is to be construed with soils having more than 20% retained on the No. 4 sieve.
6. The sealed double ring infiltrometer test is a field test which is to be performed prior to construction of the liner where soils have more than 20% retained on the No. 4 sieve.

**END OF SECTION**



## **SECTION 02205**

### **RIP-RAP**

#### **PART 1 – GENERAL**

##### **1.01 SUMMARY**

- A. This work shall consist of furnishing and placing rip-rap and geotextile underlayment, in accordance with these Specifications and in reasonably close conformity to the dimensions, lines, and grades shown on the Drawings or as established by the Engineer.

#### **PART 2 – PRODUCTS**

##### **2.01 RIP-RAP**

- A. Material Specifications
  - 1. Rip-rap shall be obtained from a source approved by the Engineer and shall consist of sandstone, limestone, or other hard and durable stone that will be resistant to the action of air and water. Rip-rap stone shall consist of field stone or quarry stone with angular or fractured faces, weighing not less than 140 pounds per solid cubic foot (2,200 kilograms per solid cubic meter). Size of rip-rap shall vary according to a uniform distribution as shown in the Drawings. Material for rip-rap shall be hard and durable and from a source with a percent of wear not greater than 45 by the Los Angeles Test (AASHTO T 96).
  - 2. Recycled concrete shall not be used as a substitute for rip-rap.

##### **2.02 GEOTEXTILE UNDERLAYMENT**

- A. Material Specifications
  - 1. Material shall be polypropylene, staple fiber, needlepunched, nonwoven heat set on one side to ensure consistent roll width and rollout, or a woven monofilament. Material shall be Geotex 104F manufactured by Propex, or approved equal.
  - 2. Resistant to ultraviolet degradation and to biological and chemical environments normally found in soils. Minimum average roll values shall be the following:

Property	Test Method	Units	Property Requirement
Grab Tensile Strength	ASTM D4632	pounds	370 x 250
Grab Elongation	ASTM D4632	Percent	15 x 15
Puncture Strength	ASTM D4833	pounds	120
Mullen Burst	ASTM D3786	Pounds per square inch	450
Trapezoidal Tear	ASTM D4533	pounds	100 x 60
Percent Open Area	Area of Openings divided by Total Area x 100	Percent	4-6
Permittivity	ASTM D4491	sec-1	0.28
Water Flow Rate	ASTM D4491	Gallons per minute/square feet	18
Ultraviolet Resistance (percent retained at 500 hours)	ASTM D4355	Percent	90

**B. SUBMITTALS**

1. Product Data documenting conformance with material specifications.

**PART 3 – EXECUTION**

**3.01 EQUIPMENT**

- A. Equipment shall be typical for earthwork activities and as approved by the Engineer.

**3.02 INSTALLATION**

- A. Rip-rap shall be placed in such a manner as to produce a reasonably well graded mass of rock with the minimum practicable percentage of voids and shall be constructed to the lines and grades shown on the plans or as directed by the Engineer.
- B. Material shall be placed in such a manner as to avoid displacing the underlying material.
- C. The larger pieces shall be well-distributed throughout the entire mass and the finished riprap shall be free from objectionable pockets of small or large pieces.
- D. Hand placing, to a limited extent, may be required, but only to the extent necessary to secure the results specified above.
- E. Placing rip-rap by dumping into chutes or by similar methods likely to cause segregation will not be permitted.

- F. Rip-rap shall not be deposited in a manner that will cause damage to underlying geotextile reinforcement. Damage to geotextile during placement of rip-rap shall be corrected by the Contractor at no cost to the Owner prior to proceeding with the Work. Damaged fabric shall be repaired by placing a piece of fabric large enough to cover the damaged area and overlapping and pinning according to Manufacturer's instructions.

**END OF SECTION**

## SECTION 02222

### COMMON EXCAVATION FOR UTILITIES

#### PART 1 — GENERAL

- A. The work called for by this section shall consist of clearing and grubbing, loosening, loading, removing, in the specified manner, all wet and dry materials (including rock) encountered that must be removed for construction purposes; furnishing, placing, and maintaining all sheeting, shoring, bracing, and timbering necessary for the proper protection and safety of the work, the workmen, the public, and adjacent property and improvements; the dewatering of trenches and other excavations; the preparation of satisfactory pipe beds; the backfilling and tamping of trenches, foundations, and other structures; the preparation of fills and embankments; the removal of unsuitable material from outside the normal limits of excavation and, where ordered by the Engineer, their replacement with suitable materials; and all other grading or excavation work incidental to or necessary for the work. This work shall be performed as specified below.

#### PART 2 — PRODUCTS (Not Used)

#### PART 3 — EXECUTION

##### 3.01 PREPARATION OF THE SITE

- A. Before starting construction, remove from the work site all vegetative growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as other structures that the Drawings and/or the Engineer specifically indicate are to be removed. Dispose of this refuse material in a manner acceptable to the Engineer.
- B. In certain areas it may be desirable for existing trees, shrubs, or other vegetation on the site to be preserved for the permanent landscape. Such vegetation may be shown on the Drawings, specifically listed in the specifications, marked on the site, or identified by the Engineer. In no case damage or remove such growth without permission from the Owner.
- C. If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth and grub the excavated area, and remove all large roots to a depth of not less than 2 feet below the bottom of the proposed construction. Dispose of the growth removed in a manner satisfactory to the Engineer. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material, and compact to the same density as the surrounding material.
- D. Trees, cultivated shrubs, etc., that are situated within public rights-of-way and/or construction easements through private property but not directly within the excavation area shall remain undisturbed unless it is necessary to remove them so that the work can be performed safely and unless their removal is

specifically ordered by the Engineer. Take special precautions to protect and preserve such growth throughout all stages of the construction.

- E. Preparation of the site shall be considered an integral part of the excavation and one for which no separate payment shall be allowed.

### 3.02 UNSUITABLE MATERIALS

- A. Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, subgrade, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below. Then refill the areas excavated for this reason with 1 inch to 2 inches crushed stone up to the level of the lines, grades, and/or cross sections shown on the Drawings. The top 6 inches of this refill shall be No. 57 crushed stone for bedding.

### 3.03 ROCKS AND BOULDERS

- A. Remove all rocks or boulders encountered during common excavation with a volume of less than 1/2 cubic yard to the lateral limits of the excavation. Backfill any space created beyond the excavation limits by their removal with earth or other material approved by the Engineer, and compact to the same density as the surrounding earth and to the proper line and grade.
- B. The removal of rocks and boulders as specified in the preceding paragraph shall be considered common excavation.

### 3.04 DISPOSAL OF NON-CONTAMINATED MATERIALS

- A. Whenever practicable, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the Drawings or directed by the Engineer shall be used for these purposes. Any materials not so used shall be considered waste materials and disposed of by the Contractor as specified below.
- B. Waste materials may be deposited in spoil areas at locations designated by the Owner. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as specified in Section 02930. No excess soil or waste material is to be transported off-site for disposal unless allowed by Owner.

### 3.05 EXCAVATION FOR TRENCHES, MANHOLES, AND STRUCTURES

- A. Unclassified excavation for pipelines shall consist of the excavation necessary for the construction of process pipes and their appurtenances (including outlets, headwalls, collars, concrete saddles, and pipe protection) that are called for by the Drawings. It shall include clearing and grubbing where necessary, backfilling and tamping pipe trenches and around structures, and disposing of waste materials, all of which shall conform to the applicable provisions set for the elsewhere in these specifications.

- B. The Contractor may, if he chooses, use a motor powered trenching machine. If he does, however, he shall be fully responsible for the preservation or repair of existing utility service connections.
- C. Unless the construction of lines by tunneling, jacking, or boring is called for by the Drawings or specifically authorized by the Engineer, make excavation for pipelines in open cut and true to the lines and grades shown on the Drawings or established by the Engineer on the ground. Cut the banks of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of that sheeting) shall vary with the size of the pipe to be installed, but shall not be more than the distance determined by the following formula:  $4/3d + 15$  inches, where "d" represents the internal diameter of the pipe in inches. When approved in writing by the Engineer, the banks of trenches from the ground surface down to a depth not closer than 1 foot above the top of the pipe may be excavated to nonvertical and nonparallel planes, provided the excavation below that depth is made with vertical and parallel sides equidistant from the pipe centerline in accordance with the formula given above. Any cut made in excess of the formula  $4/3d + 15$  inches shall be at the expense of the Contractor and may be cause for the Engineer to require that stronger pipe and/or a higher class of bedding be used at no cost to the Owner.
- D. For rigid pipe, shape the bottom of all trenches to provide uniform bearing for the bottom of the pipe barrel. For plastic sewer lines, provide a minimum of 6 inches of No. 57 crushed stone for bedding.
- E. Excavate bell holes for bell and spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper jointing of the pipe. Do not excavate bell holes more than 2 joints ahead of pipe laying.
- F. Excavation for incidental structures shall not be greater in horizontal area than that required to allow a 2 foot clearance between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it. The bottom of the excavation shall be true to the required shape and elevation shown on the Drawings. No earth backfilling will be permitted under headwalls or similar structures. Should the Contractor excavate below the elevations shown or specified, he shall, at his own expense, fill the void with either concrete or granular material approved by the Engineer.
- G. Do not excavate pipe trenches more than 200 feet ahead of the pipe laying, and perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where the Engineer deems necessary to maintain vehicular or pedestrian traffic.
- H. In all cases where materials are deposited along open trenches, place them so that in the event of rain no damage will result to the work and/or to adjacent property.

- I. Excavation for incidental structures may be performed with nonvertical banks except beneath pavements or adjoining existing improvements. Do not permit the horizontal area of the excavation to exceed that required to allow a 2 foot clearance between the outer surface of the structure and the banks of the excavation or the sheeting used to protect the embankments. The bottom of the excavation shall be true to the required shape and elevation shown on the Drawings.

### 3.06 SHEETING, SHORING, AND BRACING

- A. Take special care to avoid damage wherever excavation is being done. Sufficiently sheet, shore, and brace the sides of all excavations to prevent slides, cave-ins, settlement, or movement of the banks and to maintain the specified trench widths. Use solid sheets in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have enough strength and rigidity to withstand the pressures exerted, to keep the walls of the excavation properly in place, and to protect all persons and property from injury or damage. Separate payment will not be made for sheeting, shoring, and bracing, which are considered an incidental part of the excavation work.
- B. Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than 5 feet high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than 5 feet deep when examination of the ground indicates hazardous ground movement may be expected. Guard the walls and faces of all excavations in which employees are exposed to danger from moving ground by a shoring system, sloping of the ground, or some equivalent protection.
- C. Comply with all OSHA standards in determining where and in what manner sheeting, shoring, and bracing are to be done. The sheeting, shoring, and bracing system shall be designed by a professional Engineer licensed in the State of Tennessee and shall be subject to approval by the Engineer. However, such approval does not relieve the Contractor of the sole responsibility for the safety of all employees, the effectiveness of the system, and any damages or injuries resulting from the lack or inadequacy of sheeting, shoring, and bracing.
- D. Where excavations are made adjacent to existing buildings or structures or in paved streets or alleys, take particular care to sheet, shore, and brace the sides of the excavation so as to prevent any undermining of or settlement beneath such structures or pavement. Under pin adjacent structures wherever necessary, with the approval of the Engineer.
- E. Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the Drawings, ordered by the Engineer, or deemed necessary or advisable for the safety or protection of the new or existing work or features. Remove these materials in such a manner that the new structure or any existing structures or property, whether public or private, will not be endangered or damaged and that cave-ins and slides are avoided.

- F. Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.
- G. The Contractor may use a trench box, which is a prefabricated movable trench shield composed of steel plates welded to a heavy steel frame. The trench box shall be designed to provide protection equal to or greater than that of an appropriate shoring system.

### 3.07 DEWATERING OF EXCAVATION

- A. Provide and keep in operation enough suitable pumping equipment whenever necessary or whenever directed to do so by the Engineer. Give special attention to excavations for those structures that, prior to proper backfilling, are subject to flotation from hydrostatic uplift.

### 3.08 BACKFILLING

- A. Begin backfilling after the line construction is completed and then inspected and approved by the Engineer. On each side of the line, from the bottom of barrel to 1 foot above the top of the pipe, the backfill material shall consist either of fine, loose earth like sandy soil or loam or of granular material that is free from clods, vegetable matter, debris, stone, and/or other objectionable materials and that has a size of no more than 2 inches. Place this backfill simultaneously on either side of the pipe in even layers that before compaction are no more than 6 inches deep. Thoroughly and completely tamp each layer into place before placing additional layers. When shown on the Drawings, this backfill shall, at locations beneath or closely adjacent to pavement, consist of No. 67 crushed stone.
- B. If plastic sewer pipe is used, install No. 57 crushed stone in a 6 inch envelope on all sides of the pipe. Then add the remaining backfill up to 1 foot above the top of the pipe as described in the previous paragraph.
- C. From 1 foot above the pipe upward, the backfill material may contain broken stones that make up approximately 3/4 of the backfill's total volume. However, if this type of backfill is used, there must be enough spalls and earth materials to fill all voids completely. The maximum dimension of individual stones in such backfill shall not exceed 6 inches, and the backfill material shall be placed and spread in even layers not more than 12 inches deep. At locations beneath or closely adjacent to pavement or at locations of improvements subject to damage by displacement, tamp and thoroughly compact the backfill in layers that, before compaction, are 6 inches deep. In other areas, the backfill for the upper portion of the trenches may be placed without tamping but shall be compacted to a density equivalent to that of adjacent earth material as determined by laboratory tests. Use special care to prevent the operation of backfilling equipment from causing any damage to the pipe.
- D. If earth material for backfill is, in the opinion of the Engineer, too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth material that the Engineer considers too wet or otherwise unsuitable.



- F. Wherever excavation has been made within easements across private property, the top 1 foot of backfill material shall consist of fine loose earth free from large clods, vegetable matter, debris, stone, and/or other objectionable materials.
- G. Wherever trenches have been cut across or along existing pavement, temporarily pave the backfill of such trenches by placing Class A, Grade D, crushed stone as the top 12 inches of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the Owner.
- H. Conduct backfilling around manholes, inlets, outfalls, and/or structures in the same manner as specified above for pipelines except that even greater care is necessary to prevent damage to the utility structure.
- I. Wherever pipes have diameters of 15 inches or less, do not use power operated tampers to tamp that portion of the backfill around the pipe within 1 foot above the pipe.
- J. Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfill is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make whatever repairs are necessary, whenever directed to do so by the Engineer.
- K. Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the Engineer's requiring that the Contractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.
- L. Compaction Requirements: Compact to 95 percent maximum density in accordance with ASTM D698 or as specifically indicated on the drawings.

### 3.09 MAINTENANCE

- A. Maintain trench backfill at the approximate level of the original ground surface by periodically adding backfill material wherever necessary and whenever directed to do so by the Engineer. Continue such maintenance until final acceptance of the project, or until the Engineer issues a written release.

### 3.10 SLOPES

- A. Neatly trim all open cut slopes, and finish to conform either with the slope lines shown on the Drawings or the directions of the Engineer. Leave the finished surfaces of bottom and sides in reasonably smooth and uniform planes like those normally obtainable with hand tools, though the Contractor will not be required to use hand methods if he is able to obtain the required degree of evenness with mechanical equipment. Conduct grading operations so that material is not removed or loosened beyond the required slope.

**END OF SECTION**

## **SECTION 02223**

### **SUBGRADE CONSTRUCTION AND PREPARATION**

#### **PART 1 - GENERAL**

##### 1.01 WORK INCLUDED

- A. Preparing subgrade to receive an aggregate material.

##### 1.02 RELATED WORK

- A. Section 02110: Site Clearing and Grubbing
- B. Section 02200: Site Grading and Filling
- C. Section 02225: Aggregate Surface Course

##### 1.03 REFERENCE STANDARDS

- A. For subgrade construction: TDOT Standard Specification Section 207

##### 1.04 QUALITY ASSURANCE

- A. Determine maximum density and optimum moisture in accordance with the "Standard Method of Test for Moisture Density Relationship of Soils Using a 5.5 Pound Hammer and a 12-inch Drop," AASHTO Designation T 99, Method A.

#### **PART 2 - PRODUCTS**

(Not used)

#### **PART 3 - EXECUTION**

##### 3.01 PREPARATION

- A. Complete clearing and grubbing as stipulated in Section 02110
- B. Establish and maintain erosion and siltation control in accordance with Drawings, Specifications, and contractor prepared Storm Water Pollution Prevention Plan.
- C. Maintain benchmarks, monuments and other reference points.

##### 3.02 SUBGRADE PREPARATION

- A. Prepare subgrade in reasonably close conformity with the lines and grades as shown on the Drawings or as designated by Engineer.
- B. Haul, spread and compact suitable material in sufficient quantity to correct the deficiency where the roadbed is below grade. Spreading and compacting

material shall be performed in accordance with the pertinent provisions of Section 02220.

- C. Prepare subgrade across the entire sub-base section when sub-bases are to be constructed on the subgrade.
- D. Construct subgrade 12" wider on each side of the base when forms are required for the base or pavement.
- E. Clear subgrades, as stipulated in Section 02110, requiring reworking to the limits described above.
- F. Grade subgrade in such a manner as to provide ready drainage of water from the subgrade. Maintain ditches and drains during construction.

### 3.03 SUBGRADE COMPACTION

- A. Until laboratory tests indicate otherwise, compact each layer of earthen fill to a minimum density of 95% of the maximum density as determined by Standard Proctor testing (ASTM D698).
- B. When the density requirement is not met, loosen the subgrade by discing, harrowing or other approved methods to a depth of not less than six inches, then reshape and recompact.
- C. Moisten and aerate the subgrade material as necessary during mixing and compacting to provide optimum moisture content.
- D. Rework or remove, replace and recompact all soft, yielding material which will not compact readily.
- E. Protect subgrade from damage and limit hauling over the finished subgrade to that which is essential for construction purposes.
- F. Smooth and recompact all ruts or rough places that develop in a completed subgrade.
- G. Check the lines, cross-sections and grades of the subgrade as completed for reasonably close conformity with those shown on the Drawings.

### 3.04 MEASUREMENT AND PAYMENT - SUBGRADE PREPARATION

- A. Approved subgrade construction and preparation will be measured for payment by the lump sum.
- B. Approved subgrade construction and preparation will be paid for at the contract lump sum price.

**END OF SECTION**

## SECTION 02225

### AGGREGATE SURFACE COURSE

#### PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Hauling, placing and compacting mineral aggregate surface course for gravel access road.

1.02 WORK BY OTHERS

(Not Used)

1.03 RELATED WORK

- A. Section 02223: Subgrade Construction and Preparation

1.04 QUALITY ASSURANCE

- A. Determine maximum density and optimum moisture in accordance with the "Standard Method of Test for Moisture Density Relationship of Soils Using a 5.5 Pound Hammer and a 12-inch Drop," AASHTO Designation T 99, Method D
- B. The theoretical density of limestone aggregates shall be based on bulk specific gravity AASHTO T-85.
- C. The theoretical density of all other aggregates shall be based on bulk specific gravity AASHTO T-84 and T-85.

#### PART 2 - PRODUCTS

2.01 MINERAL AGGREGATE MATERIALS

- A. Aggregate shall be crusher run, size CR610.
- B. Aggregate gradations:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1-1/2"	100
1"	85-100
1/2"	40-75
No. 4	15-40
No. 100	0-10

- C. Furnish test reports on quality of all aggregates for approval by the Engineer prior to blending or mixing. If requested by the Engineer, furnish samples for testing by an independent laboratory. Test methods for aggregate base quality shall be by the following AASHTO methods:

Test	Method
Sampling	T-2
Percentage of wear	T-96
Soundness	T-104
Unit Weight	T-19
Sieve analysis	T-27

## 2.02 GEOTEXTILE UNDERLAYMENT

### A. Material Specifications

1. Material shall be polypropylene, and woven geotextile. Material shall be US200 manufactured by US Fabrics, or approved equal.
2. Resistant to ultraviolet degradation and to biological deterioration, and acids and basics normally found in soils. Minimum average roll values shall be the following:

Property	Test Method	Units	Property Requirement
Grab Tensile Strength	ASTM D4632	pounds	200
Elongation at Break	ASTM D4632	Percent	15%
CBR Puncture	ASTM D6241	pounds	700
Trapezoidal Tear	ASTM D4533	pounds	75
Apparent Opening Size	ASTM D-4751	US Std. Sieve	40
Permittivity	ASTM D4491	sec-1	0.05
Water Flow Rate	ASTM D4491	Gallons per minute/square feet	5
Ultraviolet Resistance (percent retained at 500 hours)	ASTM D4355	Percent	70
Mullen Burst	ASTM D-3786	psi	400
Puncture Strength	ASTM D-4833	lb.	90

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Complete subgrade construction as stipulated in Section 02223.
- B. Establish and maintain erosion and siltation control.

- C. Maintain benchmarks, monuments and other reference points.

### 3.02 PLACING AGGREGATE BASE

- A. The subgrade shall be checked and approved by the Engineer in advance of spreading any mineral aggregate. Subgrade that has been previously checked and approved and subsequently been subjected to freezing conditions or prolonged wet weather shall be rechecked for approval.
- B. Mineral aggregate bases shall not be spread on a subgrade that is frozen or contains frost.
- C. Construct mineral aggregate base in one or more layers with a compacted thickness as shown on the drawings. Place one or more courses of aggregate and additives if required, on a prepared subgrade in reasonably close conformity with the lines, grades, thicknesses, and typical cross-section shown on the drawings or established by the Engineer.
- D. Hauling over material already placed will not be permitted until it has been spread, mixed, shaped and compacted to the required density.
- E. All courses which have been damaged by settlement of subgrade shall be removed and replaced after the subgrade has been repaired.

### 3.03 MIXING AND SPREADING AGGREGATE BASE

- A. Furnish sieve analyses of mix gradations for all materials for approval by Engineer prior to beginning work. Methods of sampling and testing shall be in accordance with current AASHTO requirements.
- B. If the required compacted depth of the surface course exceeds 6 inches, construct the base in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches except when vibrating or other approved types of special compacting equipment are used, the compacted depth of a single layer of the base course may be increased to 8 inches upon approval of Engineer.
- C. Immediately following spreading, shape the base material to the required degree of uniformity and smoothness.
- D. Compact to the required density prior to any appreciable evaporation of surface moisture. Continuously compact each layer until the minimum density requirement is achieved.
- E. Test samples may be taken from stockpiles or plant production.

### 3.04 COMPACTING AGGREGATE BASES

- A. Compact materials to an average dry density of 95% of theoretical density determined in accordance with AASHTO T99, Method D. unless otherwise specified.

- B. For compaction testing purposes, each completed layer will be divided into lots of approximately 10,000 square yards. Smaller lots may be considered when approved by the Engineer.
- C. Five density tests will be performed on each lot and the results averaged.

**END OF SECTION**

## SECTION 02290

### TOPSOIL

#### PART 1 — GENERAL

##### 1.01 WORK INCLUDED

This work shall consist of applying topsoil in accordance with these Specifications and to the depths and limits shown on the Drawings or as established by the Engineer.

##### 1.02 RELATED WORK

- A. Section 02200: Site Grading and Filling
- B. Section 02930: Seeding and Mulching

#### PART 2 — MATERIALS

- A. Topsoil shall be capable of producing and sustaining vegetation and shall contain sufficient amounts of nutrients and organic matter as deemed acceptable by the Engineer.

#### PART 3 — EXECUTION

##### 3.01 PREPARING AREAS TO RECEIVE TOPSOIL

- A. Unless otherwise directed by the Engineer, areas designated to receive topsoil shall be graded, shaped, and then scarified or tilled by disking, harrowing, or other approved methods to a depth of approximately 2 inches. Topsoil shall be applied only when the subsoil is in a loose, friable condition.

##### 3.02 APPLYING TOPSOIL

- A. The loose depth of topsoil shall be sufficient to allow the area to conform to the elevations shown on the Drawings after topsoil settling effects are considered. A minimum of 4 inches of topsoil shall be placed over areas of the site to be vegetated.
- B. After topsoil has been applied, large clods, hard lumps, and unacceptably large stones; brush; roots; stumps; litter, and foreign material shall be removed from the area. When the operation is complete, the area shall be in a condition to receive seed, sod, or plants without further soil preparation. Areas shall be seeded within 7 days after topsoil is applied.
- C. Compact topsoil to meet a minimum density of 90% of Standard Proctor + 2% of optimum moisture. **Do not over-compact the topsoil layer.** Level and slope topsoil to provide positive drainage.

**END OF SECTION**



## SECTION 02721

### STORM DRAINAGE SYSTEMS

#### PART 1 – GENERAL

##### 1.01 WORK INCLUDED

- A. Installation of storm drainage systems.

##### 1.02 RELATED WORK

- A. Section 02200: Site Grading and Filling
- B. Section 02222: Common Excavation for Utilities

#### PART 2 – PRODUCTS

##### 2.01 CORRUGATED METAL PIPE (GALVANIZED) CULVERTS (CMP)

- A. Corrugated Metal Pipe: AASHTO M-36, Type I
- B. Corrugated Metal Pipe Arches: AASHTO M-36, Type II
- C. Corrugated Metal Pipe Underdrains: AASHTO M-36, Type III. Unless otherwise specified, any of the classes covered may be furnished, and shall be Type I pipe with circular or slotted perforations.
- D. Structural Plate for Pipes, Pipe Arches, and Arches: AASHTO M-167 for galvanized corrugated structural plates and fasteners.

#### PART 3 – EXECUTION

##### 3.01 PREPARATION

- A. Prior to laying pipe, prepare suitable bedding according to Section 02222.
- B. Before placing pipe in the trench, field inspect for cracks or other defects; remove defective pipe from the construction site.

##### 3.02 INSTALLING DRAINAGE PIPE

- A. Lay pipe in a straight line on a uniform grade from structure to structure with the bell or groove end upgrade.
- B. Firmly support each section throughout its length and form a close concentric joint with the adjoining pipe.
- C. Make junctions and turns with standard or special fittings.

- D. Do not open up more trench at any time than pumping facilities are able to dewater.
  - E. Whenever the work ceases, close the end of the pipe with a tight fitting plug or cover.
  - F. Any pipe which is not in good alignment or which shows any undue settlement or damage shall be taken up and relaid without additional compensation.
  - G. Laying pipe and sealing joints shall be a continuous operation.
    - 1. Seal all joints during the same day in which the pipe is laid.
    - 2. Construct the joints in such a manner that a watertight joint will result.
  - H. Joints for rigid pipe:
    - 1. Rubber gaskets; or
    - 2. Other types of joints recommended by the pipe manufacturer and approved.
  - I. Install rubber ring gaskets as per ASTM C-443 to form a flexible watertight seal.
  - J. Whenever other type joints are permitted, install or construct in accordance with the recommendations of the manufacturer.
  - K. Inspect the pipe before any backfill is placed.
  - L. As the work progresses, clean the interior of all pipe in place.
- 3.03 PLUGGING EXISTING PIPING
- A. Where indicated, plug existing storm water piping being taken out of service with concrete.
- 3.04 MEASUREMENT AND PAYMENT – DRAINAGE PIPE
- A. Drainage pipe, of the various kinds, types and sizes, shall not be measured for payment, but will be included in the Lump Sum Contract Price.
  - B. The Lump Sum Contract Price shall be full compensation for drainage piping, including all labor, material, equipment, and other incidentals.

**END OF SECTION**

**SECTION 02930**

**SEEDING AND MULCHING**

**PART 1 — GENERAL**

1.01 WORK INCLUDED

This work shall consist of furnishing and applying fertilizer, lime, and seed, in the quantities specified below over all areas disturbed by the construction operations and other denuded areas specifically designated by the Engineer.

1.02 RELATED WORK

- A. Section 02290: Topsoil

**PART 2 — PRODUCTS**

2.01 SEED MATERIALS - GENERAL

- A. Inspect and test seed for germination and purity prior to mixing.
- B. Uniformly mix:

Seed Name	Quantity Lbs/Acre
Red Fescue	50
Perennial Ryegrass	30
White Clover	5

- C. All seed shall meet the requirements of the Tennessee State Department of Agriculture.
- D. Furnish the Engineer a certified laboratory report showing the analysis of the seed to be furnished. The report shall bear the signature of a senior seed technologist.
- E. Inoculant for Legumes:
  - 1. Nitrogen fixing bacteria cultures adapted to the particular seed to be treated.
  - 2. Furnish to containers of a size sufficient to treat the specified quantity of seed to be planted.

2.02 MULCH MATERIALS

- A. Hay composed of approved stalks from grasses, sedges, or legumes; or straw composed of stalks from rye, oats, wheat, or other approved grains.
- B. Air dried and reasonably free from noxious weeds, weed seeds, and other detrimental plant growth.
- C. Suitable for spreading with mulch blower machinery.
- D. Wood fiber mulch, when used, shall meet the following specifications:

Maximum Moisture Content	10% +/- 3%
Organic Matter	99.4% +/- 0.2%
Ash Content	0.8% +/- 0.2%
pH	4.8 +/- 0.5
Water Hold Capacity (minimum) (grams of water per 100 grams of fiber)	1000

- E. Mulch Binders:
  - 1. Cut back asphalt, Grade RC-70 or RC-250 conforming to AASHTO M-81, M-82 or M-141, for the type and grade specified.
  - 2. Emulsified asphalt, Type SS-1 conforming to AASHTO M-140. In addition to Type SS-1, a special mixing material AE-3 or a special priming material AE-P may be specified.

2.03 COMMERCIAL FERTILIZERS

- A. Unless otherwise specified inorganic 10-6-4 nitrogen, phosphoric acid, and potash for seeding and 15-15-15 or 1-1-1 for sodding.
- B. Furnish in standard containers with the brand name, weight and guaranteed analysis of the contents clearly marked.
- C. Comply with Federal, State, and local laws.
- D. Ammonium Nitrate shall be a standard commercial product, having a minimum of 33.5 percent nitrogen.
- E. Agricultural limestone shall contain a minimum of 85% of calcium carbonate and magnesium carbonate combined, and be of particular size that 85% will pass a No. 10 mesh sieve.

2.04 WATER

- A. Free from harmful organisms or other objectionable materials.

## **PART 3 – EXECUTION**

### **3.01 GENERAL**

- A. Scarify, disc, harrow, rake, or otherwise work each area to be seeded until it has been loosened and pulverized to a depth as directed by the Engineer.
- B. Uniformly incorporate fertilizer and lime into the soil for a depth of approximately 1/2" at the rate of:
  - 1. Not less than 800 pounds per 1,000 square feet for grade 10-6-4 or equivalent.
  - 2. Not less than 100 pounds per 1,000 square feet for agricultural limestone.
- C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment.
- D. Sow seed as soon as preparation of the seedbed has been completed.
- E. Sow uniformly by means of a rotary seeder, hydraulic equipment, or other satisfactory means at the rate of 2 pounds per 1,000 square feet, unless otherwise specified.
- F. Inoculate Group C seed and seeds of legumes, when sown alone, before sowing in accordance with the recommendations of the manufacturer of the inoculant.
- G. Do not perform seeding during windy weather, or when the ground surface is frozen, wet or otherwise non-tillable. No seeding shall be performed during December through February unless otherwise permitted.
- H. When specified, provide seeding with mulch:
  - 1. Spread hay or straw mulch evenly over the seeded area at an approximate rate of 75 pounds per 1,000 square feet immediately following the seeding operations. This rate may be varied by the Engineer, depending on the texture and condition of the mulch material and the characteristics of the area seeded.
  - 2. Hold hay or straw mulch in place by the use of a mulch binder applied at the approximate rate of 4 gallons per 1,000 square feet as required.
  - 3. Cover bridges, guardrails, signs and appurtenances, if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.
  - 4. When wood fiber mulch is used, uniformly apply at the rate of 28 to 35 pounds per 1,000 square feet with hydraulic mulching equipment.

### **3.02 WATERING**

Seeded areas shall be watered after mulching. The seeded areas shall be watered immediately after sowing with a second and third water application following the first at 48-hour intervals.

**END OF SECTION**

**SECTION 03100**  
**CONCRETE FORMWORK**

**PART 1 - GENERAL**

- 1.01 RELATED WORK SPECIFIED ELSEWHERE
  - A. Section 03200: Concrete Reinforcement
  - B. Section 03300: Cast-In-Place Concrete
- 1.02 WORK INSTALLED BUT FURNISHED BY OTHERS
  - A. Built-in anchors, inserts, bolts, hangers, sleeves, ferrules, waterstops and other accessories.
- 1.03 QUALITY ASSURANCE
  - A. Design, construct, and erect formwork per ACI 347, Recommended Practice for Concrete Formwork.
- 1.04 ALLOWABLE TOLERANCES
  - A. In accordance with ACI 301 as listed in Table 4.3.1 -Tolerances for Formed Surfaces.
- 1.05 REFERENCES
  - A. The following references shall be obtained by the Contractor and maintained at the job site in a readable condition:
    - 1. ACI 347, Recommended Practice for Concrete Formwork.

**PART 2 - PRODUCTS**

- 2.01 MATERIALS
  - A. Concealed concrete: No. 2 Common Southern Pine, S4S, or better.
  - B. Exposed concrete: B-B Plyform, Class I or II, EXT-APA, Metal or fiberglass forms may be used.
  - C. Construction joint forms: Key-type steel formers, Vulcan Screed Joints, Burke Keyed Kold Joint Form or equal.
  - D. Form coating: Non-staining mineral oil.

- E. Expansion joint filler: Asphalt impregnated, premolded fiberboard by full thickness of slab or joint. ASTM D 994.

## 2.02 EARTH FORMS

- A. Where soil is firm enough to permit cutting to true size, concrete may be placed without forms.

## **PART 3 - EXECUTION**

### 3.01 ERECTING

- A. Erect forms to obtain shapes, designs and dimensions indicated. Make forms sufficiently tight to prevent leakage. Brace, shore and tie forms together to maintain position without sagging or bulging.
- B. Provide 3/4" chamfering at exposed corners.
- C. Prepare insides of forms so that concrete will have a smooth, uniform finish, free from fins, stone pockets, voids and other surface defects.
- D. Provide construction joint forms where concrete placement terminates at the end of a day or because of other reasons.
- E. Provide bulkheads, with reinforcing steel penetrating bulkheads, where concrete placement stops at end of day or for other reasons.
- F. Where soil conditions are such that concrete cannot be placed without forms, and where other conditions cause trenches to be opened wider than footing or slab widths, erect forms for footing or slabs.
- G. Install items furnished by others for installation in concrete. Use templates to locate anchor bolts and other critical items.

### 3.02 PREPARING

- A. Prepare insides of forms so that concrete will have a smooth, uniform finish free of surface defects.
- B. Coat forms before reinforcement steel is placed. Where mill-oiled forming material is used, follow manufacturer's instructions for recoating. Where forming material is not mill-oiled, coat forms before each use.
- C. Before reusing forms, thoroughly clean them and remove projecting nails or similar devices.

3.03 FORM REMOVAL

- A. Remove forms in such manner and such time as to insure safety of structure and to avoid chipping and spalling of concrete. Refer to Section 6.2 of ACI 318-83, Section 6.2 of the Commentary to ACI 318-83, and Section 3.6.2.3 of ACI 347-78 for form removal requirements.

**END OF SECTION**



## SECTION 03200

### CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

##### 1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03100: Concrete Formwork
- B. Section 03300: Cast-In-Place Concrete

##### 1.02 SUBMITTALS

- A. Submit warranty from mill or supplier stating that materials meet requirements of referenced ASTM and ACI Standards.
- B. Detail reinforcing steel in accord with ACI 315, "Details and Detailing of Concrete Reinforcement." Submit three prints of shop drawings indicating bending and placement of reinforcement as well as sleeve and built-in work locations. Do not fabricate reinforcement steel until approval of Engineer has been obtained.

##### 1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in bundles marked with metal tags for easy identification.
- B. Handle and store materials to prevent contamination.
- C. Deliver and store welding electrodes in accord with American Welding Society D 1.4-79.

##### 1.04 REFERENCES

- A. The following references shall be obtained by the Contractor and maintained at the job site in readable condition at all times:
  - 1. CRSI, Manual of Standard Practice, January 1980 Edition
  - 2. CRSI, Placing Reinforcing Bars, 1976 Edition
  - 3. AWS D1.4-79, Reinforcing Steel Welding Code

#### PART 2 - PRODUCTS

##### 2.01 REINFORCEMENT STEEL

ASTM A 615-84a Grade 60, conforming to supplemental requirements S1.

##### 2.02 REINFORCEMENT WIRE

Welded steel wire fabric, ASTM A 185-79.

2.03 TIE WIRE

ASTM A 82-79, Plain, cold-drawn steel.

2.04 BAR SUPPORTS

- A. All surfaces exposed to weather or liquid or which can be seen in service condition shall have bar supports conforming to Class C, D, or E as defined in Chapter 9 of CRSI, Placing Reinforcing Bars, 1976 Edition. Where no protection is required, Class A supports may be used.

2.05 FABRICATING

- A. In accord with CRSI Manual of Standard Practice, latest edition.

**PART 3 - EXECUTION**

3.01 CONDITION OF SURFACES

- A. Maintain reinforcement surfaces free of rust scale and other coatings which might impair concrete bond as described in Section 7.4 of ACI 318-83.

3.02 INSTALLING REINFORCING STEEL

- A. Handle, place and tie reinforcement steel in accord with "Building Code Requirements for Reinforced Steel," ACI 318-83 and CRSI publication "Placing Reinforcing Bars," 1976 Edition.
- B. All reinforcement bars shall be supported and secured as directed in ACI 315-80 and CRSI Manual of Standard Practice, January 1980 Edition.
- C. Provide Class C tension splices for all splices unless indicated or noted otherwise. Do no splicing of reinforcement steel except as authorized by Engineer.
- D. Reinforcement shall not be heated or welded without written permission of Engineer. Where permission is obtained, welding shall be in accordance with American Welding Society publication "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction," AWS D 1.4-79.
- E. Bend bars cold. Do not field bend bars partially embedded in concrete except as specifically permitted by Engineer. Do not heat or cut bars with a torch.

3.03           INSTALLING WELDED WIRE FABRIC

- A.     After vapor barrier or underfloor waterproofing, as applicable, or slab-on-grade has been placed, install welded wire fabric.

Locate welded wire fabric in center third of slabs.

- B.     Lap sides one full mesh plus 2". Lap ends two full meshes. Offset end laps in adjacent width to prevent continuous laps.

3.04           CONCRETE PROTECTION FOR REINFORCEMENT

- A.     Protect reinforcing by thickness of concrete indicated.

- B.     Where not indicated, thickness of concrete over reinforcing shall be as follows:

1.     Where concrete is deposited against the ground without the use of forms — 3".
2.     Where concrete is exposed to weather or to ground but placed in forms — 2" for bars larger than No. 5 and 1-1/2" for No. 5 bars or smaller.
3.     In slabs and walls not exposed to the ground or to the weather — 3/4".
4.     In beams, girders, and columns not exposed to the ground or to the weather — 1-1/2".

- C.     Variation from clear cover shall conform to Section 7.5 of ACI 318-83.

**END OF SECTION**

## SECTION 03300

### CAST-IN-PLACE CONCRETE

#### PART 1.0 — GENERAL

##### 1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01410: Testing Laboratory Services

##### 1.02 QUALITY ASSURANCE

- A. Owner to employ a testing laboratory to perform concrete tests. Included in the responsibilities for concrete testing are the taking, handling, protecting and storing of test specimens, and the accurate reporting of compressive strength, weight of cylinders, content of concrete, slump, air content, and location of concrete. If the concrete fails to meet any part of the specifications, immediately notify Engineer to obtain instructions. Payment for retests will be made by the Contractor.
- B. Laboratory will be required to obtain samples, in accordance with C 31 and perform compression tests per ASTM C 39; air content tests per ASTM C 138 (gravimetric method) or ASTM C 231 (pressure method); slump tests per ASTM C 143.
- C. Laboratory will test one set of cylinders (6 specimens) for each 150 cubic yards, or fraction thereof, or for each 5000 square feet of surface area for slabs or walls, whichever is smaller, of each class of concrete placed each day; two cylinders shall be tested at 7 days for information, and two cylinders shall be tested at 28 days for acceptance. If the cylinders tested at 28 days do not indicate proper strength, the third set of two will be tested at a later time as directed by the Engineer.
- D. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength  $f'_c$ , and no individual test result falls below the specified strength  $f'_c$  by more than 500 psi.
- E. Additional tests may be required if evidence of faulty workmanship, failure of laboratory tests, or questionable concrete exists. These tests shall be paid for by Contractor.

##### 1.03 EVALUATION AND ACCEPTANCE OF CONCRETE

- A. Concrete strength will be evaluated by the Engineer according to the provisions of ACI 318-95, Section 4.7. Should evidence of low-strength concrete exist, or if test results indicate non-conformance with these specifications, additional testing, as outlined in ACI 318-95, Section 4.7.4 may be directed by the Engineer. The Contractor shall bear the cost of any additional testing required.

- B. If, after additional testing, evidence of low-strength concrete still exists, load tests in accordance with Chapter 20 of ACI 318-95 may be ordered by the Engineer. In the event the concrete is determined to be inadequate by the Engineer, the Contractor will remove it from the Project and replace it with concrete conforming to these specifications, subject to all testing requirements herein. All such remedial work shall be at the Contractor's expense.

Contractor shall provide Testing Laboratory with assistance required to gather and store sample cylinders. On site storage of cylinders, if required, shall be provided for adequate protection of the samples.

#### 1.04 CONCRETE QUALITY DESIGN

- A. All concrete mix designs shall be proportioned in accordance with Section 4.3 (field experience and/or trial mixtures) of ACI 318-95. Submit mix design for each class of concrete based on a standard deviation analysis or trial mixtures. If a standard deviation analysis is used, the concrete shall achieve an average strength in accordance with 4.3.2.1 of ACI 318-95. If trial mixtures are used, the proposed mix design shall achieve an average strength in accordance with Table 4.3.2.2 of ACI 318-95. Refer to Figure 4.3 of the Commentary on Building Code Requirements for Reinforced Concrete (ACI 318-95) for flow chart outlining this procedure. Submittals made that do not conform to Section 4.3 of ACI 318-95 shall be rejected.

#### 1.05 SUBMITTALS

- A. Submit five copies of the concrete mix designs with supporting data confirming compliance with ACI 318-95, Chapter 4 and this specification. Indicate types and quantities of materials used, the fresh unit weight, compressive strength, slump, air content, and aggregate analysis in mix design.
- B. Submit two copies of certification showing that the aggregate cement and all admixtures conform to these specifications.
- C. Submit copies of each laboratory test report indicating type of concrete furnished, compressive strength, slump, air content, and water added to concrete after batching. Distribution of copies shall be as directed by the Engineer.
- D. Retain ready-mix delivery tickets at job site for inspection by Engineer.

#### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when temperature is below 40 degrees F (4.5 degrees C.) or forecast to go below 40 degrees F within 24 hours, unless adequate heating and protecting equipment is on hand to warm concrete. In these circumstances, use heating and protecting equipment continuously until concrete has set and for at least 72 hours after placing.

- B. Perform cold weather concrete work in accordance with ACI 306-R-78, "Cold Weather concreting, 1978."
- C. Perform hot weather concrete work in accordance with ACI 305R-77, "Hot Weather Concreting, 1977."
- D. When high temperatures and/or placing or humidity conditions dictate, the mix may be initially retarded by use of the water reducing, retarding formulation (Type D) of the specified water reducing admixture (Type A).

1.07 REFERENCES

- A. The following references shall be obtained by the Contractor and maintained at the job site in a readable condition at all times.
  - 1. ACI 318, Building Code Requirements for Reinforced Concrete
  - 2. ACI 315, Details and Detailing of Concrete Reinforcement
  - 3. ACI 306R, Cold Weather Concreting
  - 4. ACI 305R, Hot Weather Concreting
  - 5. ACI 302.1R, Guide for Concrete Floor and Slab Construction
  - 6. ACI 301, Specifications for Structural Concrete for Buildings
  - 7. Manufacturer's Instructions of all products required for proper use or installation of the product

**PART 2.0 — PRODUCTS**

2.01 PORTLAND CEMENT

- A. ASTM C 150, Type I. Use only one brand. In addition to the requirements of C150, the cement shall contain no more than 8 percent tri-calcium aluminate.

2.02 FINE AGGREGATE

- A. Natural siliceous sand conforming to ASTM C 33.

2.03 COARSE AGGREGATE

- A. Washed gravel or crushed stone, ASTM C 33. Size coarse aggregate in accordance with ACI 318, Chapter 3, Subparagraph 3.3.3.

2.04 WATER

- A. Clean water, free from elements which might adversely affect concrete, and embedded items.

## 2.05 ADMIXTURES

- A. Water Reducing Admixture: Eucon WR-75 by the Euclid Chemical Company, Pozzolith 200 N by Master Builders or Plastocrete 160 by Sika Chemical Corporation. The admixture shall conform to ASTM C 494, Type A, and not contain more chloride ions than are present in municipal drinking water.
- B. Water Reducing, Retarding Admixture: Eucon Retarder-75 by the Euclid Chemical Company, Pozzolith 100 XR by Master Builders or Plastiment by Sika Chemical Corporation. The admixture shall conform to ASTM C 494, Type D, and not contain more chloride ions than are present in municipal drinking water.
- C. High Range Water Reducing Admixture/(Superplasticizer): Eucon 37 by the Euclid Chemical Company or Sikament by Sika Chemical Corporation. The admixture shall conform to ASTM C 494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
- D. Non-Chloride Accelerator: Accelguard 80 by the Euclid Chemical Company or Darex Set Accelerator by W. R. Grace. The admixture shall conform to ASTM C 494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.
- E. Air Entraining Admixture: Conforming to ASTM C 260.
- F. Calcium Chloride: Calcium chloride or admixtures containing more than 0.05 percent chloride ions are not permitted.
- G. Certification: Written conformance to requirements stated above and the chloride ion content will be required from the admixture manufacturer prior to mix design review by the Engineer.

## 2.06 FLY ASH

- A. Fly Ash shall conform to ASTM C 618 Class C or F.

## 2.07 CONCRETE CLASSIFICATIONS

- A. Class A Concrete: Unless otherwise specified and shown on the Plans, all concrete shall be Class A.
  - 1. In accord with ASTM C 94, Alternative No. 2.
  - 2. Strength: As specified on the Structural Drawings.
  - 3. Air Content: Provide entrained air in accordance with ACI 302.1R. Table 5.2.7a within tolerances specified. All interior slabs subject to abrasion shall have a maximum air content of 3 percent.
  - 4. Water-Cement Ratio: All concrete exposed to freezing and thawing shall have a maximum water-cement ratio of 0.50. All concrete subjected to

de-icers and/or required to be watertight shall have a maximum water-cement ratio of 0.45.

5. Slump: All concrete containing the high range water reducing admixture (superplasticizer) shall have a maximum slump of 8" unless otherwise approved by the Engineer. The concrete shall arrive at the job site at a slump of 2" to 3", be verified, then the high range water reducing admixture added to increase the slump to the approved level.
6. All other concrete shall have a maximum slump of 3" for slabs and 4" for other members.
7. Limestone aggregate shall be used in all Class A concrete.

B. Class B Concrete: Use for anchors, kickers, encasement for pipelines, and fill, unless otherwise specified.

1. Fine Aggregate: Proportion by dry weight of fine to coarse aggregates between 30-45%. Test for potential alkali reactivity per ASTM C-289. Use natural river sand or specially approved manufactured sand, only.
2. Coarse Aggregate: Size No. 57.
3. Minimum Cement Content: 5.0 bags (470 pounds) per cubic yard.
4. Minimum Compressive Strength: 28 day, 2,500 psi, average of any 3 cylinders.
5. Slump: 5 to 8 inches for pipe encasements and 2 to 4 inches for other specified areas.
6. Mixing Water: Maximum amount of water per 94 pound bag of Portland cement shall be 6.5 gallons. Deduct the moisture content of the aggregate from the amount of water required.

## 2.08 ADMIXTURES

- A. All concrete shall contain the specified water reducing admixture or high range water reducing admixture (superplasticizer). At the Contractor's option, both water reducing admixtures may be included in the concrete mix. All concrete slabs placed at air temperatures below 50 F shall contain the specified non chloride accelerator. All concrete required to be air entrained shall contain the approved air entraining admixture. All pumped concrete, architectural concrete, concrete for industrial slabs and parking decks, and concrete with a water-cement ratio below 0.50 shall contain the specified high range water reducing admixture (superplasticizer).

## 2.09 VAPOR BARRIER

- A. Vapor barrier shall consist of 6 mil polyethylene sheeting conforming to ASTM E 154.

## 2.10 BOND BREAKER

- A. 30# and 90# asphalt saturated roofing felt.



## 2.11 CURING AND SEALING COMPOUND

- A. Super Floor Coat or Super Pliocure by the Euclid Chemical Company or Masterseal 66 by Master Builders. The compound shall conform to ASTM C309, 30 percent solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.055 grams per square cm in 72 hours when applied at a coverage rate in conformance with the manufacturer's recommendations. Manufacturer's certification required.

## 2.12 SHEET MATERIAL FOR CURING CONCRETE

- A. Waterproof paper or polyethylene film as per ASTM C171.
- B. Bonding Compound: Euco Weld by the Euclid Chemical Company or Weldcrete by the Larsen Company. The compound shall be a polyvinyl acetate, rewettable type.
- C. Epoxy Adhesive: Euco Epoxy #463 or #615 by the Euclid Chemical Company or Sikadur Hi-Mod by Sika Chemical Corporation. The compound shall be a two (2) component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces.
- D. Non-Shrink Grout: Firmix (metallic) or Euco NS (non-metallic) by the Euclid Chemical Company or Embecco 153 (metallic) and Masterflow 713 (non-metallic) by Master Builders. The grout shall conform to CRD-C-621-80, "Corps of Engineers Specification for Non-Shrink Grout."

## 2.13 WATERSTOPS

- A. Waterstops at construction joints shall be Greenstreak Plastic Products, Division of Wester Textile Products Company, P.O. Box 7139, St. Louis, Missouri 63177, #784 or Vinylex Corporation, 2636 Bylington-Solway Road, Knoxville, Tennessee 37921, #RB6-12, or equal. Waterstops shall be at least 1/2" thick at their center and 6" wide.
- B. Between new and old construction waterstops shall be Synko Flex Preformed Plastic Adhesive Waterstop by Synko-Flex Products, Inc., Houston, Texas.

## **PART 3.0 — EXECUTION**

### 3.01 FIELD QUALITY CONTROL

- A. As concrete is delivered, a testing laboratory will take three sets of two cylinders per set for each 50 cubic yards, or fraction thereof, or for each 5,000 square feet of surface area for slabs and walls, whichever is smaller, of each type of concrete placed each day. In addition, laboratory will take small batches of the same concrete used for making cylinders for making slump tests and air entrainment tests. Assist the laboratory in taking samples and furnish concrete required for making tests.

### 3.02 CONDITION OF SURFACES

- A. Notify testing laboratory at least 48 hours before starting concrete placement. Do not start concrete placing until laboratory has approved surfaces, reinforcement placement, and other embedded items.
- B. Place no concrete until reinforcement and other embedded items are positioned and secured.
- C. Forms, surfaces, and trenches shall be free from water, mud, ice, frost, and debris when concrete is placed.
- D. Wet surfaces before placing concrete.

### 3.03 VAPOR BARRIER

- A. Place vapor barrier under all slabs placed on earth or aggregate. Place smoothly, without wrinkles and trapped air. Lap side and end joints at least 6" (15 cm) and weight down sheeting to avoid blowing. Turn vapor barrier up 4" (10 cm) at vertical surfaces. Keep unnecessary traffic off of vapor barrier. Note areas on drawings where 3" of damp sand is required, prior to concrete placement.

### 3.04 BOND BREAKERS

- A. Where separation from a vertical surface is desired, place 12" wide strips of 30# felt, creased at a right angle in the long direction at all vertical surfaces, except where fiberboard is to be installed. Turn up on vertical surfaces for full thickness of concrete.
- B. Where floor slabs bear on tops of foundations, place a 90# strip of felt, full width of bearing surfaces, on all bearing surfaces.

### 3.05 PRODUCTION OF CONCRETE

- A. Produce concrete in accordance with Chapter 7 of ACI 301 for ready-mixed concrete.

### 3.06 PLACING CONCRETE

- A. Prepare place of deposit and equipment. Convey and place concrete in accord with ACI 301, Chapter 8, Paragraphs 8.1 through 8.3. Certain parts of those paragraphs are modified below, and where modifications conflict with those paragraphs or add additional instructions they should take precedence over the printed paragraphs of ACI 301.
- B. Variation from clear cover and depth of members shall conform to Section 7.5 of ACI 318.

- C. Deposit concrete within one hour after water is added to dry batching, or use retarding admixture.
- D. Convey concrete promptly to point of use in a manner which will prevent separation of ingredients and loss of water. Deposit concrete near its final position to avoid rehandling.
- E. Consolidate concrete, including floor slabs, in accordance with ACI 309, "Recommended Practice for Consolidation of Concrete." All concrete shall be vibrated. Maintain at least one vibrator as a stand-by. Lower frequency vibrators may be used with "flowing" concrete.
- F. Do not use vibrators to cause concrete to flow.

### 3.07 CONSTRUCTION JOINTS AND EMBEDDED ITEMS

- A. Construction joints and embedded items shall conform to Chapter 6 of ACI 301. Location of all construction joints shall be approved by the Engineer.

### 3.08 FINISHING

- A. After placing concrete, screed to levels and slopes indicated. Do not use tamping tools to force aggregate away from surface.
- B. When the water sheen has disappeared, use a wood float to bring concrete to a true level or slope as indicated. Depressions between high spots shall not exceed 5/16" under a 10' straightedge after floating.
- C. Exterior vertical surfaces which will be exposed to view after construction shall receive a rubbed finish. All other surfaces shall receive a broom finish.
- D. Do not use dry materials, such as sand and cement, on surfaces during finishing.
- E. Maximum allowable variation in finished surfaces should be such that depressions between high spots should not exceed 3/16" under a 10' straightedge.

### 3.09 CURING

- A. As finished work is completed, begin curing. Curing may be accomplished by either of the methods described below, except for items specifically designated for a particular method.
- B. Waterproof paper or plastic film curing: Cover damp surfaces with film or paper and lap at edges at least 4 inches. Apply weights to prevent displacement. Repair tears and punctures, as they occur.
- C. All exterior slabs, sidewalks, curbs, etc. shall be cured with the specified clear curing and sealing compound. The compound shall be applied immediately after final finishing operations are completed. Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

D. Where forms are left in place, keep forms damp by spraying at frequent intervals for at least 8 days. Do not allow forms to dry out.

3.10 PROTECTION

A. Protect concrete against traffic for at least 48 hours. Erect barriers as necessary to protect uncured areas. Provide wood covers to protect concrete step-ups from all construction traffic.

B. Protect concrete from paint and other stains, and from abrasive traffic.

3.11 PATCHING

A. After forms are removed do not patch or repair, except that fins may be removed back to formed surfaces, until Engineer has examined the work. After inspection by Engineer, patch voids, honeycombs, spalls, chips, as directed.

B. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar, thoroughly clean, dampen with water and apply the specified bonding compound. The cement mortar shall be placed after the bonding compound has dried.

C. Rub exposed interior finished concrete as specified above. Where form marks and fins detract from appearance or are otherwise objectionable remove them by rubbing.

D. All structural repairs shall be made with prior approval of the Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar.

3.12 CLEANUP

A. Clean up and leave concrete work free from any loose material. Remove any mortar spills from floors or other materials. Leave areas free from any debris.

B. Remove excess material and equipment from site when work is completed.

3.13 MEASUREMENT AND PAYMENT

A. Measurement

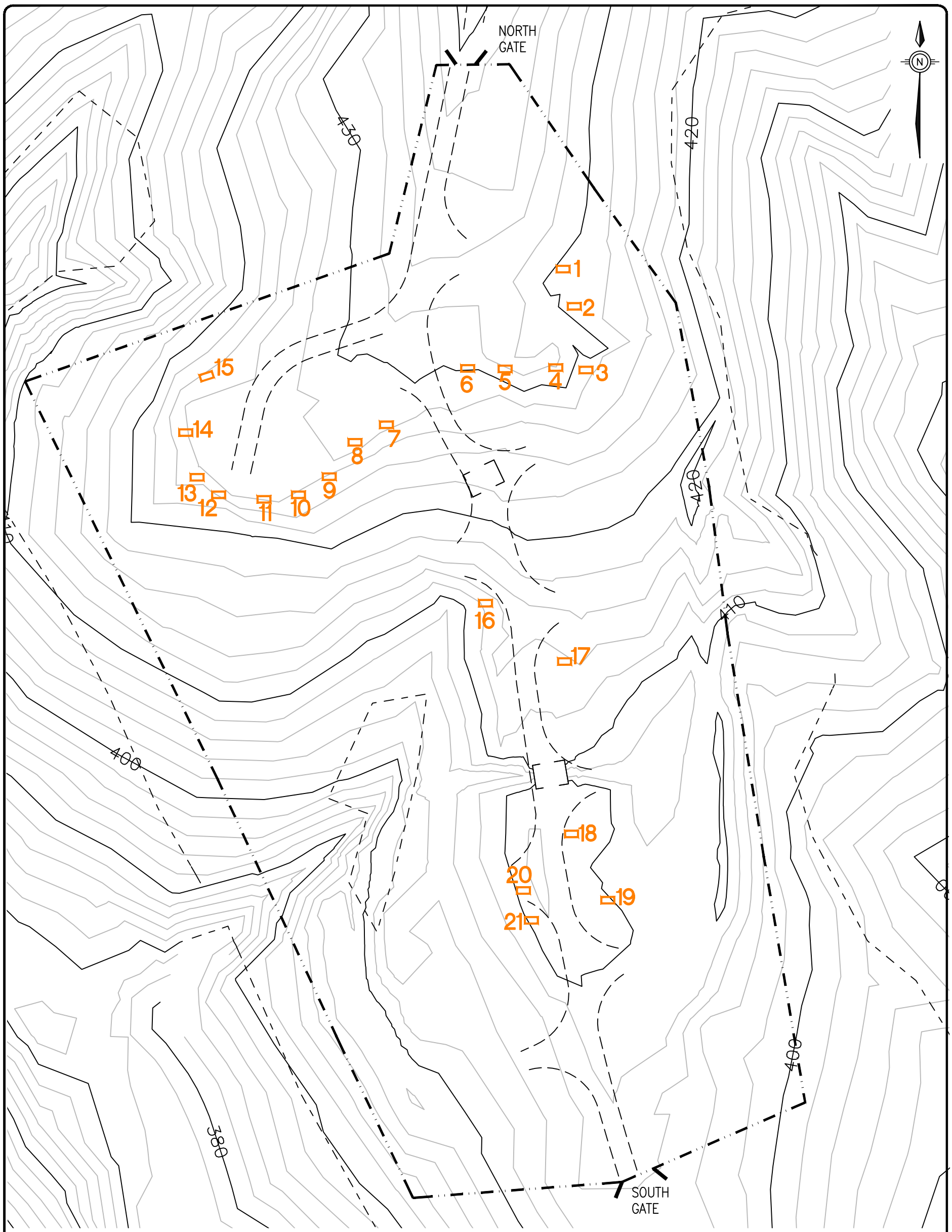
1. Class A and Class B concrete will not be measured for payment.

B. Payment

1. Payment for Class A and Class B concrete, including conveyance, placing and finishing, all reinforcing steel, anchor bolts, and any other miscellaneous embedded items, will be included with the Work with which it is associated.

**END OF SECTION**

**Appendix D-2**  
**Figures**



- LEGEND**
- HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
  - GRAVEL ROAD
  - CONTOUR LINES
  - EXISTING INTERIM STATUS BURN PAN

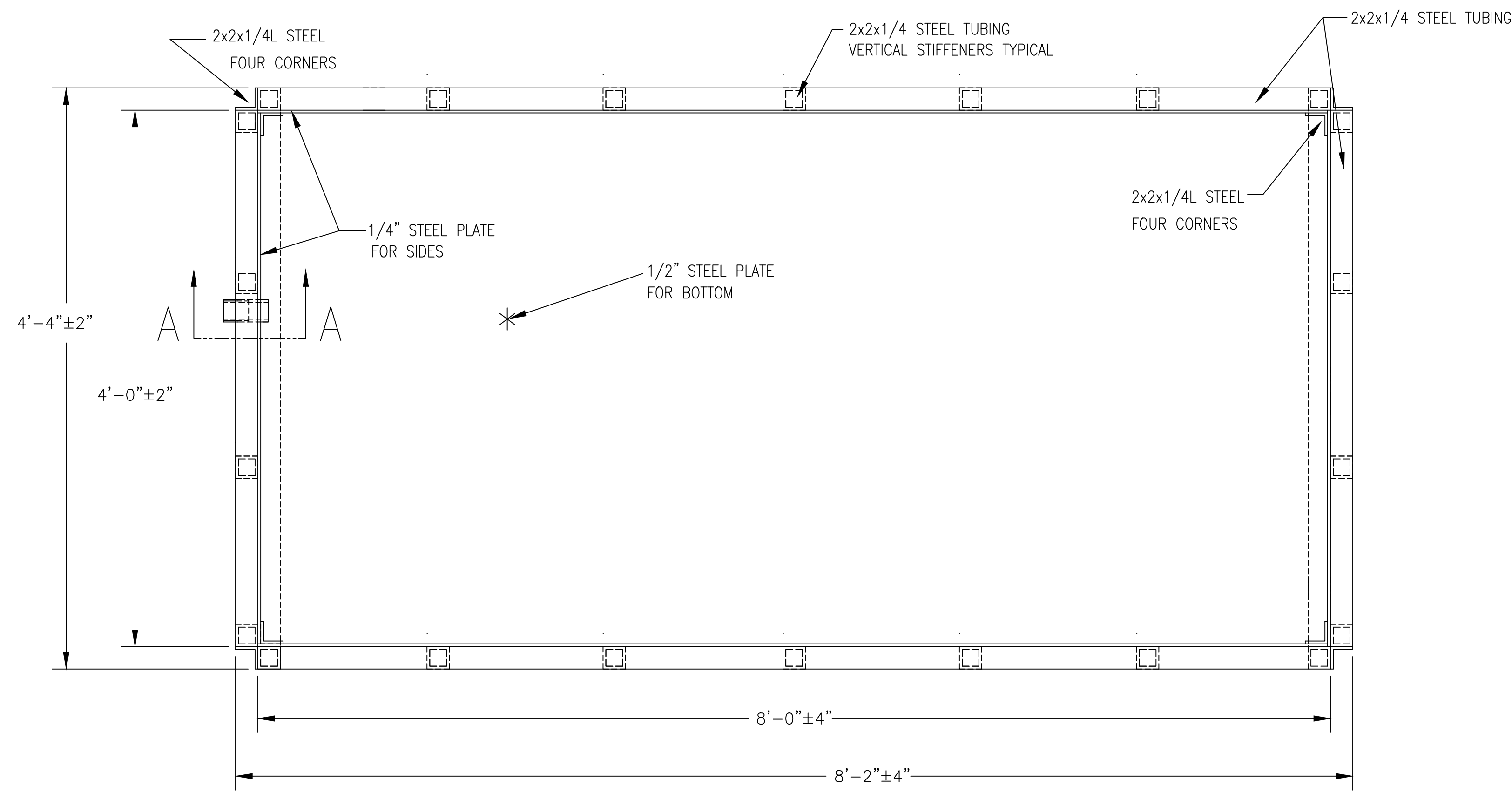
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 SCALE FEET  
 CONTOUR INTERVAL = 2'



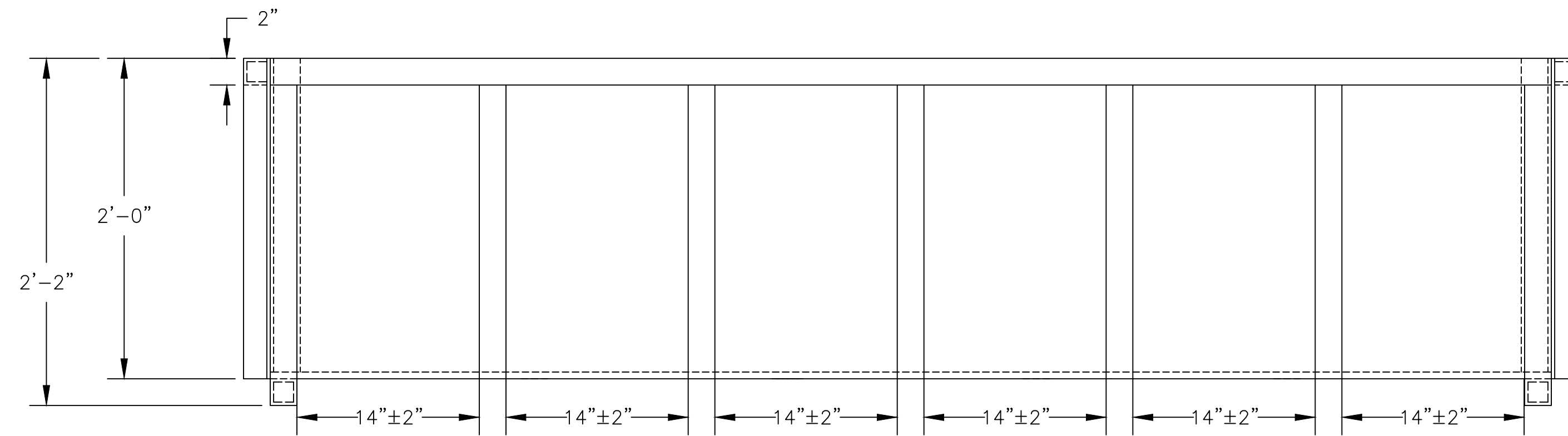
SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE D-1 EXISTING INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNITS (HWOBUS) BURN PANS 1-21 PART B PERMIT APPLICATION KILGORE FLARES COMPANY, LLC TOONE, TENNESSEE	
REQUESTED BY: G. POPE DRAWN BY: BRONSON DWG DATE: 05/13/15 DWG NO: 15139_B072	 creative thinking. custom solutions. (800) 588-7962 www.ensafe.com

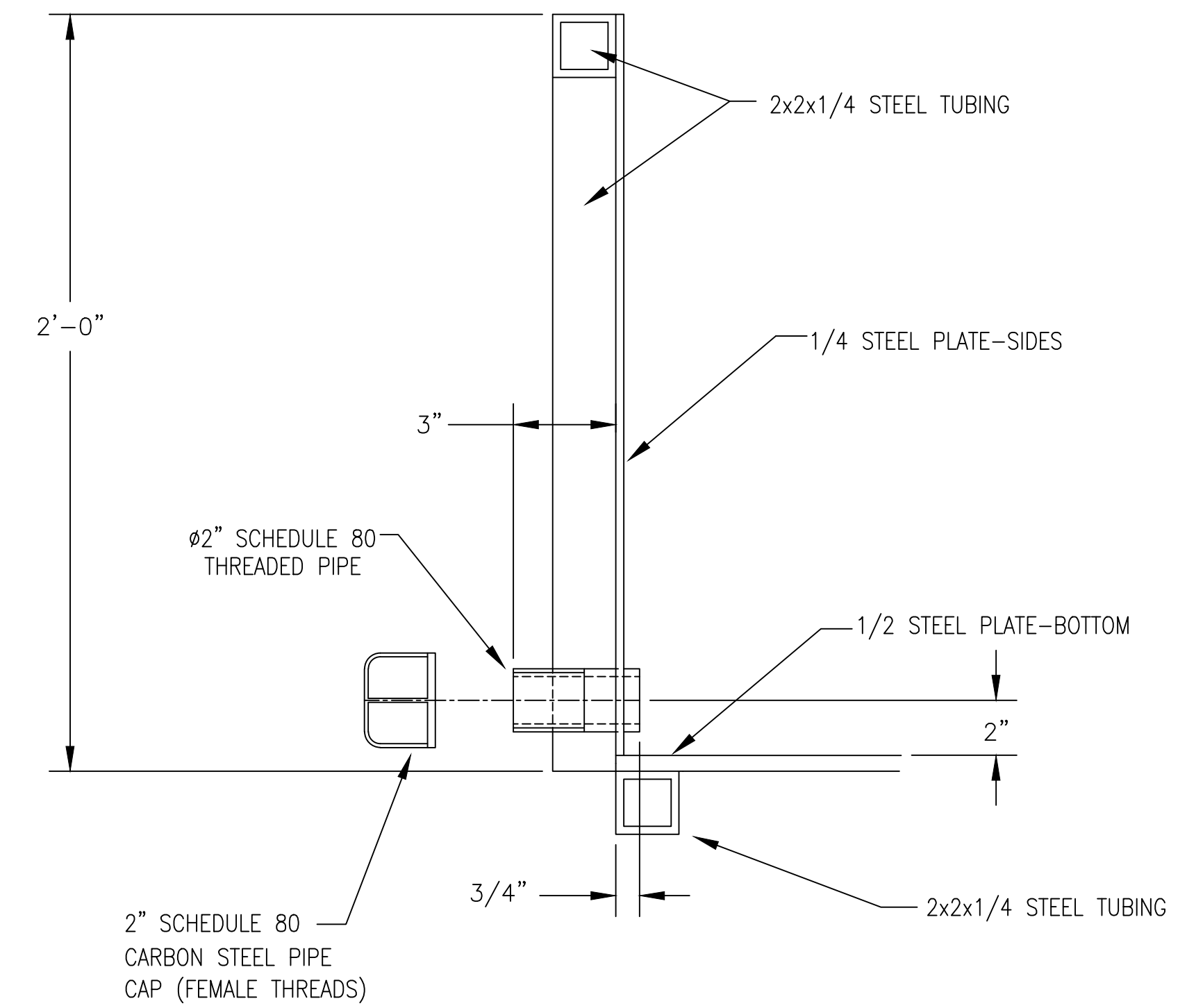
NOTE:  
1. ALL SEAMS AND JOINTS ARE WELDED.



PLAN VIEW  
NTS



ELEVATION VIEW  
NTS



SECTION A-A ENLARGED VIEW  
NTS

# HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)

NOT TO SCALE



FIGURE D-2  
INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNITS (HWOBUS)  
1, 3, 5, 6, 8, 9, 12, 14, 15, 18, 19, 20, AND 21  
PART B PERMIT APPLICATION  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

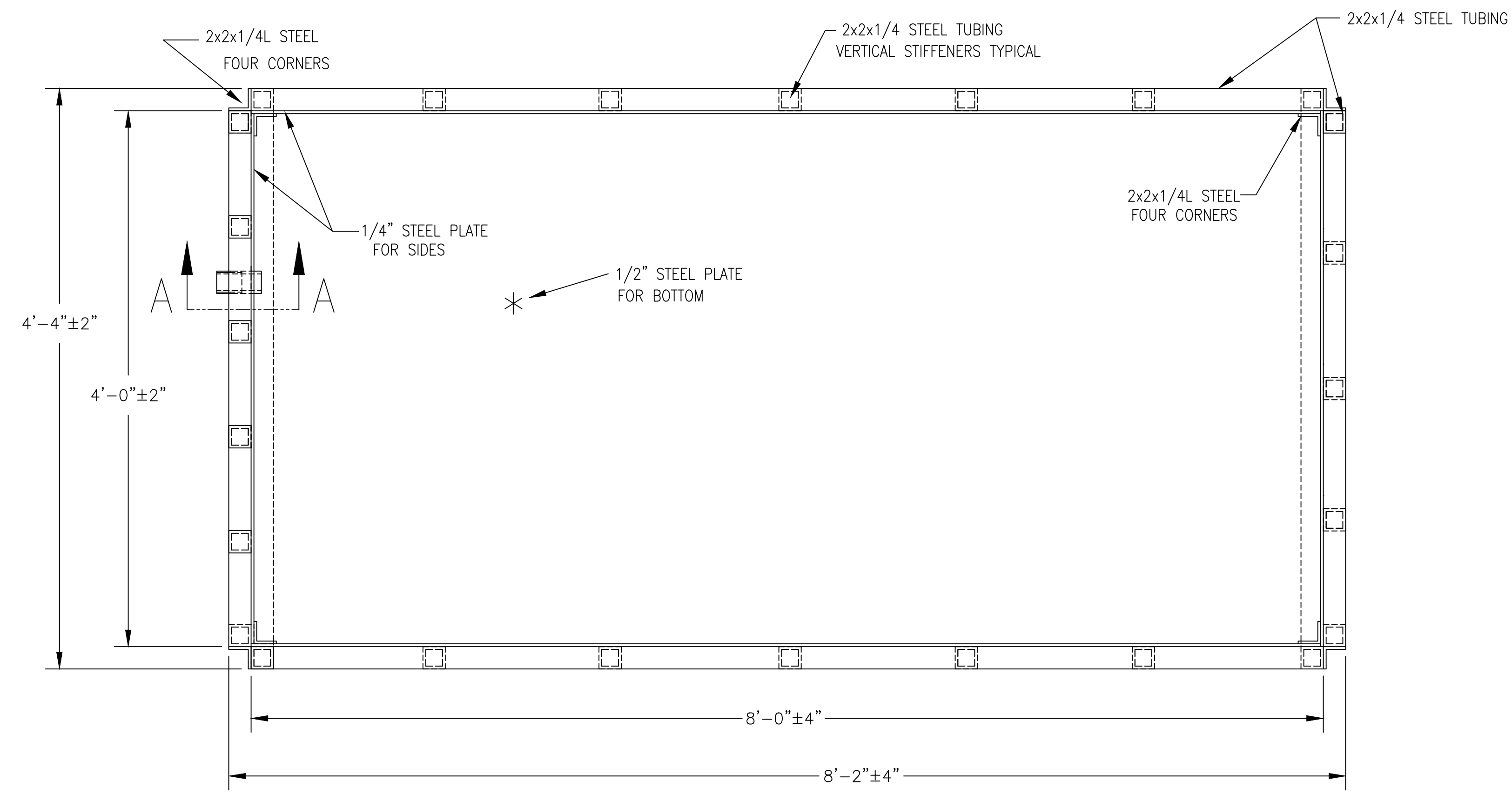
REQUESTED BY: G. POPE  
DRAWN BY: BRONSON  
DWG DATE: 05/13/15  
DWG NO: 15139_B046



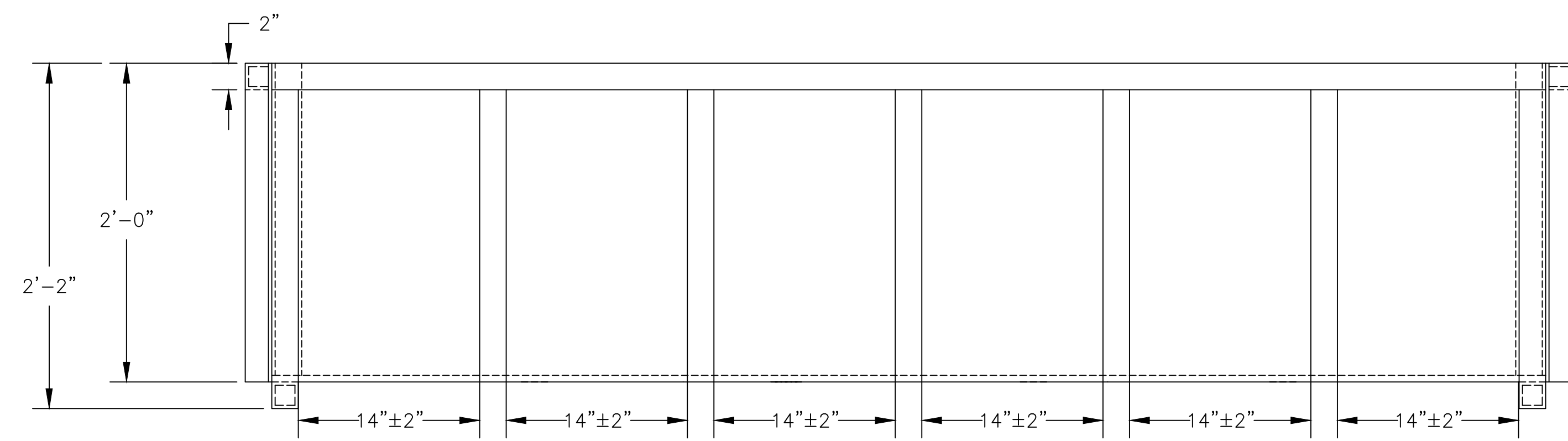
SOURCE: KILGORE FLARES COMPANY, LLC



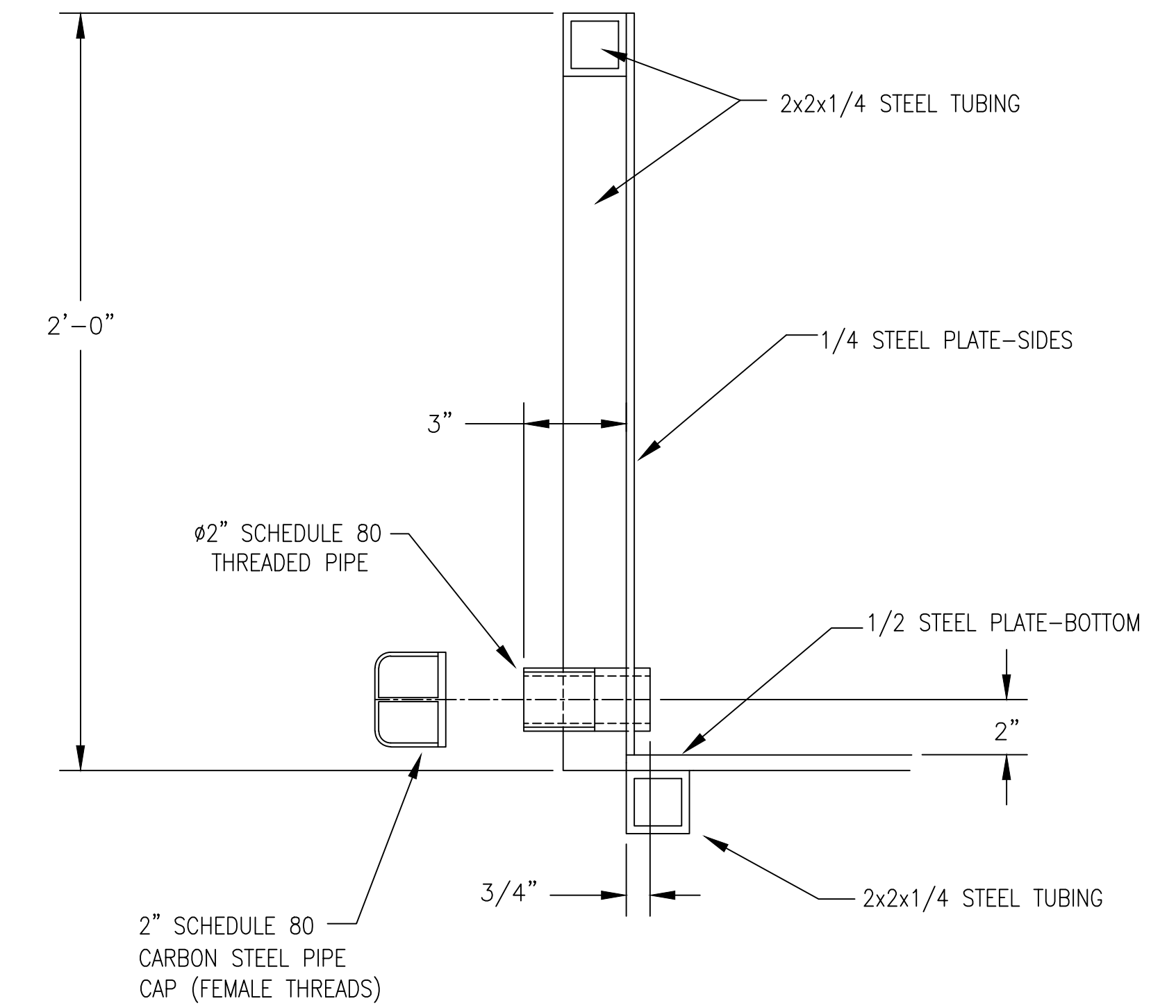
NOTE:  
1. ALL SEAMS AND JOINTS ARE WELDED.



PLAN VIEW  
NTS



ELEVATION VIEW  
NTS



SECTION A-A ENLARGED VIEW  
NTS

# HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)

NOT TO SCALE



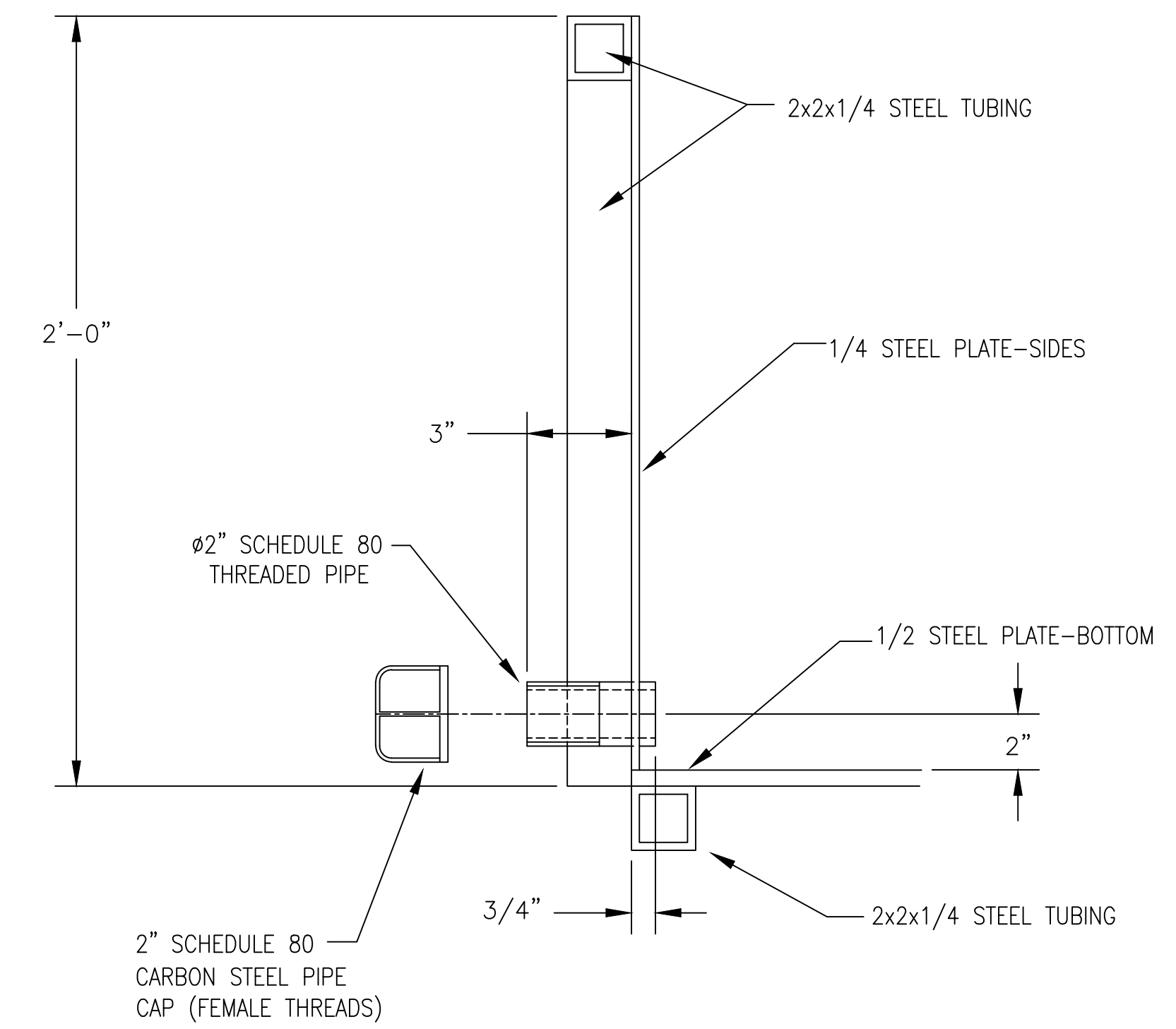
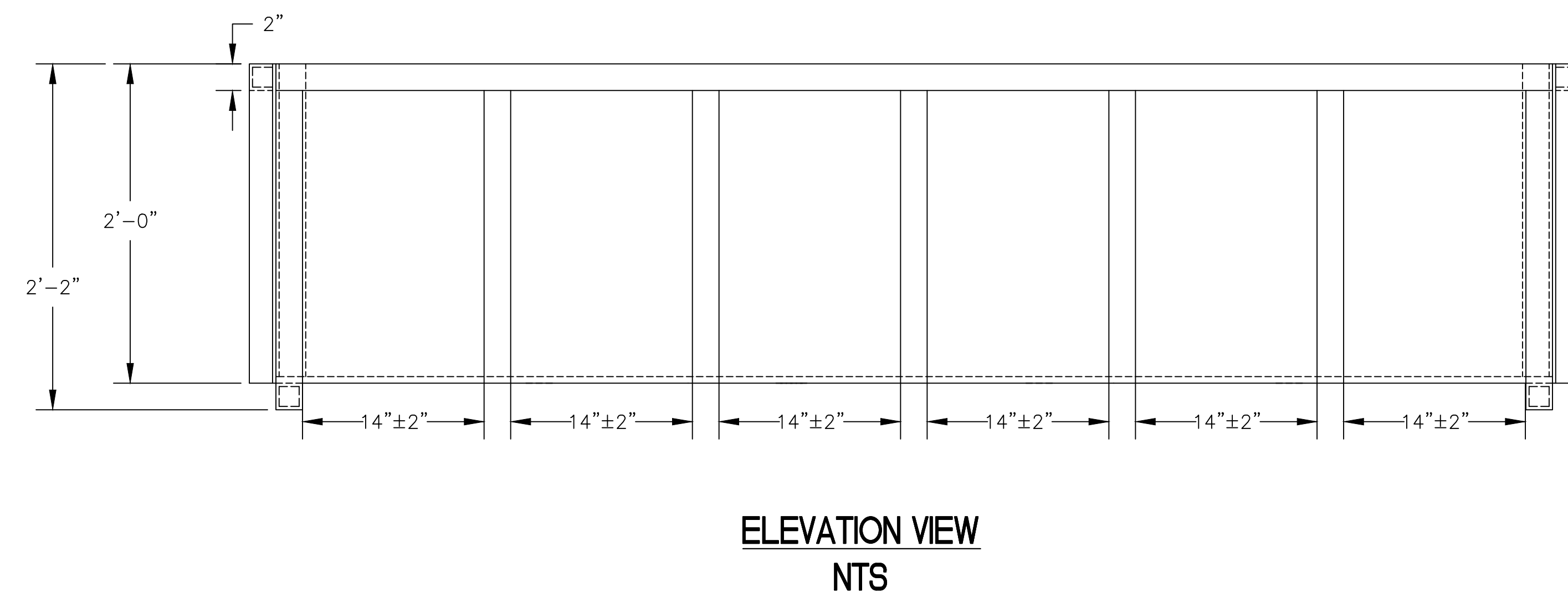
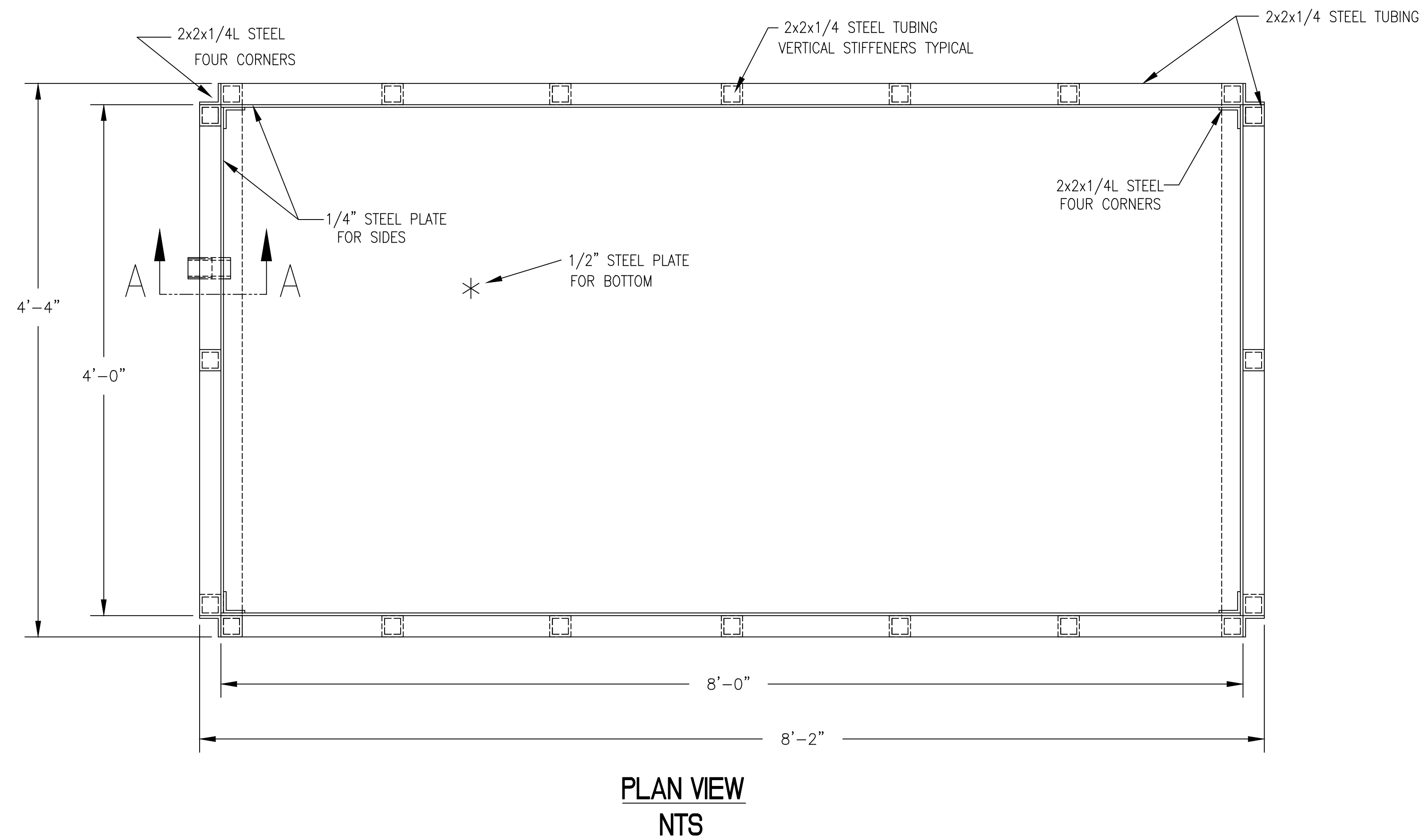
FIGURE D-3  
INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNITS (HWOBU)  
2, 4, AND 11  
PART B PERMIT APPLICATION  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

REQUESTED BY: G. POPE  
DRAWN BY: BRONSON  
DWG DATE: 05/13/15  
DWG NO: 15139_B046



SOURCE: KILGORE FLARES COMPANY, LLC

NOTE:  
1. ALL SEAMS AND JOINTS ARE WELDED.



# HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)

NOT TO SCALE



SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE D-4  
INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)  
7  
PART B PERMIT APPLICATION  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

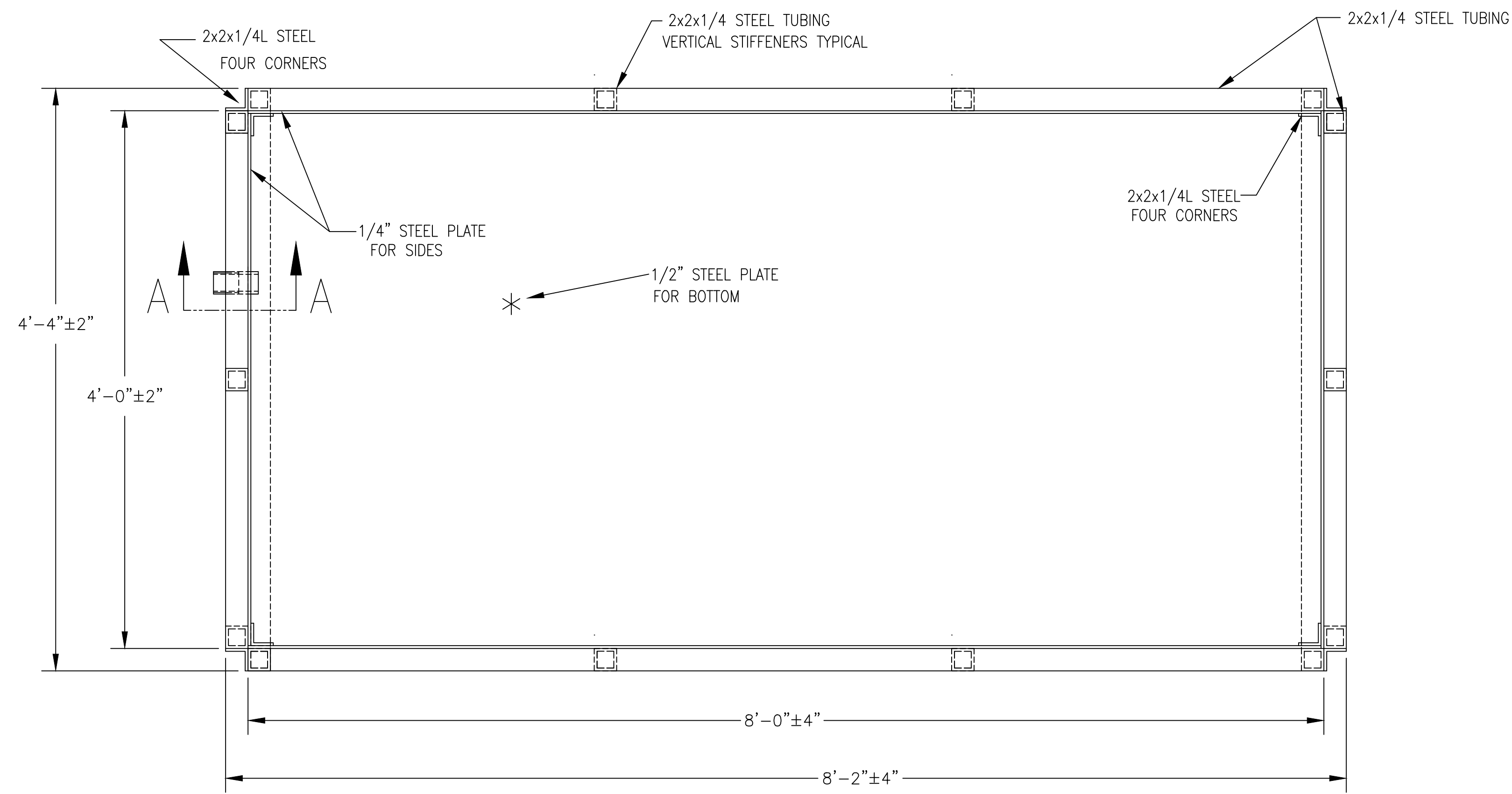
REQUESTED BY: G. POPE  
DRAWN BY: BRONSON  
DWG DATE: 05/13/15  
DWG NO: 15139_B046



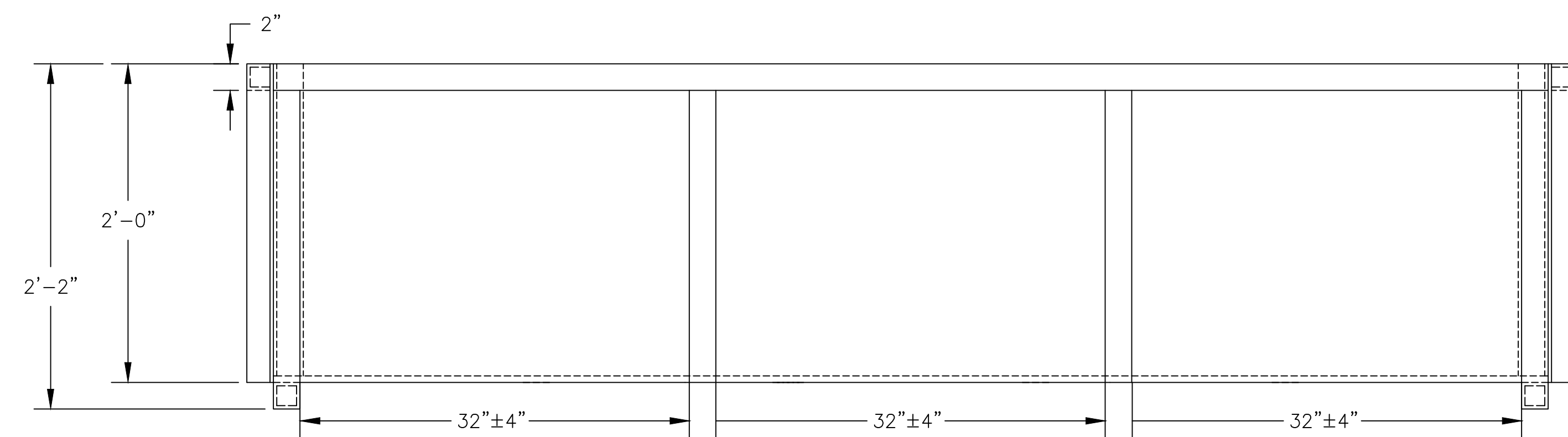
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**NOTE:**

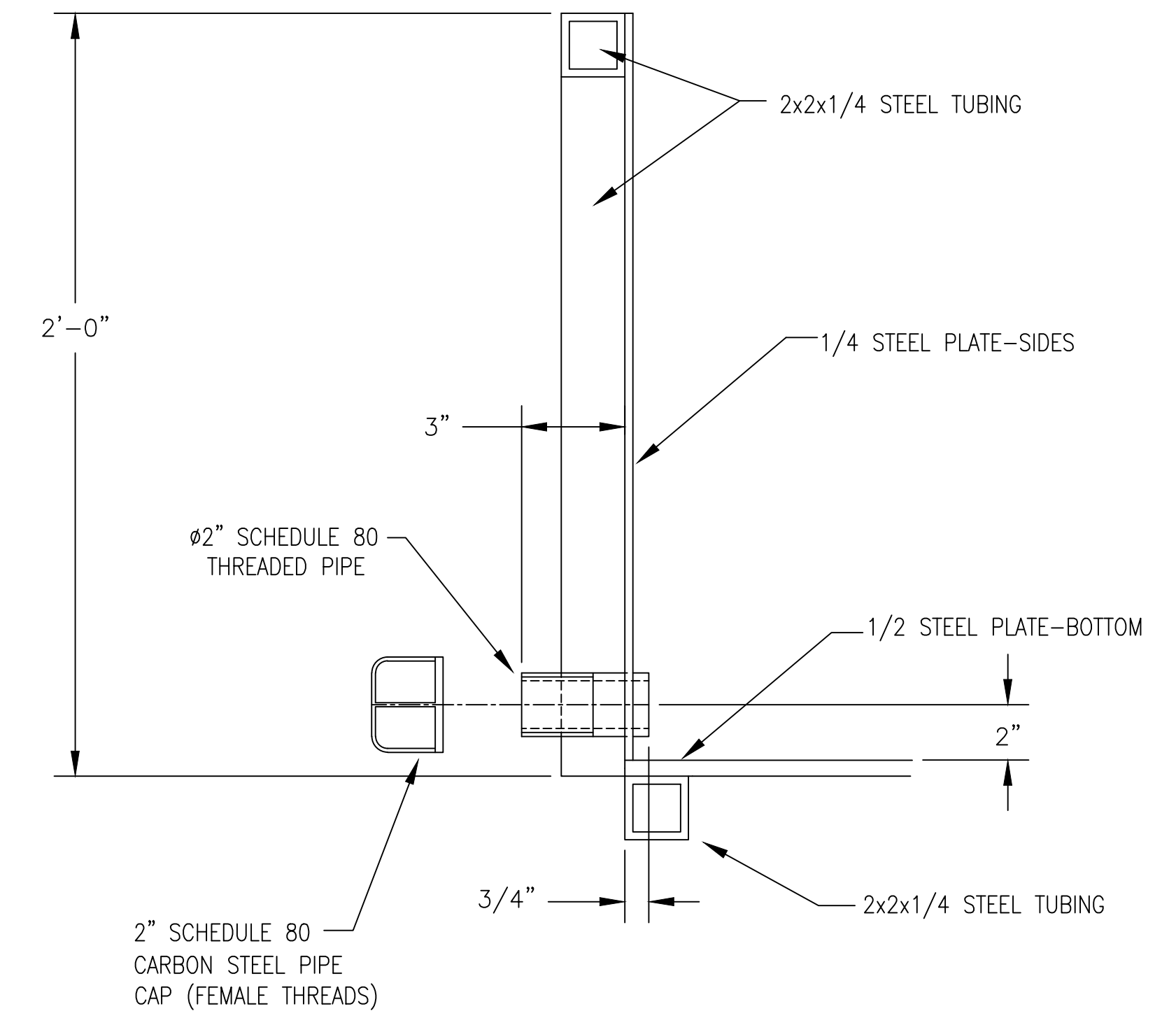
1. ALL SEAMS AND JOINTS ARE WELDED.



**PLAN VIEW**  
NTS



**ELEVATION VIEW**  
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**SECTION A-A ENLARGED VIEW**  
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# HAZARDOUS WASTE OPEN BURN UNIT (HWOBUS)

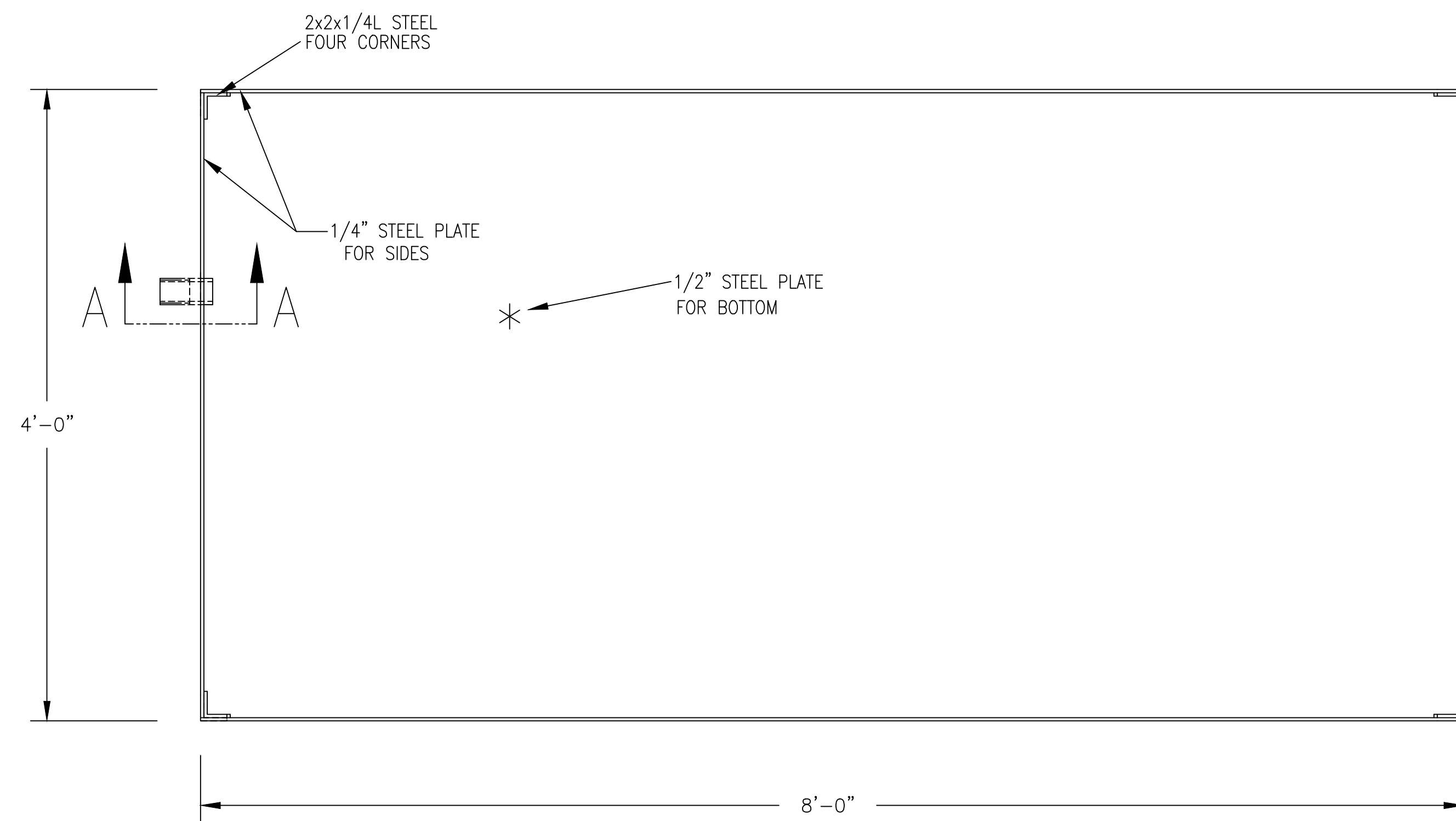
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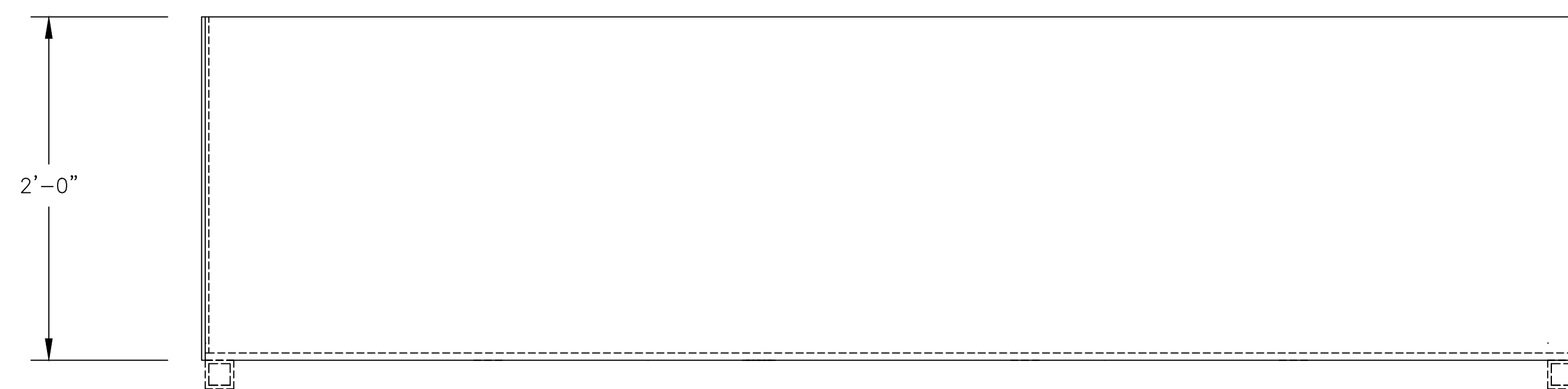
SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE D-5 INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNITS (HWOBUS) 10, 13, AND 17 PART B PERMIT APPLICATION KILGORE FLARES COMPANY, LLC TOONE, TENNESSEE	
REQUESTED BY: G. POPE	
DRAWN BY: BRONSON	
DWG DATE: 05/13/15	
DWG NO: 15139_B046	

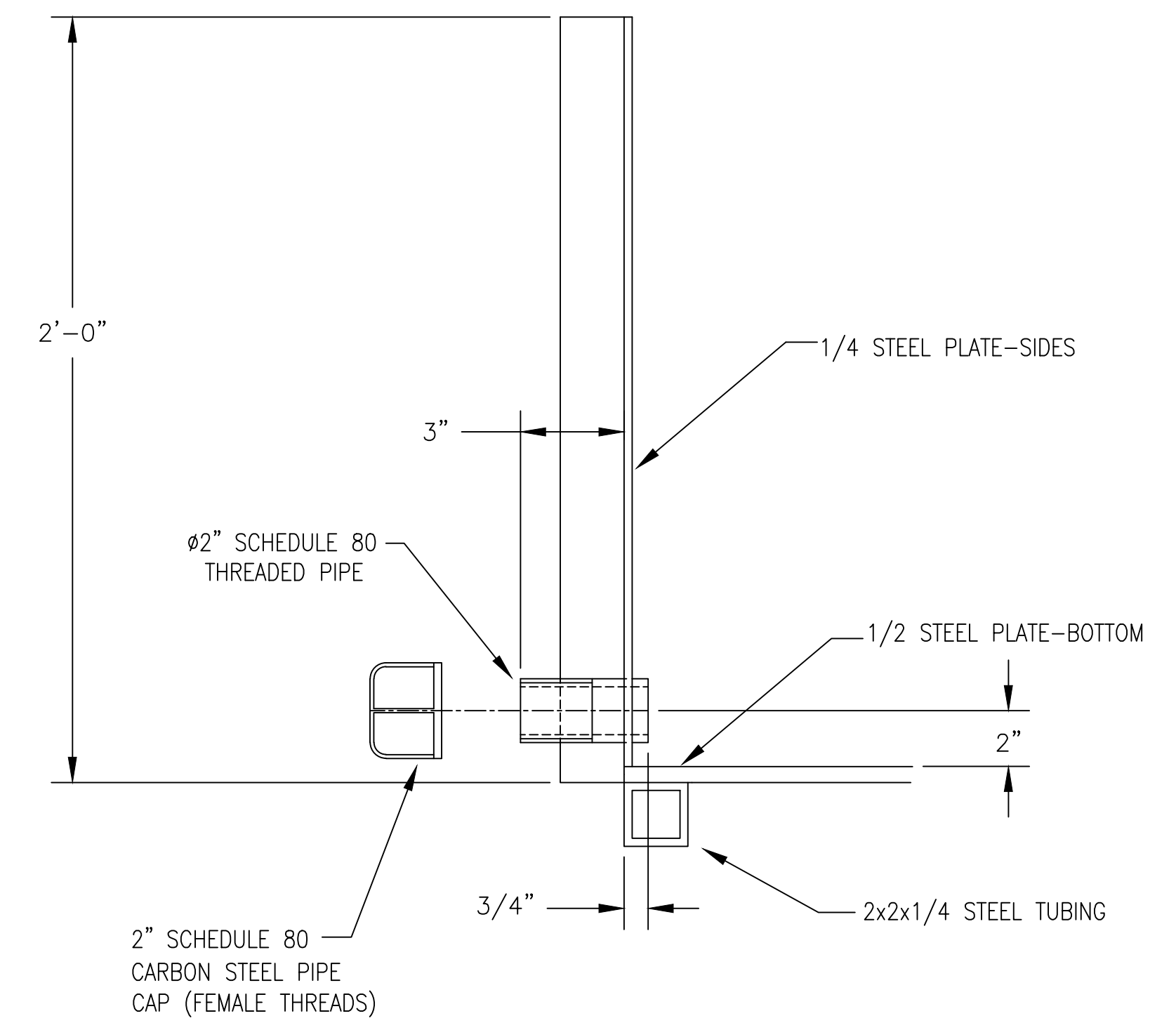
NOTE:  
1. ALL SEAMS AND JOINTS ARE WELDED.



PLAN VIEW  
NTS



ELEVATION VIEW  
NTS



SECTION A-A ENLARGED VIEW  
NTS

# HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)

NOT TO SCALE



SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE D-6  
INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)  
16  
PART B PERMIT APPLICATION  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

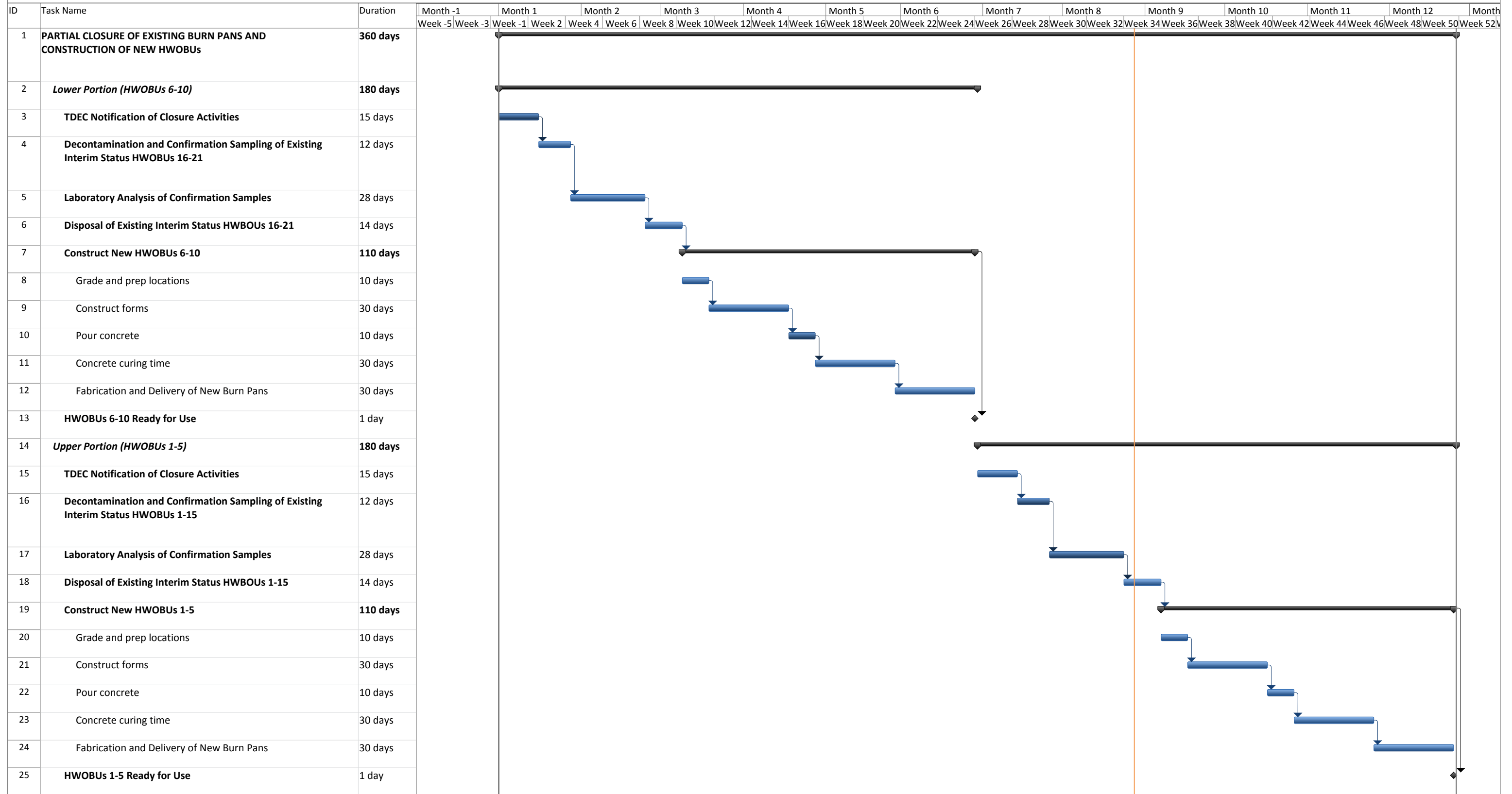
REQUESTED BY: G. POPE  
DRAWN BY: BRONSON  
DWG DATE: 05/13/15  
DWG NO: 15139_B046



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**Appendix D-3**  
**Construction Schedules**

**PROPOSED SCHEDULE FOR PARTIAL CLOSURE  
EXISTING INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNITS (HWOBUs)  
AND CONSTRUCTION OF NEW HWOBUS**



Thu 5/28/15 Page 1 of 1	Task		Summary		External Milestone		Inactive Summary		Manual Summary Rollup		Finish-only		Deadline	
	Split		Project Summary		Inactive Task		Manual Task		Manual Summary		Progress			
	Milestone		External Tasks		Inactive Milestone		Duration-only		Start-only					

**SCHEDULE IS PRESENTED FOR PLANNING PURPOSES AND IS SUBJECT TO MODIFICATION TO ACCOUNT FOR EFFECTIVENESS DATE OF PERMIT, KILGORE'S OPERATIONAL SCHEDULES, AND/OR WEATHER.**

**Appendix D-4**  
**Secondary Containment Drainage Log**

<b>SECONDARY CONTAINMENT DRAINAGE AND INSPECTION LOG</b>
----------------------------------------------------------

Instructions: This log must be completed each time storm water is discharged from secondary containment or drainage control features. The storm water shall not be discharged without treatment if it has a visible sheen. Furthermore, any product in the secondary containment structure must be removed. Notify Fire and Safety Officer or designee immediately if any significant deficiencies are identified.

Industry Standard Consideration: NFPA 30 and API 2610 (Section 7)

Frequency: Within 7 days of rainfall event

Location	Date	Oil Present ¹ (Y/N)	Treatment Employed (Y/N)	Drain Valve Opened (time)	Drain Valve Closed (time)	Inspector Name	Comments

- Notes:**
- 1 = product or sheen
  - API = American Petroleum Institute
  - N = no
  - NFPA = National Fire Protection Association
  - Y = yes



## **SECTION E**

### **GROUNDWATER DETECTION AND COMPLIANCE MONITORING PLAN**

While operating under interim status, activities at the HWOBA did not trigger the requirement for groundwater monitoring. Although a monitoring system was not established to determine the potential for releases from treatment operations, investigations were conducted under RFIs to investigate SWMUs located within the HWOBA. Information and data from the RFIs were used to develop this Groundwater Detection and Compliance Monitoring Plan (Groundwater Monitoring Plan) for open burning operations at the HWOBA proposed in this Part B Permit Application.

The objective of this Groundwater Monitoring Plan is to establish baseline groundwater conditions and monitor for potential future significant releases associated with treatment operations that cross a groundwater compliance point at the regulated HWOBA. This Groundwater Monitoring Plan follows a detection and compliance monitoring program as specified under 40 CFR 264.91 and 270.14(c), and THWMR 0400-12-.07(c). As part of this Groundwater Monitoring Plan, four existing monitoring wells will form the downgradient point of compliance and one new well will be installed to establish an upgradient background monitoring area, as specified in 40 CFR 264.97 and THWMR 0400-12-01-.06(f) and (h). Figures B-1 and B-4 in Appendix B-1 of this Part B Permit Application provide topographic maps depicting the TTF property boundary, the delineation of the HWOBA, the point of compliance, the existing location of burn pans and monitoring wells, and proposed locations of HWOBU. Figure E-1 in Appendix E-1 provides a concentrated view of the HWOBA, point of compliance, existing downgradient monitoring wells, and the proposed locations of the new upgradient background well.

Groundwater samples will be collected semi-annually and annually from four existing downgradient and one proposed upgradient well to evaluate significant changes in site conditions, maintain a point of compliance line of wells for groundwater detection, and assess potential releases from the HWOBA to groundwater during its operational period.

#### **E-1 EXISTING INTERIM STATUS MONITORING DATA**

Interim status monitoring of groundwater for VOCs was conducted across the TTF under THWMR 0400-12-01-.05(6)(a) through (e) and 40 CFR 270.14(c)(1). A summary of the groundwater monitoring data obtained during interim status is presented in a separate Groundwater Summary Report. THWMR 0400-12-01-.07(5)(c) requires reporting of the sampling for wastes related to the interim status unit, but constituents generated by the new treatment operations within the HWOBA have not been sampled in groundwater during the interim status period.

The RFIs concluded that chlorinated solvents were historically used at Kilgore's main production plant to clean casings and likely as part of routine maintenance. It is assumed that chlorinated solvent waste materials were sometimes co-mingled with pyrotechnic wastes for thermal treatment, and that releases at the HWOBA may have occurred during open burning and waste disposal activities over the past 50 years. The 1991 RFA identified nine SWMUs and two AOCs at the approximately 240-acre TTF property owned by Kilgore. One identified SWMU (SWMU 1) is within the footprint of the 5-acre HWOBA. SWMU 1, originally labeled the Thermal Treatment Facility, was subsequently subdivided into SWMUs 1A through 1F, which include previous landfills and land treatment units. In conjunction with a previous due diligence assessment and RFI groundwater sampling events, 13 monitoring wells (MW-4, MW-15 to MW-17, MW-28 to MW-30, and MW-37 to MW-42) were installed at the TTF and have been sampled consistently since 1999. The sampling data from those wells was documented and presented in the 1999 and 2000 RFI reports.

## **E-2 GENERAL HYDROGEOLOGIC INFORMATION**

As required under 40 CFR 264.93(b)(1)(ii) and 270.14(c) and THWMR 0400-12-.07(c)2, the general hydrogeologic information that supplements the groundwater analytical results is summarized in Section B of this permit application. The information provided in that section includes details concerning the nature of the upper aquifer, hydraulic interconnections, and groundwater flow rates.

Aquifer identification based upon lithologic observation in 13 wells surrounding the HWOBA and 30 additional wells across the entire TTF has been correlated to published information to identify the uppermost aquifer beneath the HWOBA. The HWOBA rests on a thin veneer of soil developed from underlying sandy deposits. The soil, along with loess and alluvium, form a mantle over the stable substrate of the exposed sands of the Claiborne and Wilcox Formations that crop out at or near the surface. All wells at the HWOBA are completed and screened in the uppermost aquifer in the upper portions of the Claiborne and Wilcox formations, which contain major regional aquifers.

As part of activities subsequent to the RFI, preliminary aquifer testing was performed on HWOBA well MW-29; data from that well indicates a hydraulic conductivity of approximately 1 to 2 feet/day. Figure E-2 in Appendix E-1 shows the groundwater flow direction recorded in June 2006.

Detailed information regarding soils, geology, and hydrogeology are provided in Section B-2(g).

### **E-3 TOPOGRAPHIC MAP REQUIREMENTS**

Detailed topographic maps and discussion of the HWOBA and surrounding TTF are included in Appendix B-1 and Section B-5 of this Part B Permit Application, respectively. Information in Section B-5 and on the topographic maps includes identification of the point of compliance, waste management areas, and the property boundary.

Additional discussion for these items is provided in the 1999 through 2000 RFI reports and a 2002 Facility Action Plan.

### **E-4 CONTAMINANT PLUME DESCRIPTION**

The description of any contaminant plume from the HWOBA is required by 40 CFR 264.97 and THWMR 0400 12-01-.07(c)4. There has been groundwater monitoring under the RFI/RCRA Corrective Action monitoring program in wells surrounding the HWOBA; however, there has been no sampling of groundwater during the interim status period for the constituents associated with the HWOBA treatment operations.

Low levels of historical contamination from VOCs detected under the RFI/RCRA Corrective Action monitoring program exist in groundwater, and will be addressed during additional corrective action. Appendix B-3 provides a detailed list of all SWMUs at the TTF. The VOCs present in groundwater are a result of past waste treatment activities, and are not related to current treatment activities at the HWOBA.

### **E-5 GENERAL MONITORING PROGRAM REQUIREMENTS**

A groundwater monitoring detection and compliance program, independent of the RFI/RCRA Corrective Action monitoring program, has been designed for the HWOBA as required under 40 CFR 264.98 and THWMR 0400-12-01-.06(b)1. The detection monitoring program addresses only constituents associated with ongoing and future treatment processes, and includes indicator parameters and relative waste constituents that are byproducts from treatment by open burning the waste streams listed in Part A and described in Section C of this Part B Permit Application.

The following sections in conjunction with the SAP in Appendix C-4 describe the details of the planned sampling at the HWOBA, and constitute the detailed plans and engineering report describing the proposed groundwater detection and compliance monitoring programs. The sampling described will provide the characterization of groundwater and identify any hazardous constituents potentially released from the HWOBA under detection and compliance monitoring.

Semi-annual and annual sampling events will be conducted for the monitoring program during the prescribed compliance period, consistent with 40 CFR 264.96 and THWMR 0400-12-01-.06(g). During the first two years, four semi-annual sampling events will be completed to determine present conditions in the aquifer. Following those four events, annual sampling will be conducted for the operational life of the HWOBA. All sampling events will be completed using one upgradient well and four downgradient compliance-point wells.

#### **E-5(a) Description of Monitoring Wells**

Five wells completed in the uppermost aquifer beneath the HWOBA will be used for the future detection and compliance groundwater monitoring. The locations of the 13 wells surrounding the HWOBA within the TTF are shown on Figure E-1. The proposed new well (to be named MW-44) will be installed upgradient of the HWOBA prior to beginning of monitoring and compliance program. The existing four downgradient compliance wells (MW-4, MW-28, MW-29, and MW-30) were sampled during RFI/Corrective Action Monitoring Program events. This line of four existing wells will form the compliance point for the HWOBA.

The new well to be installed will be 2-inch polyvinyl-chloride-cased wells completed with a screen 10 feet in length in the same portion of the aquifer as the four downgradient wells. The estimated depth of the new upgradient well is 70 feet. The four existing wells and the new well to be installed will all have slotted well screens surrounded by a graded silica sand pack. The annular space above the well screen will be sealed with an annular bentonite seal and cement-bentonite grout to prevent contamination to the samples and groundwater from surface water infiltrating into the well.

#### **E-5(b) Description of Sampling and Analysis Procedures**

The descriptions of the sampling and analytical procedures for groundwater monitoring are included in the SAP in Appendix C-4 of this permit application. Those procedures include:

- Sample collection methods.
- Sample preservation, labeling, and shipment.
- Analytical procedures.
- Chain-of-custody control for all samples.
- Documentation of proper sampling and analysis procedures.
- Determining groundwater elevation with each sample.

Those procedures will be followed for all wells and samples during every semi-annual and annual sampling event conducted as part of the Groundwater Monitoring Plan.

#### **E-5(c) Procedures for Establishing Background Quality**

Statistical procedures will be used for establishing background groundwater quality upgradient of the HWOBA as specified in 40 CFR 264.97(g) and THWMR 0400-12-01-.06(h)1(i). The newly installed upgradient well will be assessed for background using the guidance provided in the following U.S. EPA documents: *Statistical Analysis of Groundwater Monitoring Data, Interim Final Guidance (1989)*, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance (1992a)*, and *Statistical Training Course for Groundwater Monitoring Data (1992b)*. The background study will be completed for those constituents identified for the HWOBA in Section E-7(a)(3), and will involve the data from two years of semi-annual sampling (four events) in the upgradient well. For the identified constituents, upper tolerance limits will be calculated and assigned in a manner consistent with the guidance documents. The use of parametric or non-parametric statistical testing will be evaluated based on the initial sampling results and the number of non-detected concentrations.

#### **E-6 DESCRIPTION OF DETECTION MONITORING PROGRAM FOR FACILITIES NOT DETECTING THE PRESENCE OF HAZARDOUS CONSTITUENTS**

This subject requirement does not apply to the HWOBA. The compliance monitoring program for facilities which have detected the presence of hazardous constituents is addressed in Section E-7.

#### **E-7 COMPLIANCE MONITORING PROGRAM FOR FACILITIES WHICH HAVE DETECTED THE PRESENCE OF HAZARDOUS CONSTITUENTS**

The following sections describe the monitoring program to be conducted. Low levels of hazardous constituents from historical operations were detected in groundwater beneath the HWOBA, but are related to SWMU 1 and are being addressed under the RCRA Corrective Action monitoring program. Groundwater detection and compliance monitoring presented herein is for the evaluation of potential hazardous groundwater constituents associated with open burning treatment activities conducted during the operating period of the HWOBA.

##### **E-7(a) Description of Monitoring Program**

Groundwater samples will be analyzed for each hazardous constituent associated with the HWOBA. Semi-annual groundwater monitoring events will be conducted during the first two years of the operation of the proposed HWOBA, then continued annually for the operating life of the HWOBA. The

monitoring will be conducted to ensure that the control measures planned for the proposed HWOBA effectively protect groundwater. During monitoring, groundwater samples will be collected from the upgradient well and from designated points of compliance (four downgradient wells) around the HWOBA. The samples will be analyzed only for those 40 CFR 264 Appendix IX constituents expected to be generated during treatment activities at the HWOBA. Additional hydrologic data will be collected along with chemical and indicator parameter data. Hydrologic results from the RFA and the RFI at the TTF have provided the most significant hydrologic information to assist with development and formulation of this Groundwater Monitoring Plan.

#### **E-7(a)(1) Description of Wastes Previously Handled at the Facility**

As specified in 40 CFR 264.98 and THWMR 0400-12-01-.07(c)6(i), groundwater will be monitored for the 40 CFR 264 Appendix IX indicator parameters consistent with the types of waste treated at the HWOBA. Pyrotechnic wastes historically treated at the HWOBA are consistent in composition with the pyrotechnic wastes currently treated. The following list summarizes constituents of waste treated at the HWOBA: Metals (antimony, arsenic, barium, beryllium, cadmium, cobalt, copper, lead, mercury, selenium, silver, and zinc), Explosive Compounds (RDX), Total Dioxin/Furan Compounds (TCDD, HxCDD, OCDF, and OCDD), and ammonium perchlorate.

These constituents may remain in waste ash and residues following treatment operations at the HWOBA, based on information discussed in Section C.

#### **E-7(a)(2) Characterization of Contaminated Groundwater**

A summary of the groundwater monitoring data obtained during interim status is presented in a separate Groundwater Summary Report. There has been no sampling for new constituents from the HWOBA during the interim status period.

#### **E-7(a)(3) List of Hazardous Constituents to be Monitored in a Compliance Program**

Groundwater samples collected from the five designated groundwater monitoring wells surrounding the HWOBA during the detection and compliance monitoring period will be analyzed for the 40 CFR 264 Appendix IX constituents expected to be generated from the HWOBA. A list of the 40 CFR 264 Appendix IX constituents potentially released from the HWOBU's and subject to monitoring is provided in Section C-6 (with corresponding analytical methods) and are as follows: Metals (U.S. EPA SW-846 Method 6010B for antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, and zinc); mercury (U.S. EPA SW-846 Method 7470A [aqueous] and 7471 [solid]); RDX (U.S. EPA SW-846 Method 8330B); Dioxins/Furans (U.S. EPA SW-846 Method 8280A); and

ammonium perchlorate (U.S. EPA SW-846 Method 6850). Indicator parameters for groundwater that will also be monitored include pH, conductivity, temperature, dissolved oxygen, and turbidity.

#### **E-7(a)(4) Proposed Concentration Limits for Each Constituent**

As required in 40 CFR 264.92 and 264.93 and THWMR 0400-12-01-.07(i)6, hazardous constituents are constituents identified in 40 CFR 264 Appendix IX that have been detected in the uppermost aquifer. Hazardous constituents must not show statistically significant exceedances of background levels or the values provided for maximum concentrations of selected constituents in 40 CFR 264.94 or THWMR 0400-12-01-.06(e)1, or exceedances of 40 CFR 264.94 Table 1 — Maximum Concentration of Constituents for Groundwater Protection (herein referred to as Table 1 Values), also referenced in THWMR 0400-12-01-.06(e)1.

Per 40 CFR 264.97(h) and THWMR 0400-12-01-.06(i)6, the concentration limits for each constituent are proposed as the concentrations that represent statistically significant exceedances based on analysis through an approved statistical method. The background values will be determined for groundwater in the upgradient well using statistical analysis of data generated for the well during four semi-annual sampling events. Those background values will then be used to compare to results from downgradient compliance wells during annual events conducted while the HWOBA is operating. The statistical procedures for this comparison are identified in E-7(a)(6). Statistically significant evidence of contamination or exceedances of Table 1 Values detected for a constituent will be verified and confirmed.

In the event monitoring data indicates a potential for a statistically significant exceedance, additional evaluation of the data will be conducted. Verification, special sampling procedures, or changes to sampling and analysis protocols may be required should evidence of a statistically significant exceedance be encountered, or detected concentrations exceed Table 1 Values. The exact procedures to be employed depend upon the analyte and the quality of the sample. For example, a significant false positive detection could result from excessively turbid groundwater samples. In those instances, alternative sample collection methods may be proposed or sampling filtering may be considered.

A value that represents a statistically significant exceedance or an exceedance of Table 1 values will be carefully evaluated and weighed against a number of factors, including sampling and analytical errors, influence from exogenous sources, and natural seasonal fluctuations.

### **E-7(a)(5) Detailed Plans of an Engineering Report Describing Groundwater Monitoring Systems**

The following discussion provides the details of groundwater monitoring system requirements under 40 CFR 264.97(a) and THWMR 0400-12-01-.07(c)6(i). This discussion functions as an engineering report describing the monitoring system. Four existing RFI wells (MW-4, MW-28, MW-29, and MW-30), and the proposed well (MW-44) will serve as the groundwater monitoring network for the HWOBA during the entire period of detection and compliance monitoring. The locations of the selected wells are shown on Figure E-1. As planned, the wells will be effectively located at upgradient and downgradient points around the HWOBA.

A point of compliance for groundwater monitoring has been selected to provide protection to possible points of exposure. The line formed by the four downgradient wells (MW-4, MW-28, MW-29, and MW-30) will represent the point of compliance. The point of compliance is downgradient of the unit and within the demonstrated flow lines of groundwater from the HWOBA as shown in a groundwater flow map in Figure E-2.

### **E-7(a)(6) Description of Proposed Sampling and Statistical Analysis Procedures for Groundwater Data**

Groundwater sampling and analysis of the sample results for statistically significant changes indicating a statistically significant exceedance will be conducted according to methods and procedures in 40 CFR 264.97(h) and THWMR 0400-12-01-.06(h)4 and 8. The groundwater sampling for detection and compliance monitoring will be completed during semi-annual events during the first two years of the program followed by annual sampling events during the operational life of the HWOBA. In order to ensure that representative data is collected, all procedures and sampling requirements will be followed as presented in the SAP in Section C-6 of this Part B Permit Application.

#### **Sample Collection**

Samples will be collected with a peristaltic and/or bladder pump using low-flow techniques described in Section C-6 and as prescribed by U.S. EPA Region 4 in the *Field Branches Quality System and Technical Procedures* from the Science and Ecosystem Support Division in Athens, Georgia. Groundwater indicator parameters consisting of pH, conductivity, temperature, dissolved oxygen, and turbidity will be monitored, and the static water level will be measured. The confirmation of consistent readings and measurements of these parameters ensures stability and representativeness of groundwater before samples are collected.



As an adjunct to sampling, the following QA criteria are included in the SAP:

- Details of sample labeling, preservation, and shipment.
- Analytical methods and testing procedures (40 CFR 261 Appendix III).
- Chain-of-custody requirements.
- Documentation of sampling and analysis.

In compliance with 40 CFR 264.97(f) and THWMR 0400-12-01-.06(h)6, groundwater elevations will be measured with a static water level indicator at the beginning of each sampling event during one 8-hour day from all 13 wells surrounding the HWOBA, including the proposed upgradient and four downgradient compliance-point wells. The elevations from all wells will be used to create a potentiometric surface map for the HWOBA. This data and resulting map will confirm the direction of groundwater flow, and establish a value for the hydraulic gradient across the site. Using the value for the hydraulic gradient, a new value for the rate of groundwater flow can then be calculated.

### **Statistical Analysis**

As required in 40 CFR 264.97(h) and THWMR 0400-12-01-.06(h)8, approved statistical methods will be used to evaluate spatial differences and temporal changes between the downgradient compliance wells and the upgradient wells during annual monitoring events. Evaluations will be performed for each of the 40 CFR 264 Appendix IX constituents identified in Section E-7(a)(3) and used to identify statistically significant changes in concentrations for each of the 40 CFR 264 Appendix IX constituents being monitored.

### ***Spatial Analyses***

To characterize the differences between downgradient and upgradient wells, a one-tailed analysis of variance (ANOVA) test (U.S. EPA, 1989 and 1992) will be used for the semi-annual and annual sampling events. The test will examine well-to-well (“between-well”) variances with respect to time-related variations common to the wells (within wells). The between-well variance is obtained by calculating the sum of the squares of the each well mean, then normalizing those results by the degrees of freedom (related to the number of wells). The among-well variance sums the squares of each individual measurement, normalizing by the degrees of freedom (related to the number of observations). The ratio of these two calculations gives the calculated F-statistic, which is then compared to a theoretical F-statistic, which serves as a threshold value at a confidence level of  $\alpha=0.05$  (95%). If the calculated F-statistic exceeds this threshold, it is concluded that a statistically

significant difference exists between the wells. If so, the Bonferroni method (Dunn, 1961) will be used to determine which individual wells differ from the upgradient well.

Before ANOVA calculations are performed, the data will be tested for non-detections (nondetects), normality, and seasonality. Based upon these tests, the statistical procedure will be modified in compliance with U.S. EPA guidance (U.S. EPA, 1989 and 1992). Specifically, if nondetects are less than 15 percent of the sample group, the nondetects will be replaced by half the PQL; if the percentage is more than 15, the Wilcoxon Rank-Sum test will be used (U.S. EPA, 1992). If the data are non-normal, they shall be log transformed; if the transformed data are non-normal, a nonparametric ANOVA calculation will be performed. If trends are evident, no ANOVA calculation will be performed.

### ***Temporal Analyses***

Because both upgradient and downgradient wells are potentially impacted by past treatment activities, ANOVA is better suited to monitor current spatial patterns than to distinguish any potential impact of present HWOBA operations from unrelated impacts of the past. To test impact, a temporal trend analysis will compare the rate of change (slope) in constituent concentrations for downgradient wells with respect to the rate of change in the upgradient well. If the slope of a downgradient well exceeds the slope of the upgradient well, a potential impact of HWOBA operations on groundwater will be inferred and TDEC will be notified.

The Theil Sen nonparametric estimator of slope (Gilbert, 1987) has four advantages over parametric and other nonparametric tests for slope: it greatly suppresses noise from outliers and data variability, it makes no assumptions about data distribution, it accommodates missing and nondetect data, and it provides a numerical slope value with confidence interval. Thus, Theil Sen's method can be used to compare the slope of data at one well to that at another, providing an indicator capable of discriminating between a true onsite impact from offsite influences or changes.

For each well, a two-sided confidence interval will be calculated about the true slope using a confidence coefficient of  $\alpha=0.10$  and the most recent sampling events. Upgradient-downgradient comparisons will be done in spatial groups of wells.

If the lower confidence limit of the estimated slope at any downgradient well exceeds the upper confidence limit of the estimated slope at its corresponding upgradient well, a potential groundwater impact from current HWOBA activities will be inferred and reported as required.

Relevant data such as changes with respect to the baseline ANOVA (calculated immediately following issuance of this permit), trend graphs, etc., will be used to qualify this determination.

### **References for the Statistical Analysis**

The following will be referenced for statistical analysis guidance.

- Gilbert, Richard O., *Statistical Methods for Environmental Pollution Monitoring*. New York: Van Nostrand Reinhold 1987.
- O. J. Dunn, *Journal of the American Statistical Association*. **56** (293): 52–64. 1961.
- United States Environmental Protection Agency, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities — Addendum to Interim Final Guidance*. United States Environmental Protection Agency, Washington, D.C. 1992.
  - *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities — Interim Final Guidance*. United States Environmental Protection Agency document PB89-151047, Washington, D.C. 1989

### **Report**

The data and information gathered from the scheduled sampling events will be presented in a brief report. A summary report will be produced following the completion of each sampling event, and submitted prior to the next sampling event.

Data generated during the detection and compliance groundwater sampling events will be handled and managed consistently from one event to another by Kilgore's Environmental Manager. Data will be requested from the analytical laboratory in hard-copy and electronic formats for both results and supporting quality assurance logs, charts, and records. Once received, results will either be hand-keyed into Microsoft Excel (or similar software program), or manipulated directly in an electronic data reporting system for adjustment and use in a report in tabular format. All hard-copy data will be archived at Kilgore's main production plant, while electronic files will be maintained both on a hard-drive computer system and copied to diskette(s).

### **E-7(a)(7) Procedures to be Implemented if a Groundwater Protection Standard is Exceeded at a Compliance Point Monitoring Well**

The procedures to be followed are established here as prescribed under 40 CFR 264.99(h) and THWMR 0400-12-01-.06(6)(k) and .07(c)8, in the event that a statistically significant increase for a constituent(s) occurs, or if a detected value exceeds the value of that constituent as presented in Table 1 Values. These procedures will include the following actions.

- The Commissioner will be notified in writing of the exceedance.
- If applicable, a demonstration will be submitted that documents concentration limits were exceeded due to a source besides the regulated unit, or due to statistical error.
- An application for permit modification will be sought to allow the operator to establish a Corrective Action Program (CAP).

The CAP will include details of the planned efforts to comply with groundwater protection standards, and to demonstrate the effectiveness of the groundwater monitoring program.

### **E-7(b) An Engineering Feasibility Plan for a CAP**

In the event of statistically significant increases of a constituent(s) during compliance monitoring, the completion of an engineering feasibility plan will be considered as part of a CAP. Any plan developed will meet the requirements of 40 CFR 264.100 and THWMR 0400-12-01-.06(6)(k), or a request will be submitted to the Commissioner for permission to submit a schedule for an alternative plan.

### **E-8 CORRECTIVE ACTION PROGRAM**

A CAP may be established for corrective action for statistically significant exceedances of the constituents being monitored through annual compliance monitoring for the improved HWOBUs, or for Table 1 Value exceedances of 40 CFR 264 Appendix IX constituents. The CAP will be considered in conjunction with risk-based protection levels for human health and the environment and hazardous constituents and levels as specified in 40 CFR 264.100(a) and THWMR 0400-12-01-.06(6)(d).

### **E-8(a) Characterization of Contamination**

Consideration of the CAP will be made based on the identification and concentration of hazardous constituents in groundwater exceeding statistically significant concentrations, as detected in the point of compliance monitoring wells.

### **E-8(b) Concentration Limits**

As part of corrective action, concentration limits will be reviewed and considered in accordance with concentration limits established under 40 CFR 264.94(a) and THWMR 0400-12-01-.06(6)(e)(1). Consideration will be given to assessment of risk to human health and the environment.

#### **E-8(b)(1) Concentration Limits Established Under 40 CFR 264.94(a)**

The concentration limits established and specified under 40 CFR 270.14(c)8 and THWMR 0400-12-01-.06(e) will be used, where appropriate, as benchmark concentrations for corrective action data review and decision making.

#### **E-8(b)(2) Alternate Concentration Limits**

Alternate concentration limits as discussed in 40 CFR 264.94 and THWMR 0400-12-01-.07(c)(8) will only be considered in conjunction with careful assessments of risk. Justification of proposed alternate limits can only be made through assessment of the following:

- Potential adverse effects on groundwater quality.
- Potential adverse effects on surface water quality where surface water is hydraulically connected to impacted groundwater.
- Potential for health risks by human or ecological exposure to waste constituents.

### **E-8(c) Corrective Action Program**

If necessary, a CAP will be created following detection of statistically significant exceedances during compliance monitoring. The CAP provides the details of the effort to comply with the requirements of corrective action. The CAP must prevent hazardous constituents from exceeding their respective concentration limits at the compliance point, the downgradient area between the compliance point and the property boundary, and beyond the facility boundary. The compliance plan will consist of detailed engineering plans and a report. The following sections provide the detailed contents of the CAP.

### **E-8(d) Groundwater Monitoring Program**

In conjunction with the CAP, a corrective action groundwater monitoring program will be developed and implemented. The objective of this program is to determine compliance with the concentration limits established under 40 CFR 264.92, 264.94 and 264.99, and THWMR 0400-12-01-.06(6)(e), and to determine the effectiveness of the CAP and any corrective actions.

#### **E-8(d)(1) Description of Monitoring System**

Additional monitoring points may be required under the CAP that meet the requirements of 40 CFR 264.100 and THWMR 0400-12-01-.07(c)6(ii). In this event, the description of a monitoring system to be installed for corrective action will include the following details and specifications:

- The number of wells to be installed.
- Locations of each well.
- Well depths and screened intervals.
- Well construction details and casing description.

Included with the specifications will be a description of how the wells and the proposed monitoring program will demonstrate the effectiveness and adequacy of the selected corrective action.

#### **E-8(d)(2) Description of Sampling and Analysis Procedures**

In order to ensure that representative data is collected during corrective action sampling, all procedures and sampling requirements will be followed as presented in the SAP in Section C-6 of this Part B Permit Application. As proposed, samples will be collected with a peristaltic and/or bladder pump. As an adjunct to sampling, the following quality assurance items are included in the SAP:

- Details of sample preservation and shipment.
- Analytical methods and testing procedures (40 CFR 261 Appendix III).
- Chain-of-custody requirements.
- Documentation of sampling and analysis.

During each sampling event, groundwater elevations will be recorded with a static water level indicator during one 8-hour day. The elevations will be used to create a piezometric surface map for the HWOBA. This map will confirm the direction of groundwater flow, and establish a value for the hydraulic gradient

across the site. Using the value for the hydraulic gradient, a new value for the rate of groundwater flow can then be calculated.

Data generated during the corrective action groundwater sampling events will be handled and managed consistently from one event to another by Kilgore's Environmental Manager. Data will be requested from the analytical laboratory in hard-copy format for results and supporting quality assurance logs, charts, and records. Once received, results will be hand-keyed into Microsoft Excel (or similar software program) or provided in an electronic database for adjustment and use in a report in tabular format. All hard-copy data will be archived at Kilgore's main production plant, while electronic files will be maintained both on a hard-drive computer system and copied to diskette(s).

#### **E-8(d)(3) Monitoring Data and Statistical Analysis Procedures**

Analytical data from corrective action monitoring will be reviewed and statistically analyzed where appropriate. Background values will again be considered for corrective action monitoring given that more data will be available to increase the significance of results from statistical analysis.

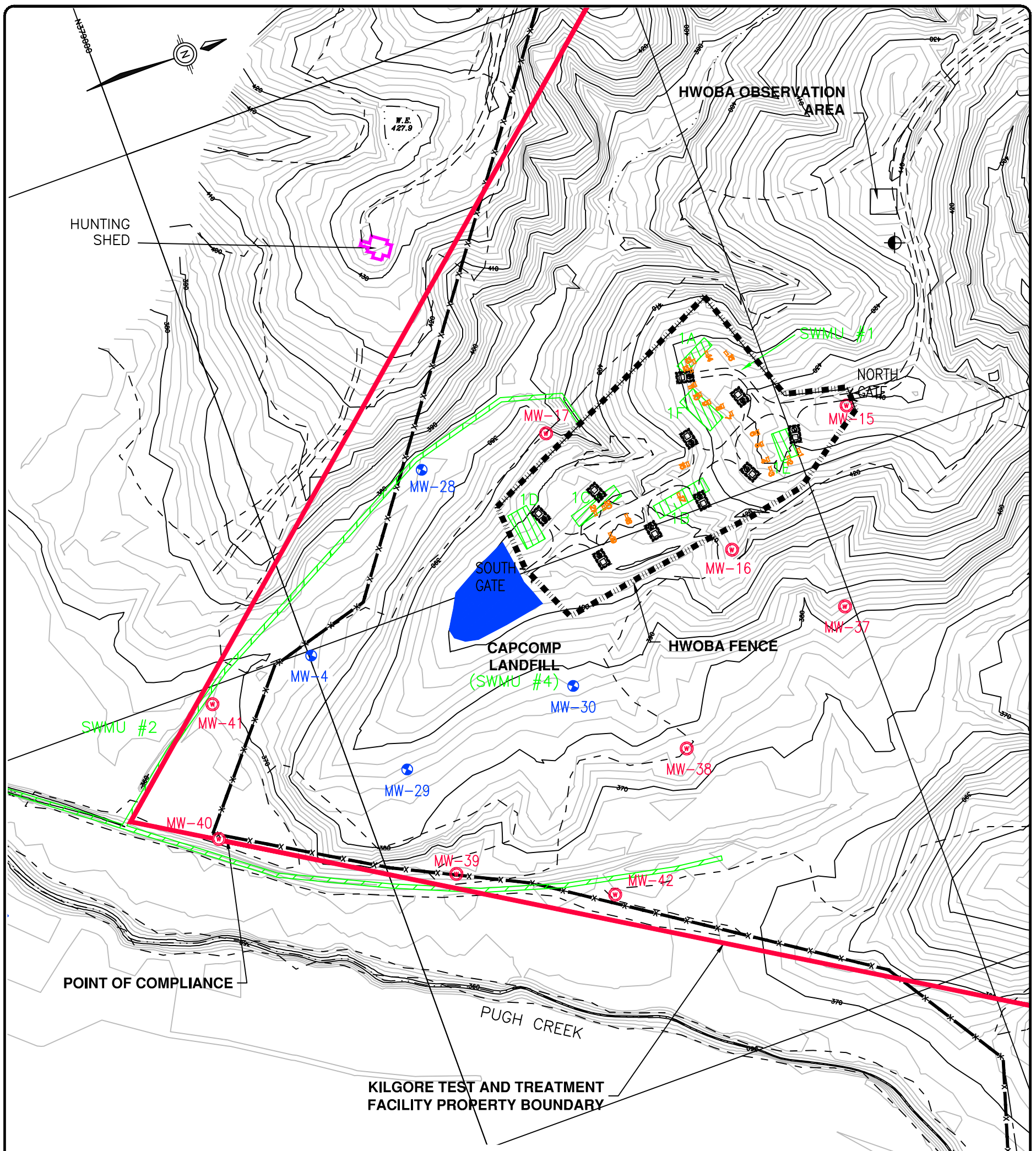
Statistical procedures selected for data review will comply with requirements established in 40 CFR 270.14(c)(8) and 270.14(c)(7)(vi) and THWMR 0400-12-01-.06(h)8. Statistical procedures for corrective action data review will be considered based on the number of wells and the results of all available sampling events.

#### **E-8(d)(4) Reporting Requirements**

A semi-annual report will be submitted to the Commissioner evaluating the effectiveness of the CAP and any remedies taken.

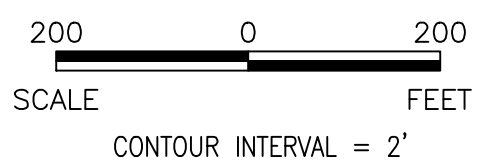
**Appendix E-1**  
**Figures**





LEGEND

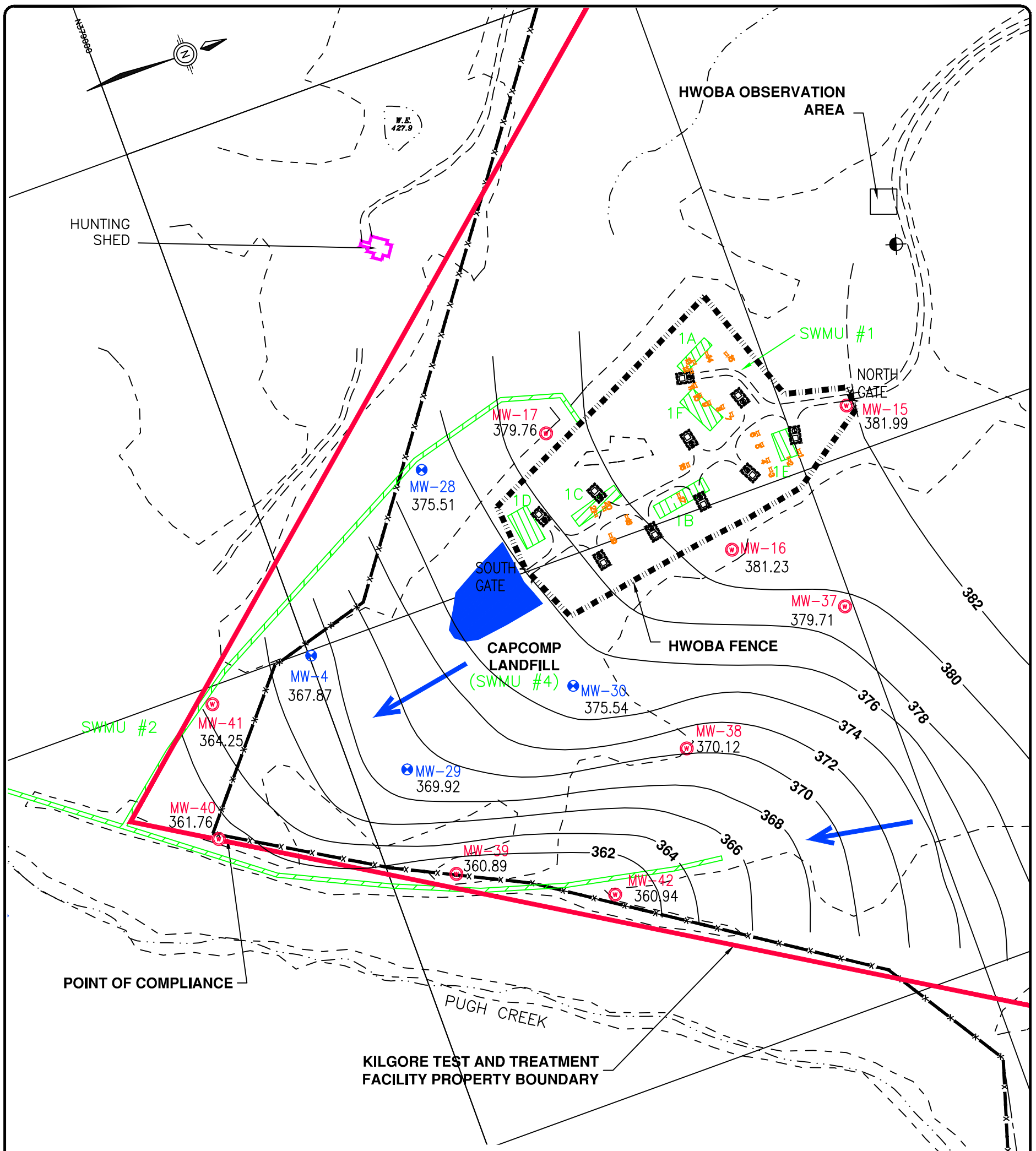
- PAVED ROAD
- - - GRAVEL ROAD
- ▭ STRUCTURES/BUILDINGS
- ⊙ MW-3 MONITORING WELL
- ▬▬▬ HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
- ⊕ POLE
- ⊗ STORM WATER OUTFALL
- ⊠ PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
- LANDFILL AREAS
- ⊕ COMPLIANCE WELL
- 620 CONTOUR LINES
- - - TREE OUTLINE
- ▬ KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
- ▨ SWMU AREAS
- 20 EXISTING INTERIM STATUS BURN PAN
- ⊕ WELL TO BE INSTALLED
- x - x - KILGORE FENCE LINE



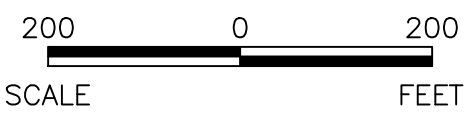
SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE E-1  
 WELL LOCATIONS MAP  
 PART B PERMIT APPLICATION  
 KILGORE FLARES COMPANY, LLC  
 TOONE, TENNESSEE

REQUESTED BY: D.FUEHRER	
DRAWN BY: BRONSON	
DWG DATE: 05/15/15	
DWG NO: 15139_B075	



- LEGEND
- |  |                                                   |  |                                                         |
|--|---------------------------------------------------|--|---------------------------------------------------------|
|  | - PAVED ROAD                                      |  | - TREE OUTLINE                                          |
|  | - GRAVEL ROAD                                     |  | - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY |
|  | - STRUCTURES/BUILDINGS                            |  | - SWMU AREAS                                            |
|  | - MONITORING WELL                                 |  | - EXISTING INTERIM STATUS BURN PAN                      |
|  | - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE    |  | - WELL TO BE INSTALLED                                  |
|  | - POLE                                            |  | - CONTOUR LINES                                         |
|  | - STORM WATER OUTFALL                             |  | - FLOW DIRECTION                                        |
|  | - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU) |  | - KILGORE FENCE LINE                                    |
|  | - LANDFILL AREAS                                  |  |                                                         |
|  | - COMPLIANCE WELL                                 |  |                                                         |



SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE E-2  
GROUNDWATER FLOW MAP  
PART B PERMIT APPLICATION  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

REQUESTED BY: D.FUEHRER	 creative thinking. custom solutions. (800) 588-7962 www.ensafe.com
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## **SECTION F PROCEDURES TO PREVENT HAZARDS**

This section discusses the procedures, equipment, and structures maintained by Kilgore to prevent hazardous waste incidents related to the accumulation, transportation, and treatment of hazardous waste pyrotechnics at the HWOBA. The following information is provided in accordance with 40 CFR 270.14(b)(4), (5), (6), (8), and (9), and THWMR 0400-12-01-.07 (5)(a)1(iv), (v), (vi), (viii), and (ix). This section also addresses the requirements of 40 CFR 264.14, 264.15, and 264.30-264.37, and THWMR 0400-12-01-.06(2) (e), (f) and 0400-12-01-.06(3).

### **F-1 SECURITY**

#### **Barrier and Means to Control Entry**

Overall security for the HWOBA is the responsibility of the Kilgore Security Department. Access to the TTF is gained through a gravel road off Keller Road. The entire TTF is fenced and has three gates. The access road leading to the HWOBA, illustrated on the facility topographic map (Figure B-2 in Section B of this Part B Permit Application), has an aluminum gate to prevent unauthorized personnel from entering the TTF. The gate is locked when the HWOBA is not in use and when access to the TTF is not required. The keys to the gate are maintained by the Security Department. A 24-hour surveillance system is not practical for the HWOBA which is staffed only during open burning activities.

The HWOBA is surrounded by an 8-foot-high chain-link fence supported by steel posts, with an aluminum gate (North Gate) at the entrance. This gate is locked at all times when the HWOBA is not in use. Visitors wishing to enter the HWOBA must obtain a pass from Kilgore and be accompanied by authorized personnel. A second gate (South Gate) on the south side of the HWOBA is locked at all times except when maintenance access is required at the lower end of the HWOBA.

After a burn is initiated by lighting the timed fuse (see Section D-1[c]), and the hazardous waste technicians retreat to the observation area, the gate to the HWOBA is locked. However, during transportation to and unloading of hazardous waste pyrotechnics in the HWOBA, and while initiating a burn, both the gate to the HWOBA and the primary TTF access gate are left unlocked for safety reasons (allowing for expedited exit and to allow entrance of any required emergency personnel). Due to the reactivity of the hazardous waste pyrotechnics and open burning process, time is of the essence in the event of an emergency, and the safety of the

hazardous waste technicians cannot be compromised by securing those gates during transportation, unloading, or initiating a burn. Hazardous waste technicians maintain visual control of the gates during those times. The posted warning signs and presence of the hazardous waste technicians are additional security measures to limit access to the HWOBA during these operations.

All security and RCRA-trained Kilgore personnel involved in the operation of hazardous waste treatment in conjunction with the HWOBA are equipped with two-way radios to immediately report emergencies or security problems at the HWOBA. All personnel involved with treatment operations are trained in the contents of this section and the Contingency Plan (Section G of this Part B Permit Application) for the HWOBA.

### **Warning Signs**

The following warning signs are used at the HWOBA. All of the signs are legible from at least 25 feet and are written in English.

There are signs posted on each side of the fence surrounding the HWOBA that read:

**Dangerous Area  
No Trespassing  
Authorized  
Personnel Only  
Warning — Do Not Enter**

Signs that read "No Smoking" are posted at both HWOBA gates and the nearest TTF gate.

## **F-2 INSPECTION SCHEDULE**

### **F-2(a) General Inspection Requirements**

The hazardous waste technicians and Environmental Manager or designee(s) are responsible for ensuring that inspections are completed and properly documented. Inspection logs include a description of items to be inspected, date and time of inspection, inspector's name, and a "comments" column in which observations, conditions, remedial actions, recommendations, and corrective actions required/taken may be recorded. The inspector is required to check the status of each item and indicate whether its condition is acceptable or unacceptable, and to follow up on unacceptable items with the date and nature of corrections or repairs. If a hazard is imminent or has already occurred, remedial action is immediately required as specified in 40 CFR 264.15(c) and THWMR 0400-12-01-.06(2)(f)3.



Any significant deterioration or malfunction of the HWOBUs noted during an inspection will be remedied before any further treatment is conducted at that particular HWOBUs. The Environmental Manager or designee is responsible for ensuring appropriate remedial actions are taken, when needed. As with misfires or incompletely treated waste pyrotechnics, spilled pyrotechnic wastes around the HWOBUs will be collected using non-sparking equipment and burned during the next event. Soil affected by spills involving diesel fuel will be removed and disposed of in accordance with applicable regulations.

Appendix F-1 contains blank copies of the inspection log forms that are used. Inspection criteria, frequency, and procedures are also discussed in more detail in following Section F-2(b). Appendix F-2 contains the copies of the detailed WIs implemented by Kilgore to accomplish the inspections.

Current inspection logs are maintained in a three-ring binder in the hazardous waste technician's vehicle. Previously completed inspection logs are maintained for at least three years in the Environmental Manager's or designee's office at Kilgore's main production plant.

## **F-2(b) Specific Inspection Requirements**

### **Inspection of HWOBA**

The HWOBA and associated emergency equipment are inspected before conducting any treatment operations, in accordance with Kilgore WIs. Pretreatment inspections are conducted by hazardous waste technicians, who are trained in treatment operations. Procedures also require inspection of the HWOBA grounds before and after each burn operation to detect the presence of unreacted pyrotechnic materials. The inspections are conducted on days when treatment occurs. The inspection logs for this activity are in Appendix F-1.

For security, the inspection log requires assessment of the condition of the HWOBA North Gate, HWOBA South Gate, and HWOBA access road gate at Keller Road. The Neighboring Structure Gate Check is conducted on a dedicated inspection log to confirm that no one is near the HWOBA prior to a burn and that the gate is closed.

Items inspected at the HWOBA include security, safety, and emergency equipment.

### ***Security***

- Main TTF Keller Road gate and HWOBA gates and fences

### ***Safety***

- Entrance Road is serviceable without erosion or damage that makes it unsafe.
- The HWOBA is free of spills, erosion, or other damage.
- The HWOBUs are clean, serviceable, and without standing water or unburned material (except ash).
- Verify that vegetation is under control.
- Verify ash collection drums are available and verify there is no standing water in the pans to be used that day.

### ***Emergency Equipment***

- Radio check with security at Kilgore's main production plant to ensure emergency communication is available
- Kilgore relies on the Toone, Tennessee fire department for fighting fires.
- Portable water back packs are full of water and functioning properly
- Vehicle spill response pack is present

### **Inspection of Explosive Scrap Vehicle and Trailer**

Before commencing collection and transport operations, hazardous waste technicians inspect the transport vehicle and trailer. Inspections of the transport vehicle and trailer will be completed only on days that waste is transported. A Motor Vehicle Inspection Form (DD Form 626) is used to ensure that a proper and complete inspection is conducted. The completed inspection form is kept on a clipboard in the transport vehicle as proof of successful inspection. A copy of DD Form 626 is in Appendix F-1. Also used is Form 5006C in Appendix F-1.

### **Inspection of the Areas around the Concrete Pads and Burn Pans**

The areas around each of the HWOBUs (including areas subject to spills such as loading/unloading and runoff/runoff areas) will be inspected each day a burn is conducted, provided they can be approached safely. Areas immediately around smoldering pans will not be inspected. These inspections include visually observing the area immediately adjacent to each HWOBU for waste contamination. The HWOBA Treatment Facility Daily Inspection Log is in Appendix F-1. Spilled pyrotechnic waste found on the concrete pad must be moved to the nearest available HWOBU for treatment.

### **Inspection of Security Devices**

Inspections conducted on each of the security devices include the following.

- Visually inspect all “warning” and “no-smoking” signs to ensure that they are in place and legible. Reset or replace signs that are damaged or illegible.
- Visually inspect the fences and gates to ensure they are free of significant signs of deterioration and suitable for use as intended.
- Visually inspect the gate locks to ensure they function properly.

### **Inspection of Emergency Response Equipment**

The following emergency response equipment must be inspected, and maintained onsite or carried to the HWOBA by hazardous waste technicians whenever hazardous waste is being treated.

- **Two-Way Radio:** The hazardous waste technicians are equipped with a hand-held, functioning two-way radio capable of transmitting site information to the base station at Kilgore’s main production plant. The radio is inspected before initiating open burning. Hazardous waste technicians must verify that the radio is functioning by calling Kilgore’s main production plant and receiving “clear signal” verification.

Several communication devices were evaluated for the HWOBA; however, no direct coordination communication devices are available for this area. Conventional telephone systems were rejected due to the lack of personnel in the area on a continuous basis, and the impracticality of installing a telephone system. Cellular telephones were also rejected due to the remoteness of the HWOBA and the lack of

available coverage. While radios can only connect the HWOBA with the base station at the main production plant, the base station can forward any emergency calls to the Kilgore Main Plant Management and the local police and fire departments. Therefore, two-way radios are the only viable option for communication devices to summon emergency assistance from outside the HWOBA.

The procedures for forwarding emergency calls from the HWOBA are as follows.

- The Guard House at the main facility is contacted immediately by using the two-way radio. The on-duty Security Officer (present 24 hours a day, 7 days a week, 365 days a year) is briefed on the emergency situation and immediately contacts the appropriate internal emergency department or external agency, as detailed in Section 4 of the Contingency Plan (Section G).
- The Security Officer then informs the caller on the two-way radio that the appropriate emergency departments/agencies have been contacted and the estimated response time.
- **Manually operated, water fire-fighting backpacks:** The vehicle used to transport hazardous waste is equipped with two water fire-fighting backpacks. Hazardous waste technicians inspect the portable water fire-fighting backpacks before leaving the plant to ensure that they are filled with water and functioning properly.
- **Shovels and rakes:** The vehicle used to transport hazardous waste pyrotechnics for treatment carry two non-sparking shovels and rakes. Shovels and rakes are to be used to retrieve any hazardous waste spilled or dropped outside the tray. All spilled waste is to be collected and returned to the tray for treatment. The shovels and rakes must be non-sparking, and the equipment inspection should ensure they are present and in good condition.

### **Inspection of Monitoring Wells**

Appendix F-3 contains Kilgore's Well Inspection Plan and well inspection checklist. This plan may be implemented by Kilgore staff and/or environmental contractors as needed.



### **F-2(c) Remedial Action**

Kilgore will remedy any deterioration or malfunction of equipment or structures that the inspections referenced in Sections F-2(a) and F-2(b) reveal, on a schedule that ensures that the problem does not lead to an environmental or human health hazard. Where a hazard is imminent or has already occurred, remedial action will be taken immediately. The hazardous waste technicians are authorized to initiate immediate action to correct unacceptable emergency or non-emergency conditions. If an actual emergency exists, the inspector must immediately notify Kilgore's Environmental Manager or Safety Department.

Minor maintenance or repairs, such as replacing light bulbs, fuses, or patching a hole in a fence can be conducted independently by the hazardous waste technicians. The Environmental Manager or designee will be verbally notified of any minor maintenance or repairs conducted involving hazardous waste accumulation and transportation, or HWOBA equipment, structures, or areas. The procedures for remediating problems (beyond minor repairs) associated with the deterioration or malfunction of the HWOBA, and equipment and structures associated with the HWOBA identified during an inspection, are as follows:

- Hazardous waste technicians notify the Environmental Manager or designee and the Safety Department.
- A Maintenance Work Order Request Form is completed online. It identifies the location of the problem, work/problem description, type of request (i.e., emergency, safety, routine, project specific), parts/materials required, date ordered, and estimated costs.
- A copy of this form is retained by the Environmental Manager or designee, and the original and second copies are forwarded to Kilgore's Maintenance Department.
- Appropriate main facility and/or hazardous waste technicians make the necessary repairs/modifications, etc., as appropriate, depending upon the actual problem.

### **F-3 WAIVER OF PREPAREDNESS AND PREVENTION REQUIREMENTS**

Kilgore does not request a waiver of the preparedness and prevention plan requirements of 40 CFR Subpart C or THWMR 0400-12-01-.06(3) as they apply to the hazardous waste pyrotechnics treatment operations. Documentation of compliance with these requirements is below and in Sections D and G of this Part B Permit Application.

### **F-3(a) Equipment Requirements**

#### **Internal and External Communications**

At no time shall treatment operations be conducted by fewer than two people. Per facility WIs, internal communications by voice will be sufficient to relay emergency instructions to personnel within the HWOBA, because each person is approximately 50 feet away from the other.

At least one of the hazardous waste technicians is equipped, at all times, with a hand-held two-way radio that provides external communications to emergency assistance personnel. In addition, the Vice President Health, Safety, and Environmental or designee is equipped with a hand-held two-way radio at all times during plant operations. The hazardous waste technicians are required to notify the Security Department before commencing hazardous waste pyrotechnics treatment operations at the HWOBA.

#### **Documentation of Arrangements**

As specified in 40 CFR 264.37 and THWMR 0400-12-01-.06(3)(h), Kilgore has made arrangements with the Town of Toone volunteer fire department, as appropriate for the type of waste handled at the HWOBA and the potential need for the services of that organization. Kilgore and the Town of Toone have a Mutual Aid Agreement (mutual fire-fighting assistance agreement) that provides each entity with fire and security assistance from the other when available. In addition, Kilgore has arranged with the Jackson-Madison County General Hospital in Jackson, Tennessee; the Hardeman County Sheriff's Department in Bolivar, Tennessee; and the Tennessee Emergency Management Agency (TEMA) to provide certain services in an emergency. Documentation of the Mutual Aid Agreement and these arrangements are provided in Appendix 1 of the Contingency Plan and discussed further in Section G, the Contingency Plan.

Kilgore provides the Toone Volunteer Fire Department, TEMA, and TDEC with copies of the facility's updated Contingency Plan and annual Emergency Planning and Community Right-to-Know Act Tier II forms. This information provides sufficient information to familiarize each agency with the properties of hazardous materials and hazardous wastes handled at the facility and the types of injuries or illnesses which could result from fires, explosions, or releases at the facility.

### **Emergency Equipment**

Inspection schedules for emergency equipment required for safe treatment operations at the HWOBA have been described in Section F-2. Table F-1 lists emergency equipment owned by Kilgore.

**Table F-1  
Emergency Equipment**

<b>Type</b>	<b>Size</b>	<b>Quantity</b>	<b>Location</b>
Fire-Extinguisher	10 pounds	1	Transport Vehicle (Truck)
First Aid Kit	Not Applicable	1	Transport Vehicle (Truck)
Shovels and Rakes	Not Applicable	2 each	Transport Vehicle (Truck)
Water Fire-Fighting Backpacks	2.5 gallons	2	Transport Vehicle (Truck)
Fire Blanket	Approximately 4 feet by 8 feet	1	Transport Vehicle (Truck)

The transport vehicle associated with hazardous waste pyrotechnics treatment operations shall be equipped with fire-extinguishers, a fire blanket, and first-aid kits.

### **Water for Fire Control**

The fire-extinguishers and water fire-fighting backpacks available for fighting grass fires at the HWOBA are discussed in Section F-2 and in Section G (Contingency Plan). As previously identified, the vehicle transporting hazardous waste pyrotechnics is equipped with water fire-fighting backpacks with spray nozzles to assist in fighting small/grass fires.

The HWOBA is an open area where treatment operations may be safely conducted. The only structures at the HWOBA are the HWOBUs (burn pan and concrete pad); therefore, there is no need for a fire control water source. Also, the hazardous waste technicians continuously monitor open burning operations and watch for fires. In the unlikely event that a small grass fire starts, hazardous waste technicians retreat to a safe distance and allow the fire to burn out; for incipient-stage grass fires, hazardous waste technicians would use back packs to put out the fire when safe to do so. If a fire threatens larger grass areas outside the HWOBA, other available fire-fighting units trained for the type of fire involved will be summoned immediately by radio, since Kilgore crews are not trained (for instance) in firefighting standards for wild fires/forest fire.

All hazardous waste treated at the HWOBA is waste pyrotechnic material that has been specifically manufactured to burn rapidly and completely. Water supplies for emergency purposes are not required, but are available on the transport vehicle and from fire-fighting crews.

### **Aisle Space Requirements**

The HWOBA is in the middle of an open field and has ample space for the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of the HWOBA in the event of an emergency. Spacing of individual HWOBUs discussed in Section D is required to ensure treatment safety.

## **F-4 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT**

### **F-4(a) Loading/Unloading Operations**

At Kilgore's main production plant HWAA, hazardous waste pyrotechnics are loaded manually by the hazardous waste technicians. Hazardous waste pyrotechnics are accumulated in conductive bags, which are filled to no more than 50 percent capacity. The spill potential is reduced by limiting transfer distance using trailers of a certain height that facilitate loading and unloading, and by performing the following unloading operations within each HWOBU.

- The trailer is backed up to the unload position in front of the HWOBU burn pan.
- The trailer wheels are chocked prior to unloading to prevent inadvertent movement of the trailer.
- The anti-static bags are removed from the drums and placed in the HWOBU burn pan.
- The trailer is then moved at least 50 feet from the HWOBU.
- The anti-static bags are cut open and the waste distributed over the HWOBU burn pan area to a depth of 3 inches.

Hazardous waste pyrotechnics are manually unloaded at each HWOBU and subsequently placed in the HWOBU burn pan for treatment.

WIs for loading/unloading and transporting hazardous waste pyrotechnics are discussed in Section D and copies are included in Appendix F-2.

### **F-4(b) Runoff**

Runoff is prevented because open burning is conducted in a burn pan, and detectable material that may have been ejected from the tray during operations is removed within 72 hours after open burning. In addition, operations are not conducted during less-than-average dispersion

conditions, as defined in Sections D and F-4(f). These operations limit the waste from contacting precipitation and prevent contaminated runoff. Kilgore's proposed improvements upon receiving the Final Permit include constructing 10 new burn pans within concrete containment pads (each pair constituting a HWOBUs) designed to contain runoff. The proposed designs for each HWOBUs are discussed further in Section D and shown on Figures D-1 through D-3.

#### **F-4(c) Water Supplies**

There are no public or private drinking water supplies near the HWOBAs. Pugh Creek adjacent to the HWOBAs is used to water livestock.

#### **F-4(d) Equipment and Power Failure**

If equipment fails, burn operations will be halted and the situation reported to the Kilgore Safety Officer, Environmental Manager, or designee(s), as appropriate. The Environmental Manager or designee shall be responsible for having the equipment restored to proper operational status or having the equipment replaced as the situation warrants. There is no power provided to the HWOBAs; therefore, power failure is not a concern.

#### **F-4(e) Personal Protective Equipment**

Hazardous waste technicians must always wear approved safety glasses, conductive safety shoes, minimum-90-percent cotton clothing, and flame-retardant coveralls. During loading/unloading and open burning of waste magnesium pyrotechnic material, and subsequent waste residue cleanup, hazardous waste technicians must also wear cotton or leather gloves and an aluminized apron. No additional PPE is required during an emergency at the HWOBAs.

#### **F-4(f) Procedures to Minimize Releases to the Atmosphere**

Currently, the HWOBAs operate five days a week, with one burn of up to 1,500 pounds per work day. Open burning at the HWOBAs is conducted in burn pans that are 8 feet long by 4 feet wide by 3 feet high. Upon issuance of the Final Permit, Kilgore will construct 10 HWOBUs capable of treating a maximum capacity of 3,300 pounds of pyrotechnic waste per day and 858,000 pounds per year.

The HWOBAs will not be operated under the following meteorological conditions unless necessitated by an emergency (discussed in Section D-1(d)):

- When precipitation does not allow for combustion.
- Wind speed in excess of 20 mph.

- When ambient conditions do not promote good dispersion.
- Any day declared to be an Air Pollution Emergency Episode by TDEC's DAPC.

In general, the more unstable the atmospheric conditions, the better dispersion will be. Atmospheric stability is determined by such factors as: wind speed and variability, surface temperature, diurnal temperature changes, and cloud cover. Above-average, average, and less-than-average dispersion conditions are defined by the following criteria.

#### **Above-Average Dispersion Conditions**

- Clear, warm, sunny days (partly cloudy conditions are acceptable if the cloud cover is relatively high and the clouds are not opaque)
- Temperature increases greater than 15 degrees Fahrenheit from sunrise to mid-day, with daytime high temperatures above 50 degrees Fahrenheit
- Light to moderate variable wind with speeds less than 5 mph
- A high ceiling

#### **Average Dispersion Conditions**

- Partly cloudy conditions (if the cloud cover is relatively high and the clouds are not opaque).
- Temperature increases greater than 5 degrees Fahrenheit from sunrise to mid-day, with daytime high temperatures above 15 degrees Fahrenheit.
- Moderate variable wind with speeds between 5 and 15 mph.
- A medium height ceiling.

#### **Less-Than-Average Dispersion Conditions**

Unfavorable conditions listed below are the opposite of those described above (i.e., the more stable the conditions are, the worse dispersion will be).

- Extreme cold
- Heavy and/or low cloud cover/ceiling
- Greater than 5 degrees Fahrenheit temperature decrease from sunrise to mid-day
- Steady winds

These conditions limit buoyant turbulence and significantly reduce dispersion. Under these neutral or stable conditions, surface releases disperse slowly in the vertical and horizontal planes. A local low-pressure system can result in very poor dispersion conditions. Dispersion is worst at night and during the hour after sunrise and the hour before sunset; therefore, open burning is limited to the hours between 9 a.m. and 2 p.m.

Meteorological conditions (i.e., wind speed, wind direction, temperature, and precipitation) will be monitored by Kilgore's Environmental Manager or designee and hazardous waste technicians as needed throughout the day for planning purposes, before open burning. The above-named Kilgore personnel will monitor conditions via any one of the following Internet meteorological Web site(s):

- News Channel 3 Memphis ([www.wreg.com](http://www.wreg.com)) Weather Net 3 Real Time Weather.
- Intellicast ([www.intellicast.com](http://www.intellicast.com)).
- The Weather Channel ([www.weather.com](http://www.weather.com)).
- National Weather Service METAR/TAF ([www.srh.noaa.gov](http://www.srh.noaa.gov)) and ([www.nws.noaa.gov](http://www.nws.noaa.gov)).

The monitored parameters are updated hourly on those Web sites.

Direct observations of meteorological conditions (i.e., precipitation, excessive wind, cloud cover, calm periods, and storm conditions) will be used in conjunction with Web site monitoring and are typically conducted in the morning and just before open burning.

Ambient air monitoring of open burn operations is not feasible for several reasons. First, trying to predict and then capture an emission plume from open burning is not practical because it is not in an enclosed environment. Second, the high temperature in the immediate area of the burn is such that any equipment used for testing would be subject to severe damage and malfunction. Finally, there are inherent safety issues involved with sampling equipment (within or around the HWOBA) becoming projectiles.

#### **F-4(g) Transport Notification**

Hazardous waste technicians shall coordinate their intent to transport hazardous waste pyrotechnics to the HWOBA in advance with the Security Department. Only Kilgore hazardous waste technicians are actively involved with the transportation operations. During transport of hazardous waste pyrotechnics, the transport vehicle travels from Kilgore's main production plant HWAA across public roads through the Town of Toone to the HWOBA.

#### **F-4(h) Pretreatment Operations**

Upon arrival at the HWOBA and before unloading hazardous waste pyrotechnics from the transport vehicle, Kilgore's hazardous waste technicians will ensure that no unauthorized personnel are at the HWOBA. Treatment operations are not conducted until the hazardous waste technicians have visually verified the area is clear.

Equipment used at the HWOBA includes the transport vehicle, miscellaneous tools, and fire-fighting gear. Equipment malfunctions will be reported immediately to the Kilgore Environmental Manager or designee. Treatment operations will be halted until all treatment equipment is fully operational.

#### **F-5 PREVENTION OF REACTION OF IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTES**

Precautions to prevent reaction of and procedures for handling ignitable, reactive, and incompatible wastes are contained within Kilgore's WIs (Appendix F-2) for operation of the HWOBA. The WIs have been developed based on applicable federal and state hazardous waste regulations, generator knowledge of the chemical and physical properties of pyrotechnics, safety evaluations by Kilgore personnel, and published literature including SDSs, *Fire Protection Guide on Hazardous Materials* (National Fire Protection Association, 1986), and 49 CFR 172.

##### **F-5(a) Design and Operation Hazardous Waste Accumulation**

Hazardous waste is not accumulated at the HWOBA before or after treatment operations, and is present only when open burning activities are conducted. Following open burning of hazardous waste pyrotechnics, 72 hours must pass before handling and containerizing the residual ash treatment by-product. That 72-hour period from initial treatment activities to the containerization of the residual ash is considered the treatment cycle. Ash accumulation begins when residual ash is placed in containers. No hazardous waste is generated at the HWOBA.

The current HWOBA and burn pans are inspected before each treatment operation and the inspection is documented in the HWOBU Treatment Facility Daily Inspection Log (Appendix F-1). The engineering schematic for the proposed HWOBUs is shown on Figure D-1. Each HWOBU is designed to contain the hazardous waste pyrotechnics during the treatment process, except for air emission products that may escape its confines. Similarly, the proposed HWOBUs' integrity will be examined before each treatment operation and documented.



### **Hazardous Waste Treatment Location**

The HWOBA is maintained and operated to prevent the spread of fire and contamination. Daily inspections of the HWOBA are designed to prevent conditions that lead to unplanned emergencies and incidents.

Maintenance of the HWOBA includes: posting applicable authorization and activity signs; weed and brush clearance in and around the HWOBA; preventive maintenance of the burn pans and ancillary equipment; periodic evaluation of containment systems (e.g., run on/run off control curbs); and facility security systems (e.g., fence).

### **F-5(b) Management of Ignitable, Reactive, and Incompatible Waste at the HWOBA**

Personnel involved in hazardous waste pyrotechnics treatment operations at Kilgore are properly trained in handling and treating pyrotechnics; details of training are discussed in Section H of this Part B Permit Application. To the greatest extent practical, hazardous waste technicians shall use extreme care in handling reactive materials during transportation and before treatment to prevent reactions that will:

- Generate extreme heat, pressure, fire, explosions, or violent reactions.
- Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment.
- Produce flammable fumes or gases in sufficient quantities to pose a risk of uncontrolled fire or explosion.
- Damage the structural integrity of the burn pans or HWOBA.
- Through other like means, threaten human health or the environment.

Hazardous waste pyrotechnics shall be separated from all other wastes. No ignition sources other than that necessary for open burning operations are allowed at the HWOBA. In addition, "No Smoking" signs are posted at both HWOBA gates and at the main gates of the surrounding TTF.

Kilgore also monitors the conditions of a burn using two procedures: a Heat Gun Log which records pans cleaned, inspected, and ambient temperature prior to a burn; and the fuse burn rate for

each burn to enable tech crews to monitor time for fuse ignition. Copies of both forms may be found in Appendix F-1.

### **F-5(c) Safety Guidelines**

All hazardous materials handled at Kilgore are classified ignitable or reactive due to their inherent physical characteristics. As such, personnel must take appropriate measures to prevent accidental ignition or detonation of hazardous waste pyrotechnic materials. The most prominent threat arises from external ignition sources such as open flames, sparks, etc. WIs in Appendix F-2 dictate safety guidelines that are strictly enforced to ensure that accidental ignition does not result. These instructions include the following:

- “No Smoking” signs are posted at the entrances to the HWOBA and the surrounding TTF.
- Ignition sources, such as open flames, smoking, cutting, welding, hot surfaces, frictional heat, sparks, spontaneous ignition, and radiant heat, are prohibited.
- Treatment operations are not conducted during electrical storms.
- Treatment operations are not conducted during periods of high atmospheric static electricity.
- Incompatible materials are not transported in the same vehicle or treated in the same location.
- Spark-resistant tools are used where applicable.

**Appendix F-1**  
**Inspection Log**

# CHEMRING COUNTERMEASURES USA KILGORE OPERATIONS

## DAILY VEHICLE CHECK

WEEKLY STARTING MILEAGE: _____

VEHICLE #: _____

DEPARTMENT: _____

WEEK OF: _____

DAY	DRIVER		FUEL ADDED	OIL ADDED	ENDING MILEAGE
	1 ST SHIFT	2 ND SHIFT			
MON					
TUE					
WED					
THUR					
FRI					
SAT					
SUN					

<i>1ST Shift: Top Section of each Box</i> <i>2nd Shift: Bottom Section of each Box</i>	OPERATOR													
	MON		TUE		WED		THUR		FRI		SAT		SUN	
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
CHECKS														
*Head Lights	/	/	/	/	/	/	/	/	/	/	/	/	/	/
*Tail/Brake Lights	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Turn Signals	/	/	/	/	/	/	/	/	/	/	/	/	/	/
*Windshield Wipers	/	/	/	/	/	/	/	/	/	/	/	/	/	/
*Doors	/	/	/	/	/	/	/	/	/	/	/	/	/	/
*Oil Level	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Water Level	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Tires	/	/	/	/	/	/	/	/	/	/	/	/	/	/
*Gas Level	/	/	/	/	/	/	/	/	/	/	/	/	/	/
*Brakes	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Cab Area Clean	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Cargo Area Clean	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Spark Arrestors (If Applicable)	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Fire Extinguishers (If Applicable)	/	/	/	/	/	/	/	/	/	/	/	/	/	/
*Windows/Windshields	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Emergency Flashers	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Backup Alarms	/	/	/	/	/	/	/	/	/	/	/	/	/	/

REMARKS (REPAIRS REQUIRED) (* indicates critical item refer to SOP# 2518)

SUPERVISOR: _____

DATE: _____

**Heat Gun Log for Burn Pans                      Month/Year**

<b>Date</b>	<b>Number of Burn Pans Cleaned</b>	<b>Inspected By</b>	<b>Ambient Temp Reading</b>	<b>Heat Gun Readings per Burn Pan</b>	<b>Comments</b>
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					

FUSE BURN RATE

Month _____

Year _____

DATE	RATE	INITIALS
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

## KILGORE HAZARDOUS WASTE OB TREATMENT FACILITY DAILY INSPECTION LOG

Inspected By: _____  
 _____

DATE: _____

TIME: _____

Description	CONDITION		CORRECTIVE ACTION				
	SERVICEABLE						
Keller Road Gate		Verify Gate is locked, no signs of unauthorized entry					
Entrance Road		Verify road is servicable, no excessive erosion, exit is clear					
Thermal Treatment Gate		Verify Gate is locked, no signs of unauthorized entry					
Thermal Treatment Area		Verify area is clean, no sign of ignition, no spills, fence intact					
		Ensure vegetaion is not present near the pans.					
Concrete pads		Verify pads are not cracked, berns are intact, no standing water (1)					
		Remove ash or debris if present					
Burn Pans		Verify pan is intact, absence of corrosion, discharge pipe is in place, no standing water (2)					
HW Tech Radio		Radio is working and contact with plant is available.					
Portable Water Back Packs		Verify water packs are full and functioning properly					
Spill Response Equipment		Confirm spill kit is present and contents are complete					
First Aid Kits		Confirm present and stocked.					
Fire Blanket		Present and servicable					
Non sparking shovel/rake		Present and servicable					
Conductive Containers		Present, liners intact					
Ash Collection Drums		Verify that ash collection drums are present and lids are secure.					

**Note**

1. If standing water is noted, implment berm stormwater plan.
2. If standing water is noted, implment pan water removal procedure.

Environmental Review: _____

Neighboring Structure Check    Month

Date	Date of Open Burn	Inspected By	Persons Present	Persons Not Present	Comments	Time
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						



## MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

*(Read Instructions before completing this form.)*

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER

<b>SECTION 1 - DOCUMENTATION</b>	<b>ORIGIN</b> a.	<b>DESTINATION</b> b.
2. CARRIER/GOVERNMENT ORGANIZATION		
3. DATE/TIME OF INSPECTION		
4. LOCATION OF INSPECTION		
5. OPERATOR(S) NAME(S)		
6. OPERATOR(S) LICENSE NUMBER(S)		
7. MEDICAL EXAMINER'S CERTIFICATE*		
8. <i>(X if satisfactory at origin)</i>		9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*
a. MILITARY HAZMAT ENDORSEMENT	d. ERG OR EQUIVALENT COMMERCIAL:	YES NO
b. VALID LEASE*	e. DRIVER'S VEHICLE INSPECTION REPORT*	a. TRUCK/TRACTOR
c. ROUTE PLAN	f. COPY OF 49 CFR PART 397	b. TRAILER

**SECTION II - MECHANICAL INSPECTION**

*All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.*

10. TYPE OF VEHICLE(S)				11. VEHICLE NUMBER(S)					
12. PART INSPECTED <i>(X as applicable)</i>	ORIGIN (1)		DESTINATION (2)		ORIGIN (1)		DESTINATION (2)		COMMENTS (3)
	SAT	UNSAT	SAT	UNSAT	SAT	UNSAT	SAT	UNSAT	
a. SPARE ELECTRICAL FUSES					k. EXHAUST SYSTEM				
b. HORN OPERATIVE					l. BRAKE SYSTEM*				
c. STEERING SYSTEM					m. SUSPENSION				
d. WINDSHIELD/WIPERS					n. COUPLING DEVICES				
e. MIRRORS					o. CARGO SPACE				
f. WARNING EQUIPMENT					p. LANDING GEAR*				
g. FIRE EXTINGUISHER*					q. TIRES, WHEELS, RIMS				
h. ELECTRICAL WIRING					r. TAILGATE/DOORS*				
i. LIGHTS AND REFLECTORS					s. TARPULIN*				
j. FUEL SYSTEM*					t. OTHER <i>(Specify)</i>				
13. INSPECTION RESULTS <i>(X one)</i> ACCEPTED				REJECTED					
<i>(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)</i>									
14. SATELLITE MOTOR SURVEILLANCE SYSTEM: <i>(X one)</i> ACCEPTED				REJECTED					
15. REMARKS									

16. INSPECTOR SIGNATURE <i>(Origin)</i>	17. INSPECTOR SIGNATURE <i>(Destination)</i>
-----------------------------------------	----------------------------------------------

**SECTION III - POST LOADING INSPECTION**

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1)		DESTINATION (2)		COMMENTS (3)
	SAT	UNSAT	SAT	UNSAT	
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 836 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT SPECIAL PERMIT 868					
25. INSPECTOR SIGNATURE <i>(Origin)</i>	26. DRIVER(S) SIGNATURE <i>(Origin)</i>				
27. INSPECTOR SIGNATURE <i>(Destination)</i>	28. DRIVER(S) SIGNATURE <i>(Destination)</i>				

## INSTRUCTIONS

### SECTION I - DOCUMENTATION

#### General Instructions.

All items (2 through 9) will be checked at origin prior to loading. Items with an asterisk (*) apply to commercial operators or equipment only. Only Items 2 through 7 are required to be checked at destination.

Items 1 through 5. Self explanatory.

Item 6. Enter operator's Commercial Driver's License (CDL) number or Military OF-346 License Number. CDL and OF-346 must have the HAZMAT and other appropriate endorsements IAW 49 CFR 383.

Item 7. *Enter the expiration date listed on the Medical Examiner's Certificate.

Item 8.a. APPLIES TO MILITARY OPERATORS ONLY. Military Hazardous Materials Certification. In accordance with applicable service regulations, ensure operator has been certified to transport hazardous materials.

b. *Valid Lease. Shipper will ensure a copy of the appropriate contract or lease is carried in all leased vehicles and is available for inspection. (49 CFR 376.12 and 376.11(c)(2)).

c. Route Plan. Prior to loading any Hazard Class/Division 1.1, 1.2, or 1.3 (Explosives) for shipment, ensure that the operator possesses a written route plan in accordance with 49 CFR Part 397. Route Plan requirements for Hazard Class 7 (Radioactive) materials are found in 49 CFR 397.101.

d. Emergency Response Guidebook (ERG) or Equivalent. Commercial operators must be in possession of an ERG or equivalent document. Shipper will provide applicable ERG page(s) to military operators.

e. *Driver's Vehicle Inspection Report. Review the operator's Vehicle Inspection Report. Ensure that there are no defects listed on the report that would affect the safe operation of the vehicle.

f. Copy of 49 CFR Part 397. Operators are required by regulation to have in their possession a copy of 49 CFR Part 397 (Transportation of Hazardous Materials Driving and Parking Rules). If military operators do not possess this document, shipper will provide a copy to operator.

Item 9. *Commercial Vehicle Safety Alliance (CVSA) Decal. Check to see if equipment has a current CVSA decal and mark applicable box. Vehicles without CVSA, check documentation of the last vehicle periodic inspection and perform DD Form 626 inspection.

### SECTION II - MECHANICAL INSPECTION

#### General Instructions.

All items (12.a. through 12.t.) will be checked on all incoming empty equipment prior to loading. All UNSATISFACTORY conditions must be corrected prior to loading. Items with an asterisk (*) shall be checked on all incoming loaded equipment. Unsatisfactory conditions that would affect the safe off-loading of the equipment must be corrected prior to unloading.

### SECTION II (Continued)

Item 12.a. Spare Electrical Fuses. Check to ensure that at least one spare fuse for each type of installed fuse is carried on the vehicle as a spare or vehicle is equipped with an overload protection device (circuit breaker). (49 CFR 393.95)

b. Horn Operative. Ensure that horn is securely mounted and of sufficient volume to serve purpose. (49 CFR 393.81)

c. Steering System. The steering wheel shall be secure and must not have any spokes cracked through or missing. The steering column must be securely fastened. Universal joints shall not be worn, faulty or repaired by welding. The steering gear box shall not have loose or missing mounting bolts or cracks in the gear box mounting brackets. The pitman arm on the steering gear output shaft shall not be loose. Steering wheel shall turn freely through the limit of travel in both directions. All components of a power steering system must be in operating condition. No parts shall be loose or broken. Belts shall not be frayed, cracked or slipping. The power steering system shall not be leaking. (49 CFR 396 Appendix G)

d. Windshield/Wipers. Inspect to ensure that windshield is free from breaks, cracks or defects that would make operation of the vehicle unsafe; that the view of the driver is not obscured and that the windshield wipers are operational and wiper blades are in serviceable condition. Defroster must be operative when conditions require. (49 CFR 393.60, 393.78 and 393.79)

e. Mirrors. Every vehicle must be equipped with two rear vision mirrors located so as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. Mirrors shall not be cracked or dirty. (49 CFR 393.80)

f. Warning Equipment. Equipment must include three bidirectional emergency reflective triangles that conform to the requirements of FMVSS No. 125. FLAME PRODUCING DEVICES ARE PROHIBITED. (49 CFR 393.95)

g. Fire Extinguisher. Military vehicles must be equipped with two serviceable fire extinguishers with an Underwriters Laboratories rating of 10 BC or more. (Commercial motor vehicles must be equipped with one serviceable 10 BC Fire Extinguisher). Fire extinguisher(s) must be located so that it is readily accessible for use and securely mounted on the vehicle. The fire extinguisher must be designed, constructed and maintained to permit visual determination of whether it is fully charged. (49 CFR 393.95)

h. Electrical Wiring: Electrical wiring must be clean and properly secured. Insulation must not be frayed, cracked or otherwise in poor condition. There shall be no uninsulated wires, improper splices or connections. Wires and electrical fixtures inside the cargo area must be protected from the lading. (49 CFR 393.28, 393.32, 393.33)

## INSTRUCTIONS

### SECTION II (Continued)

i. Lights/Reflectors. (Head, tail, turn signal, brake, clearance, marker and identification lights, Emergency Flashers). Inspect to see that all lighting devices and reflectors required are operable, of proper color and properly mounted. Ensure that lights and reflectors are not obscured by dirt or grease or have broken lenses. High/Low beam switch must be operative. Emergency Flashers must be operative on both the front and rear of vehicle. (49 CFR 393.24, 25, and 26)

j. Fuel System. Inspect fuel tank and lines to ensure that they are in serviceable condition, free from leaks, or evidence of leakage and securely mounted. Ensure that fuel tank filler cap is not missing. Examine cap for defective gasket or plugged vent. Inspect filler necks to see that they are in completely serviceable condition and not leaking at joints. (49 CFR 393.83)

k. Exhaust System. Exhaust system shall discharge to the atmosphere at a location to the rear of the cab or if the exhaust projects above the cab, at a location near the rear of the cab. Exhaust system shall not be leaking at a point forward of or directly below the driver compartment. No part of the exhaust system shall be located where it will burn, char or damage electrical wiring, fuel system or any other part of the vehicle. No part of the exhaust system shall be temporarily repaired with wrap or patches. (49 CFR 393.83)

l. Brake System (to include hand brakes, parking brakes and Low Air Warning devices). Check to ensure that brakes are operational and properly adjusted. Check for audible air leaks around air brake components and air lines. Check for fluid leaks, cracked or damaged lines in hydraulic brake systems. Ensure that parking brake is operational and properly adjusted. Low Air Warning devices must be operative. (49 CFR 393.40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, and 55)

m. Suspension. Inspect for indications of misaligned, shifted or cracked springs, loosened shackles, missing bolts, spring hangers unsecured at frame and cracked or loose U-bolts. Inspect for any unsecured axle positioning parts, and sign of axle misalignment, broken torsion bar springs (if so equipped). (49 CFR 393.207)

n. Coupling Devices (Inspect without uncoupling). Fifth Wheels: Inspect for unsecured mounting to frame or any missing or damaged parts. Inspect for any visible space between upper and lower fifth wheel plates. Ensure that the locking jaws are around the shank and not the head of the kingpin. Ensure that the release lever is seated properly and safety latch is engaged. Pintle Hook, Drawbar, Towbar Eye and Tongue and Safety Devices: Inspect for unsecured mounting, cracks, missing or ineffective fasteners (welded repairs to pintle hook is prohibited). Ensure safety devices (chains, hooks, cables) are in serviceable condition and properly attached. (49 CFR 393.70 and 71)

o. Cargo Space. Inspect to ensure that cargo space is clean and free from exposed bolts, nuts, screws, nails or inwardly projecting parts that could damage the lading. Check floor to ensure it is tight and free from holes. Floor shall not be permeated with oil or other substances. (49 CFR 393.84)

p. Landing Gear. Inspect to ensure that landing gear and assembly are in serviceable condition, correctly assembled, adequately lubricated and properly mounted.

### SECTION II (Continued)

q. Tires, Wheels and Rims: Inspect to ensure that tires are properly inflated. Flat or leaking tires are unacceptable. Inspect tires for cuts, bruises, breaks and blisters. Tires with cuts that extend into the cord body are unacceptable. Thread depth shall not be less than: 4/32 inches for tires on a steering axle of a power unit, and 2/32 inches for all other tires. Mixing bias and radial on the steering axle is prohibited. Inspect wheels and rims for cracks, unseated locking rings, broken, loose, damaged or missing lug nuts or elongated stud holes. (49 CFR 393.75)

r. Tailgate/Doors. Inspect to see that all hinges are tight in body. Check for broken latches and safety chains. Doors must close securely. (49 CFR 177.835(h))

s. Tarpaulin. If shipment is made on open equipment, ensure that lading is properly covered with fire and water resistant tarpaulin. (49 CFR 177.835(h))

t. Other Unsatisfactory Condition. Note any other condition which would prohibit the vehicle from being loaded with hazardous materials.

Item 14. For AA&E and other shipments requiring satellite surveillance, ensure that the Satellite Motor Surveillance System is operable. The DTTS Message Display Unit, when operative, will display the signal "DTTS ON". The munitions carrier driver, when practical, will position the DTTS message display unit in a manner that allows the shipping inspector or other designated shipping personnel to observe the "DTTS ON" message without climbing aboard the cab of the motor vehicle.

### SECTION III - POST LOADING INSPECTION

#### General Instructions.

All items will be checked prior to the release of loaded equipment. Shipment will not be released until deficiencies are corrected. All items will be checked on incoming loaded equipment. Deficiencies will be reported in accordance with applicable service regulations.

Item 18. Check to ensure shipment is loaded in accordance with 49 CFR Part 177.848 and the applicable Segregation or Compatibility Table of 49 CFR 177.848.

Item 19. Check to ensure the load is secured from movement in accordance with applicable service outload drawings.

Item 20. Check to ensure seal(s) have been applied to closed equipment; fire and water resistant tarpaulin applied on open equipment.

Item 21. Check to ensure each transport vehicle has been properly placarded in accordance with 49 CFR 172.504.

Item 22. Check to ensure operator has been provided shipping papers that comply with 49 CFR 172.201 and 202. For shipments transported by Government vehicle, shipping paper will be DD Form 836.

Item 23. Ensure operator(s) sign DD Form 626, are given a copy and understand the hazards associated with the shipment.

Item 24. Applies to Commercial Shipments Only. If shipment is made under DOT Special Permit 868, ensure that shipping papers are properly annotated and copy of Special Permit 868 is with shipping papers.

**Appendix F-2**  
**Inspection Work Instructions**

<b>Level III – Work Instructions</b>		
<b>Procedure: DAILY INSPECTION OF EXPLOSIVE SCRAP VEHICLE AND TRAILER</b>		
<b>Document ID:</b> EMS- 330	<b>Revision:</b>	<b>Revision Date:</b>

**I. Purpose**

To establish instructions for the inspection of Scrap vehicle and trailer

**II. Personnel Affected**

Scrap Crew

**III. Associated Documents**

Level IV Form – 5006 Kilgore Daily Vehicle Checklist

**IV. Equipment**

4-Wheel Drive Truck  
 Trailer

**V. Procedure**

1. A safety inspection of the scrap hauling vehicle and trailer must be performed each day prior to starting scrap pick up.
2. Obtain a copy of form 5006 "Kilgore Daily Vehicle Checklist". Complete the inspections and fill in the form as indicated.
3. All inspected systems must be found satisfactory before explosive scrap can be picked up and disposed.
4. Keep a copy of the completed Form 5006 in the vehicle to indicate that each day's inspection has been completed.
5. At the end of each day remove the Form 5006 and place in the file for historical reference.

Level III – Work Instructions

Procedure: EMS – 330 Daily Inspection of Explosive Scrap Vehicle and Trailer

## TRAINING VERIFICATION FORM

Instruction given by: _____  
*Print Name* *Instructor*

*Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

<b>Level III – Work Instructions</b>		
<b>Procedure: INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT</b>		
<b>Document ID:</b> EMS- 332D	<b>Revision:</b>	<b>Revision Date:</b>

**I. Purpose**

To establish instructions for the inspection of the Hazardous Waste OB Unit

**II. Personnel Affected**

Scrap Crew

**III. Associated Documents**

EMS-300 Hazardous Waste OB Treatment Facility Inspection Log  
EMS-337 Neighboring Structure Check

**IV. Equipment**

Shovel  
Burn Pans  
Radio

**V. Safety Requirements**

- A. Operator must wear safety glasses with side shields
- B. Operator must wear safety boots
- C. Operator must wear 90% minimum cotton clothing
- D. Operator must wear flame retardant (nomex) coveralls

**VI. Procedure**

- 1. Daily inspect the Hazardous Waste OB Unit Area and fill out form EMS-300.
- 2. Daily verify neighboring gate for any individual activity and fill out form EMS-337

**Neighboring Gate**

- 1. Daily verify that neighboring gate is locked and no signs of individuals are present.
- 2. If individuals are present, stop and notify Environmental Manager or designee before beginning Open Burning process.

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 332 INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT</b>

### Keller Road Gate

1. Daily upon arrival at the first gate off Keller Road, verify gate is locked, in serviceable condition, and no signs of unauthorized entry.
2. Report all deficiencies on inspection log and alert Environmental Manager or designee and Security of any unauthorized entries.

### Entrance Road

1. After unlocking the gate, enter the entrance road leading to the OB Unit verifying the road is serviceable and no signs of erosion.
2. Report all deficiencies on inspection log and place a work order with Maintenance if needed.

### Hazardous Waste Treatment Facility

1. Before opening the gate from the entrance road into the HWOB Unit, ensure gate is locked, in serviceable condition, and no signs of unauthorized entry.

**CAUTION: VISUALLY OBSERVE THE BURN PAN AND ADJACENT AREAS FOR ANY SIGNS OF THERMAL ACTIVITY. IF ACTIVITIES ARE OBSERVED, DO NOT ENTER THE OB UNIT AND REMAIN IN THE OBSERVATION AREA. CONTACT THE SAFETY OFFICER ON THE RADIO FOR INSTRUCTIONS.**

2. If no activity is noted, unlock the gate and enter the HWOB Unit.
3. Visually verify treatment area is clean, no evidence of a spill, no signs of erosion or water run off. Verify fence is intact, warning signs are present and legible.
4. Any waste found on the ground must be shoveled up and placed in the nearest enclosure and burned.
5. Report all deficiencies on inspection log and place a work order with Maintenance if needed.

### Burn Pans

1. Visually verify the Burn Pans that are not in operation (72 hour cycle) are clean; ensure pans have no standing water and no unburned materials.
2. Inspect all seams and joints of the pans to ensure that junctures of the bottom and sides have not separated allowing material to fall from or leak out of the enclosure.
3. Inspect the floor and sides of the pans for holes, which would allow waste to exit the enclosure.



<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 332 INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT</b>

4. Report all deficiencies on inspection log and remove from service any pans found to be deficient until repaired.
5. Ensure drain plugs are in place; drain plugs are only removed from pans to decant rainwater.

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 332 INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT</b>

### TRAINING VERIFICATION FORM

Instruction given by: _____  
*Print Name* *Instructor Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

<b>Level III – Work Instructions</b>		
<b>Procedure: INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT</b>		
<b>Document ID:</b> EMS- 332E	<b>Revision:</b> E	<b>Revision Date:</b> 04/01/2014

**I. Purpose**

To establish instructions for the inspection of the Hazardous Waste OB Unit

**II. Personnel Affected**

HW Technician

**III. Associated Documents**

EMS-300 Hazardous Waste OB Treatment Facility Daily Inspection Log  
Neighboring Structure Check

**IV. Equipment**

Shovel  
Burn Pans  
Radio

**V. Safety Requirements**

- A. Operator must wear safety glasses with side shields
- B. Operator must wear safety boots
- C. Operator must wear 90% minimum cotton clothing
- D. Operator must wear flame retardant (nomex) coveralls

**VI. Procedure**

- 1. Daily inspect the Hazardous Waste OB Unit Area and fill out the EMS-300.
- 2. Daily verify neighboring gate for any individual activity and fill out the Neighboring Structure Check.

**Neighboring Gate**

- 1. Daily verify that neighboring gate is locked and no signs of individuals are present.
- 2. If individuals are present, stop and notify Environmental Manager or designee before beginning Open Burning process.

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 332 INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT</b>

### Keller Road Gate

1. Daily upon arrival at the first gate off Keller Road, verify gate is locked, in serviceable condition, and no signs of unauthorized entry.
2. Report all deficiencies on inspection log and alert Environmental Manager or designee and Security of any unauthorized entries.

### Entrance Road

1. After unlocking the gate, enter the entrance road leading to the OB Unit verifying the road is serviceable and no signs of erosion.
2. Report all deficiencies on inspection log and place a work order with Maintenance if needed.

### Hazardous Waste Treatment Facility

1. Before opening the gate from the entrance road into the HWOB Unit, ensure gate is locked, in serviceable condition, and no signs of unauthorized entry.

**CAUTION: VISUALLY OBSERVE THE BURN PAN AND ADJACENT AREAS FOR ANY SIGNS OF THERMAL ACTIVITY. IF ACTIVITIES ARE OBSERVED, DO NOT ENTER THE OB UNIT AND REMAIN IN THE OBSERVATION AREA. CONTACT THE SAFETY OFFICER ON THE RADIO FOR INSTRUCTIONS.**

2. If no activity is noted, unlock the gate and enter the HWOB Unit.
3. Visually verify treatment area is clean, no evidence of a spill, no signs of erosion or water run off. Verify fence is intact, warning signs are present and legible.
4. Any waste found on the ground must be shoveled up and placed in the nearest enclosure and burned.
5. Report all deficiencies on inspection log and place a work order with Maintenance if needed.

### Burn Pans

1. Visually verify the Burn Pans that are not in operation (72 hour cycle) are clean; ensure pans have no standing water and no unburned materials.
2. Inspect all seams and joints of the pans to ensure that junctures of the bottom and sides have not separated allowing material to fall from or leak out of the enclosure.
3. Inspect the floor and sides of the pans for holes, which would allow waste to exit the enclosure.

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 332 INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT</b>

4. Report all deficiencies on inspection log and remove from service any pans found to be deficient until repaired.
5. Ensure drain plugs are in place; drain plugs are only removed from pans to decant rainwater.

#### Concrete Pads

1. Visually verify the Burn Pans that are not in operation (72 hour cycle) are clean; ensure pans have no standing water and no unburned materials.
2. Inspect all curbs and the ramps of the pads pans to ensure that the concrete is not cracked or sections of the curbs are damaged or missing; either of which could liquids to discharge directly to the ground.
3. Report all deficiencies on inspection log and remove from service any pans found to be deficient until repaired.
4. Ensure gate valves are in the closed position at each pad; gate valves should only be opened to drain rainwater from the pads following visual inspection.

**Level III – Work Instructions**

**Procedure: EMS – 332 INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT**

## TRAINING VERIFICATION FORM

**Instruction given by:** _____

*Print Name*

*Instructor*

*Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

<b>Level III – Work Instructions</b>		
<b>Procedure: COLLECTION OF HAZARDOUS WASTE</b>		
<b>Document ID:</b> EMS-333	<b>Revision:</b>	<b>Revision Date:</b>

**I. Purpose**

To establish instructions for the safe and environmentally sound accumulation of hazardous waste.

**II. Personnel Affected**

Hazardous Waste Technicians

**III. Associated Documents**

- Level IV Form – EPA 8700-22 Hazardous Waste Manifest
- Level IV Form – EMS-301 Daily Hazardous Waste Accumulation Inspection Log
- Level IV Form – EMS-343 Daily Drum Weight Log

**IV. Safety Requirements**

- A. Operator must wear safety glasses with side shields
- B. Operator must wear safety boots
- C. Operator must wear 90% minimum cotton clothing
- D. Operator must wear flame retardant (nomex) coveralls
- E. Operator must wear approved gloves
- F. Operator must have a valid Tennessee Commercial Drivers License with a Hazardous Material Endorsement, up-to-date medical card and certification
- G. All waste activities will be attended by two (2) personnel

**V. Equipment**

Truck w/ Trailer	Steel Drums
#2 Diesel Fuel	Hazardous Waste Labels-Yellow and Red
Pallet Jack	

**VI. Procedure**

**A. Preparing Steel Drums for Use**

1. Check inspection log for quantity of clean empty drums needed at each HWAA.

**Level III – Work Instructions**

**Procedure: EMS – 333 COLLECTION OF HAZARDOUS WASTE**

2. Obtain emptied hazardous waste accumulation drums, verifying that drums are free of broken seams or gouges. Do not use any drum that is found to be deficient.
3. Remove or paint over any previous hazardous waste accumulation labels attached to the drums.
4. Line the steel drum with a conductive poly bag and fill the bag with approximately 1-3 gallons of #2 diesel fuel.
5. Apply a new hazardous waste accumulation label with accumulation start date notated.
6. **Apply a red and white hazardous waste label on drum on the side near the top and notate on the label the waste area number and the drum number (example: S2-1)**

**HAZARDOUS WASTE**

**S2-1**

**ACCUMULATION** _____

**START DATE** _____

**CONTENTS** _____

7. Transport the prepared drums to the HWAA requiring an empty drum.

Replacing Drums in the Hazardous Waste Accumulation Areas

**NOTE: PLEASE TOUCH GROUND ROD BEFORE ANY OPERATIONS BEGIN IN HWAAS**

8. Locate suitable drums for use in the HWAAs (see EMS-331 for suitable drums).
9. This work can be performed with one (1) or two (2) operators
10. When arriving at the HWAA, check the drums with the heat gun for Hot Barrels. Log the heat gun check on the Daily Hazardous Waste Accumulation Area Log with the date and time and any Hot Barrels if present. If a Hot Barrel is noticed, contact the Safety Department immediately.
11. Make sure the velostat bag is in the drum and the drum has the appropriate amount of diesel.
12. Place the drum in the HWAA with ALL appropriate labeling.



<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 333 COLLECTION OF HAZARDOUS WASTE</b>

**B. Preparing to Pick Up Hazardous Waste for Transport to Hazardous Waste OB Unit**

1. Review the daily inspection log for the type and quantities of hazardous waste accumulated at the various accumulation areas.
2. From the inspection log, determine what accumulated hazardous wastes are compatible.
3. Prepare a Uniform Hazardous Waste Manifest Form for batched material leaving the "Total Quantity" and "Number of Containers" blank until all drums have been weighed for that day's transport.

**C. Pick Up Waste for Transport to Hazardous Waste OB Unit**

1. Drive the scrap truck and trailer to the designated HWAA.
2. Visually verify that HWAA's are still clean as noted on the inspection logs. Notify supervisor in charge of the HWAA of the condition to have any discrepancies corrected.

**NOTE: IF EXCESSIVE COMPOSITION OR OTHER WASTE MATERIALS ARE PRESENT, IMMEDIATELY CONTACT THE SUPERVISOR AND/OR SAFETY OFFICER FOR DIRECTION PRIOR TO PROCEEDING WITH ANY CLEAN UP.**

3. *Place pallet jack in front of the hwaa.*
4. Back the trailer up to the edge of the waste accumulation area minimizing the distance required to weigh drums and load the trailer.
5. Apply the parking brake of the truck to prevent inadvertent movement of the trailer while loading hazardous waste materials.
6. Using two people, carefully place one (1) drum onto pallet jack and record weight on log (EMS-343).
7. Using two people, carefully, lift the weighed drum up and load into the trailer.
8. Follow sequence #6 and #7 until the permitted amount of hazardous waste to be treated has been achieved.
9. Using calculator, subtract 18 pounds which is the tare weight of the empty drum, from the total weight of the drum on the scale to achieve the permitted amount of hazardous waste to be treated at the OB Unit.
10. The amount from the calculations of #9 is the treated amount to be entered on Form EMS-324 "E6-1 Daily Open Burning Log".
11. Close and secure the trailer door.

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 333 COLLECTION OF HAZARDOUS WASTE</b>

12. Release the parking brake of the truck after loading hazardous waste and prior to movement of the vehicle and trailer.
13. Verify that the transport vehicle and trailer has the proper placards displayed.
14. Transport the waste pyrotechnic materials to the Hazardous Waste OB Unit in accordance with work instruction EMS-334.

**D. Storage of Arming Fuse for the Burn Pans**

1. The roll of fuse from the manufacture is to be kept in the secured room at the Proving Ground Test Tunnel.
2. Waste Operators will check a key out from the Guard shack at the front entrance for the secure room. They will go and cut NO MORE than 20 lengths of fuse at a time needed to arm the burn pans.
3. The cut lengths will be rolled into an approximately six (6) inch loop and placed in a metal storage container (i.e. – metal ammo can, steel storage box, etc.) in either the office located at the Test Tunnel or the bed of the pickup truck used for hauling hazardous waste.

**AT NO TIME IS THE ARMING FUSE TO BE STORED OR TRANSPORTED IN THE CAB OF THE PICKUP TRUCK.**

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 333 COLLECTION OF HAZARDOUS WASTE</b>

**TRAINING VERIFICATION FORM**

**Instruction given by:** _____  
*Print Name* *Instructor*

**Signature**

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

<b>Clock Number</b>	<b>Employee Name (Print/type)</b>	<b>Employee Signature</b>	<b>Date Training was Completed</b>

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

<b>Level III – Work Instructions</b>		
<b>Procedure: TRANSPORTING AND TREATMENT OF HAZARDOUS WASTE</b>		
<b>Document ID: EMS- 334</b>	<b>Revision:</b>	<b>Revision Date: 04/01/2014</b>

**I. Purpose**

To establish instructions for the transporting and treatment of hazardous waste in a safe and environmentally sound manner.

**II. Personnel Affected**

Hazardous Waste Technicians

**III. Associated Documents**

- Level IV Form – EPA 8700-22 Uniform Hazardous Waste Manifest
- Level IV Form – 5006 Kilgore Daily Vehicle Check
- Level IV Form – EMS-304 Heat Gun Log
- Level IV Form – EMS-326 Fuse Burn Rate Log
- Level IV Form – DD Form 626 Motor Vehicle Inspection (Transporting Hazardous Materials)

- MSDS #178 - Magnesium
- MSDS #177 - Barium
- MSDS #176 - Lead
- MSDS #235 - Ammonia Perchlorate

**IV. Safety Requirements**

- A. Operator must wear safety glasses with side shields
- B. Operator must wear safety boots
- C. Operator must wear flame retardant (nomex) coveralls
- D. Operator must wear 90% minimum cotton clothing
- E. Operator must wear approved gloves.

**V. Equipment**

- Two-way radio
- Hazardous Waste Truck
- Emergency Equipment (loaded on Hazardous Waste truck) containing:
  - Portable Fire Extinguisher
  - Portable Water Back Packs
  - First Aid Kit
  - Fire Blankets
  - Non-Sparking Shovels
  - Non-Sparking Rakes
  - Heat Gun

**VI. ENVIRONMENTAL COMPLIANCE & SAFETY REQUIREMENTS**

- A. Designated personnel of the Hazardous Waste Technicians will have a valid Tennessee Commercial Drivers License (CDL) with a Hazardous Material Endorsement, up to date medical card, and certification.
- B. All cleaning of the HWOBA, loading and unloading activities associated with Hazardous Waste Treatment will be attended by two personnel.
- C. No Open Burning activity is to occur if the wind exceeds 20 MPH or during adverse weather conditions.
- D. Open burning can only occur between 9:00 a.m. to 2:00 p.m.
- E. Maximum of twelve (12) steel drums/trailer load not to exceed 1,500 pounds.
- F. The fuse burn rate is verified prior to use and is logged daily by timing the burning of a one (1) foot section. (If there is inclement weather please record on that date that there was no burn.)
- G. Burn Pans are to be assigned based on prior day(s) burning activities maintaining a 100 foot distance between burns.
- H. Never approach a burn pan that has had OB initiated within 72 hours of open burning, unless a misfire has occurred.
- I. No maintenance or ash removal is to be performed on a burn pan for 72 hours after start of treatment process.
- J. Grass fires could start from hot embers from the open burn process. These fires are to be extinguished only after it is judged by the Hazardous Waste Technicians, Environmental Manager or Safety Department that there is sufficient distance between the burn area and the grass fire so as not to put the technicians in danger.

**IV. Procedure**

**Transporting Hazardous Waste from Main Plant to HWOBA**

**Verifications:**

- 1. The Uniform Hazardous Waste Manifest EPA Form 8700-22 has been completed, signed by authorized person, and is available in the vehicle. Manifests will be filled out in accordance to each material to be transported as follows:

Scrap Pyrotechnic Compositions:

D001, D003

Waste Substances Explosives N.O.S. (Magnesium Composition)

**Level III – Work Instructions**

**Procedure: EMS – 334 TRANSPORTING AND TREATMENT OF HAZARDOUS WASTE**

1.4C UN 0479 PGII

Scrap Lead Composition

D001, D003, D008

Waste Substances Explosives, N.O.S (Lead Composition)

1.4C UN 0479 PG II

Scrap Barium Composition

D001, D003, D005

Waste Substances Explosives, N.O.S (Barium Magnesium Composition)

1.4C UN 0479 PG II

Scrap Ammonium Perchlorate Composition

D001, D003

Waste Ammonium Perchlorate

5.1 UN1442 PG II

2. The Daily vehicle Inspection DD626 and Form 5006 has been completed, and is available in the vehicle.
3. The proper placards are displayed for the hazardous material being transported:
  - 1.4C - Explosives
  - 4.1- Flammable Solid
  - 5.1 -Oxidizer
4. The vehicle headlights are on.

**Designated Route**

1. The vehicle transporting hazardous materials will leave the plant via the main gate and proceed to Kilgore Drive. Turn right onto Kilgore Drive and travel approximately 0.2 miles to State Route 138. Turn left onto State Route 138 and travel approximately 0.1 miles to Keller Street. Turn right onto Keller Street and travel 0.3 miles to Tyson Road. Turn left onto Tyson Road and travel approximately 0.5 miles to Keller Road. Turn left onto Keller Road and travel approximately 0.6 miles to the entrance of the HWOBA.
2. Upon arrival at the first gate off Keller road unlock and open the gate.
3. Proceed down the entrance road approximately 0.3 miles to the HWOBA gate.
4. If no activity is noted unlock the gate and enter the HWOBA.

**CAUTION: VISUALLY OBSERVE THE BURN PAN AND ADJACENT AREAS FOR ANY SIGNS OF THERMAL ACTIVITY. IF ACTIVITIES ARE OBSERVED, DO NOT ENTER THE HWOBA AND REMAIN IN THE OBSERVATION AREA. CONTACT THE SAFETY OFFICER ON THE RADIO**

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 334 TRANSPORTING AND TREATMENT OF HAZARDOUS WASTE</b>

### **Heat Gun Check**

1. Using a heat gun, standing back at a safe distance, collect readings on the material surface (ash) using a grid system technique.
2. If temperatures are normal throughout the surface, take a safe item (i.e. aluminum long handle shovel), to break the surface ensuring that personnel are standing back at a safe distance. Do not use any human body part (i.e. hand) at any time to check for heat. Normal for this material is anything less than 100 degrees F.
3. Obtain heat gun readings again to ensure the below surface materials are within normal limits.
4. Record all heat gun readings on form EMS-304. (If there is inclement weather record on that date that there was no burn.)
5. Notify the Environmental Manager or designee if there are no safe burn pans available for use.

### **Open Burning Treatment D001/D003 and D005/D008 Wastes**

#### **Verifications**

1. Perform two-way radio communications check with security or use cell phone if no radio contact.
2. The HWOBA daily check has been completed and any noted deficiencies have been corrected prior to starting a Hazardous Waste Treatment Activity.
3. Fuse burn rate has been checked.
4. Burn pan designed for this burn is clean and a minimum of 100 feet from previous burn.
5. No transits are in the HWOBA.
6. No cattle are within 100 feet of the HWOBA perimeter fence.

#### **Unload Hazardous Waste**

1. Upon completion of verifications drive transport vehicle to unload area.
2. Back trailer to unload position.
3. Apply parking brake of the truck prior to unloading any hazardous waste to prevent inadvertent movement of trailer while unloading.

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 334 TRANSPORTING AND TREATMENT OF HAZARDOUS WASTE</b>

**NOTE: TOUCH GROUND ROD NEAR PITS BEFORE REMOVING DRUMS FROM TRAILER**

4. Remove anti-static bags from drum and place into burn tray.
5. Remove parking brake.
6. Move vehicle a minimum of 50 feet from burn pan.
7. Distribute waste evenly over pan area.
8. Verify that no material has been spilled outside of the burn pan during the loading process. Any spilled material is to be cleaned up and placed into the burn pan.

**Arming the burn tray**

1. One member of the Hazardous Waste Technicians is to stay a safe distance in a running truck, approximately 50 feet away, from the burn tray to summon help should it be required.
2. The other member is to arm the burn tray by putting knots in fuse (minimum of three) to prevent excessive burning speed of fuse; wrapping the fuse cord around scrap paper and securing it in place. After wrapping the fuse, place the fuse into the layer of material in the burn pan; place a minimum of 8 feet of fuse cord over the burn tray and under a minimum of two objects to prevent fuse from coiling up to the burn tray after ignition. Using a lighter ignite the fuse and quickly depart the Hazardous Waste Treatment area.
3. Notify Security by two-way radio or cell phone that the burn tray has been lit.
4. Technicians are to view the Hazardous Waste Treatment from the designated observation area for a minimum of thirty (30) minutes.
5. Seventy Two-two (72) hours after the treatment cycle was initiated the Hazardous Waste Technicians will visually observe the burn pan for evidence of incomplete treatment.
6. If an incomplete treatment is found and the burn pan and ashes are cool, the Hazardous Waste Technicians will apply additional #2 diesel fuel to the waste and the arming and ignition procedures are repeated.

**Emergency Safety Requirements**

1. After pit is lit, if truck engine fails the two hazardous waste technicians are to evacuate the truck and exit by foot.
2. If one technician is injured after fuse is lit, then the other technician needs to remove fuse from burn trays and extinguish and then assist other technician.



<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 334 TRANSPORTING AND TREATMENT OF HAZARDOUS WASTE</b>

### **Misfires**

1. The Hazardous Waste Technicians will notify the Environmental Manager or designee by way of the two-way radio or cell phone that a misfire has occurred.
2. When a misfire occurs the operators will attempt to rearm the pan during the next day's burn **ONLY** after heat checks have been performed on the adjacent pans and it is deemed safe to rearm the misfire pan. The pan will be rearmed **ONLY** after all adjacent pans are deemed safe.

### **Removing Ash from Burn Trays for D001/D003**

1. After the 72-hour treatment cycle is complete, the Hazardous Waste Technicians will clean the burn trays using non-sparking conductive shovels and rakes removing the ash from the trays and placing them into DOT approved steel containers.
2. Hazardous Waste Technicians will load ash-laden drums and transport to the designated Class 1 landfill.
3. Hazardous Waste Technicians will load lead ash drum and transport to designated HWAA for offsite disposal.

### **Removing Ash from Burn Trays for D005/D008**

**NOTE: Open Burning removes D001/D003 characteristics of the hazardous waste.**

1. After the 72-hour treatment cycle is complete, the Hazardous Waste Technicians will clean the burn pans using non-sparking conductive shovels and rakes removing the ash from the pans and placing them into DOT approved steel containers.
2. Using a Uniform Shipping Manifest, the D005/D008 waste will be shipped to an approved hazardous waste facility per local, state, and federal regulations.

### **Environmental Manager or Designee**

1. Monitor activities of the Hazardous Waste Technicians to ensure compliance with facility requirements and state permits. Provide immediate corrective action as required on any deficiencies noted.
2. Perform ash sampling of the HWOBA annually or when a process change occurs.
3. The Environmental Manager will complete the Land Disposal Requirements Letter to EPA Region IV Administrator with a copy to local TDEC Solid Waste Specialist on an annual basis.

Level III – Work Instructions

Procedure: EMS – 334 TRANSPORTING AND TREATMENT OF HAZARDOUS WASTE

### TRAINING VERIFICATION FORM

Instruction given by: _____

*Print Name*

*Instructor*

*Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

**Appendix F-3**  
**Well Inspection Plan**

**KILGORE FLARES COMPANY, LLC  
WELL INSPECTION AND MAINTENANCE PLAN  
MISCELLANEOUS UNIT TREATMENT FACILITY**

Prepared for:



**Kilgore Flares Company, LLC  
Toone, Tennessee 38381**

and



**Tennessee Department of Environment and Conservation  
Division of Solid Waste Management  
William R. Snodgrass Tennessee Tower  
312 Rosa L. Parks Avenue  
14th Floor  
Nashville, Tennessee 37243**

Prepared by:



**EnSafe Inc.  
5724 Summer Trees Drive  
Memphis, Tennessee 38134  
(901) 372-7962  
[www.ensafe.com](http://www.ensafe.com)**

Revision: 0

September 2014

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**Attachments**

Attachment A Well Inspection Check List



## **1.0 INTRODUCTION**

This Well Inspection and Maintenance Plan (Plan) has been developed to support the long-term groundwater monitoring proposed in the April 2014 Part B Permit for the hazardous waste open burning area (HWOBA) at the Kilgore Flares, LLC (Kilgore) facility in Toone, Tennessee. The facility is regulated under the Resource Conservation and Recovery Act (RCRA), and a RCRA Facility Investigation (RFI) has been completed for the Solid Waste Management Units present. Information and data from the RFIs have been used to develop a Groundwater Detection and Compliance Monitoring Plan (Groundwater Monitoring Plan) for long-term groundwater monitoring, required as part of the monitoring of open burning operations at the HWOBA. Details of the Groundwater Monitoring Plan have been presented in the proposed 2014 Part B Permit Application (Revision 8, April 2014) made to the Tennessee Department of Environment and Conservation (TDEC). The objective of the Groundwater Monitoring Plan is to establish baseline groundwater conditions and monitor for potential future significant releases associated with treatment operations that cross a groundwater compliance point at the regulated HWOBA. The Groundwater Monitoring Plan follows a detection and compliance monitoring program specified under 40 CFR 264.91 and 270.14(c), and THWMR 0400-12-.07(c). As part of this Groundwater Monitoring Plan, four existing monitoring wells will form the downgradient point of compliance and two new wells will be installed to establish an upgradient background monitoring area, in accordance with in 40 CFR 264.97 and THWMR 0400-12-01-.06(f) and (h).

## **2.0 WELL INSPECTION AND MAINTENANCE PLAN**

Pursuant to 40 CFR 264.97 (c) and THWMR 0400-12-.06(h)3, the integrity of each of the monitoring wells included in the Groundwater Monitoring Plan must be maintained during the monitoring period. Well integrity is crucial in ensuring that representative samples are collected. To that end, this Plan combines a regular assessment of each well's physical condition, selected geochemical trends, and groundwater production performance history to identify physical and chemical-related problems with the well that could affect well integrity and the collection of representative samples.

### **2.1 Well Inspections**

A key component of maintaining the wells in good condition is conducting regular inspections of the physical condition of each well to determine whether repairs need to be made to maintain well integrity. As proposed here, inspections will be made of each well during every sampling event during the monitoring period. The inspections will be conducted by the well samplers. The results of each inspection will be documented in a Monitoring Well Inspection Checklist (Attachment A of this Plan).

## **2.2 Physical and Chemical Properties**

Simple physical and chemical monitoring of the groundwater can frequently detect changes in the groundwater environment that can indicate the formation of precipitates and encrustations in the well screen, and/or bio-fouling related to bacterial growth along the well screen. These conditions can affect sample quality and degrade well performance (Smith 1995; ASTM 2005). Key parameters that can help detect changes include:

- Hydrogen-ion concentration (pH)
- Dissolved oxygen (DO)
- Specific conductance
- Turbidity
- Redox potential (Eh)
- Total organic carbon (TOC)
- Iron (Fe)
- Manganese (Mn)
- Sulfur (S)
- Sulfate (SO₄)

Some of these parameters (pH, DO, specific conductance, and turbidity) are already scheduled to be measured during groundwater sampling to determine well stability prior to sampling. These scheduled parameters will be evaluated after each sampling event. Where significant changes are noted, the parameters Eh, TOC, Fe, Mn, S, and SO₄ may be added to the sampling program. For example, Eh is very important to the make-up of the micro-flora in the well and aquifer, and can indicate the fate of Fe, Mn, and S, which produce mineral precipitates. Total organic carbon is a good indicator of bio-fouling potential. Particle counting and turbidity are significant in denoting the origin of minerals and/or precipitates. Increases in turbidity and particle counts can be used to evaluate suspended solids content that may result from silting or bio-fouling.

## **2.3 Well Performance**

During routine groundwater sampling activities, flow rates and recovered volumes of groundwater are logged in the field sampling notes for each well. These rates and volumes will be compared from event to event to look for production changes indicating reduced flow and performance in the well. This comparison will be assessed along with the other physical-chemical data as another potential indicator of well screen obstructions that may develop over time.

### **3.0 WELL MAINTENANCE AND REHABILITATION**

Well maintenance and rehabilitation will be performed as necessary on the site wells once indicator parameters and evaluations discussed previously clearly show that well performance is declining in a well. Chemical and physical problems can be encountered in monitoring wells during long-term monitoring, as wells are often left idle for long periods between sampling events. It is also very important that any methods of well rehabilitation and maintenance employed should not alter the groundwater chemistry being monitored.

Methods to rehabilitate a monitoring well can include pumping, surging, and redevelopment to remove fine-grained sediments and other materials that may be clogging the well screen. In severe cases of bio-fouling, chemical rehabilitation may be necessary to improve flow and well performance. Any method employed will be discussed with TDEC prior to the work.

### **4.0 REFERENCES**

American Society for Testing and Materials. 2005. *ASTM D 5978, Standard Guide for Maintenance and Rehabilitation of Ground Water Monitoring Wells*, American Society for Testing and Materials International, West Conshohocken, Pennsylvania.

Smith, S. A. 1995. *Monitoring and Remediation Wells: Problem Prevention, Maintenance, and Rehabilitation*, CRC Press.



**Attachment A**  
**Well Inspection Checklist**

**Monitoring Well  
Inspection Check List**

**Site/Project:**

**Job Number:**

**Well ID:**

**Date Of Inspection:**

**Inspected By:**

**Original Well Depth:**

**Measured Well Depth:**

**Depth To Water:**

Inspection Item	Yes	No	N/A	Comment
Well is visible and easy to locate.				
Area around the well is cleared, easily accessible, safe for foot traffic, and free of brush and debris. There are no signs of unusual staining, odors, or dead vegetation around the well that was not present during the previous inspection.				
Well pad is in good condition, there are no cracks or sign of deterioration in the concrete, and the concrete is tight around the well head and cover with no gaps or separation.				
Well cover is in place and secured tightly. All bolts, spacers and washers are in place and in good condition.				
Well cover is in good condition, and there is no corrosion, holes or cracks visible on the cover.				
An O-ring or gasket is seated under the cover properly.				
Well has a clearly visible well number designation (on the cover, on a plate under the cover, painted on the pad or scribed into the concrete).				
Standing water is present beneath the well cover.				
There is an adequate gap between the top of capped well and the well cover.				
The well cap is firmly affixed to the well pipe, is in good condition and free of cracking or corrosion.				
A lock is affixed to the well cap, is locked, free of corrosion and in good condition.				
The top of the well casing has a clear mark or notch to indicate where the water level should be measured.				
Well casing is in good condition and free of cracks.				
The grout-concrete around the well casing is in good condition, there is no gap between the well pipe and grout.				
Well is clear and free of obstructions to total depth.				

**Monitoring Well  
Inspection Check List**

**Site/Project:**

**Job Number:**

**Well ID:**

**Date Of Inspection:**

**Inspected By:**

**Original Well Depth:**

**Measured Well Depth:**

**Depth To Water:**

Inspection Item	Yes	No	N/A	Comment
The bottom of the well is "hard" with no indications of soft sediment.				
All equipment used to sound the well and measure the groundwater level was clean and decontaminated prior to use				
The well requires repair or rehabilitation to improve flow.				

**CONTINGENCY PLAN OPEN BURN AREA (HWOBA)**

**Keller Drive, Toone, Tennessee**

**Prepared by**

**Kilgore Flares Company, LLC**

**155 Kilgore Drive**

**Toone, Tennessee 38381**

**Revision Date: May 26, 2015**

Kilgore Flares Co., LLC — Proprietary Information

Approved By: Richard Saut 5/26/15

Richard Saut, Environmental Manager

Approved By: Ron Kunkle

Ron Kunkle

HSE Vice President

Approved By: Chuck Stout

Chuck Stout,

Vice President of Operations/General Manager

**IN THE EVENT OF AN EMERGENCY AND THIS PLAN IS ACTIVATED, PLEASE PROCEED TO SECTIONS 5, 6, AND 7 OF THIS PLAN FOR YOUR IMMEDIATE ACTION ITEMS.**

**FACILITY ADDRESS AND TELEPHONE:**

Facility Name: Kilgore Hazardous Waste Open Burn Area

Address: Keller Road¹  
Toone, Tennessee 38381

Telephone: (731) 658-5231

County: Hardeman

**1. Purpose and Scope of Plan**

This Contingency Plan sets forth the actions and responses to be taken in connection with any emergency, incident, or release at the Hazardous Waste Open Burn Area (HWOBA) involving or relating to the generation, handling, and treatment (by open burning) of hazardous waste. This plan is to be distinguished from the Kilgore Flares Company, LLC (Kilgore), International Organization for Standardization Emergency Preparedness and Response Plan and Emergency Action Plan developed for purposes of employee and community safety to satisfy Occupational Safety and Health Act (OSHA)/Tennessee OSHA obligations.

The HWOBA is designed, constructed, maintained, and operated in a manner that minimizes the possibility for emergency incidents associated with hazardous waste, such as fire, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water. This plan is designed to further minimize potential hazards to human health and the environment in the unlikely event of such hazardous waste incidents.

This plan is reviewed annually and amended whenever changes occur that will significantly affect Kilgore's ability to respond to an emergency situation involving hazardous waste at the HWOBA. Potential changes include revision of the Resource Conservation and Recovery Act (RCRA) regulations, if the plan fails in an emergency, if the HWOBA changes in a way that materially increases the potential for an emergency, changes in the response necessary in a hazardous waste emergency, or if the list of emergency coordinators changes.

---

¹ This facility does not have a street number. Refer to the attached map for location.

### **AUTHORITY**

The following statutes provide the regulatory framework for management of hazardous waste at Kilgore.

- RCRA Subtitle C — (regulations found in 40 Code of Federal Regulations [CFR] parts 124, 260 through 266, 268, and 270 through 273, and 279);
- Comprehensive Environmental Response, Compensation and Liability Act — (regulations found in 40 CFR parts 260, 300, 302, 311, 355, and 370);
- OSHA — (regulations found in 29 CFR parts 1910.120 and 1910.1200);
- Federal Statutory Authority — (42 United States Code 6901 to 6992);
- Transportation Requirements — (regulations found in 49 CFR parts 170 and 171);
- Tennessee Regulatory Authority — (Tennessee Code Annotated Section 0400-12-01.11);  
and
- Tennessee Statutory Authority — (Tennessee Code Annotated Section 68-212-101, et seq.)

## **2. Overview of Facility Operations and Processes Generating Wastes**

Kilgore manufactures pyrotechnic devices such as distress flares and smokes, location markers, and illuminating rounds for the U.S. Department of Defense and commercial users. The main plant generates waste pyrotechnics from routine production processes and handling of materials that are designated as hazardous waste due to their ignitable, reactive, or toxicity characteristics. Diesel fuel is used as a stabilizing agent while handling these wastes. Hazardous waste is transported to the HWOBA by the hazardous waste technicians (from the main plant through Toone) on the day of the treatment operation. Trained hazardous waste technicians perform all treatment activities and, along with the Environmental Manager, have sole authority for conducting all such activities at Kilgore's HWOBA.

## **Quality Assurance/Quality Control Test Debris**

Waste generated from Quality Assurance/Quality Control testing at the Kilgore Test and Treatment Facility, which is part of the same approximately 240-acre parcel that includes the HWOBA, includes

shredded nylon material, aluminum pusher plugs, and brass casings released from projectile testing.

### Miscellaneous Refuse

Production refuse such as containers, rags, pallets, etc., that have come in contact with reactive materials and have the potential to retain pyrotechnic residue are also periodically burned with waste pyrotechnics at the HWOBA. Treating the hazardous waste pyrotechnics described above in the HWOBA generates ash and residue, described in Table 2-1. Previous characterization of the ash and residue, performed in accordance with 40 CFR 261 and Tennessee Hazardous Waste Management Rule 0400-12-01-.02, indicates that magnesium ash and residue does not meet the definition of hazardous waste, as open burning treats the waste so that it is no longer reactive or ignitable.

**Table 2-1  
Hazardous Waste Generated at Main Production Plant and Currently Thermally Treated at the HWOBA  
Kilgore Flares Company, LLC — Part B Permit Application**

<b>TN Waste Stream Number</b>	<b>Waste Stream</b>	<b>Hazardous Waste Codes</b>	<b>HWOBA Waste Types</b>	<b>Chemical Composition/Constituents of Hazardous Waste</b>	<b>Waste Degradation Product</b>
1	Scrap Pyrotechnic Composition	D001, D003, D007	Magnesium/ Teflon Flare Waste	Magnesium, Chromium, Teflon, Viton, Sodium Nitrate, Laminac, Lupersol, Boron Potassium Nitrate, and Hycar Rubber	Magnesium Ash
27	Residual Acetone-Contaminated Rags	F003 (Ignitable)	Acetone Rags	Acetone	Ash
31	Scrap Barium Composition	D001, D003, D005	Barium/ Magnesium Waste	Barium Peroxide, Magnesium Powder, Potassium Nitrate, Cesium Nitrate, Silicon, Hexamine, Boron, Lactose, Boron Potassium Nitrate, and Wood Charcoal	Barium Ash
32	Scrap Lead Composition	D001, D003, D008	Silicone/Lead Oxide/Cupric Oxide Flare Waste	Lead, Water, Silicone, and Cupric Oxide	Lead Ash
45	Scrap Ammonium Perchlorate Composition	D001, D003	Ammonium Perchlorate Propellant Waste	Aluminum, Ammonium Perchlorate, Boron, Diisocyanate, GAP Hexamethylene, HMX, HTPB Lactose, Magnesium, RDX, Potassium Perchlorate, RTV, Trioxide, Bismuth, and Teflon	Ash

### 3. Emergency Event and Plan Activation

The following is a list of possible incidents that may constitute an emergency event and activation of this Contingency Plan.

- Fire or explosion
  - Fire causes release of toxic fumes
  - Fire spreads beyond area of ignition

- Fire threatens offsite areas
  - Fire-fighting agents result in contaminated runoff
  - Explosion
  - Imminent threat of an explosion
- Spills or leaks
    - Fire hazard exists due to spilled material
    - Toxic fume hazard exists
    - Groundwater may be threatened
    - Spill threatens offsite property
    - Spill threatens navigable water

**IN THE EVENT OF AN EMERGENCY AND THIS PLAN IS ACTIVATED, PLEASE PROCEED TO SECTIONS 5, 6, AND 7 OF THIS PLAN FOR YOUR IMMEDIATE ACTION ITEMS.**

#### **4. Emergency Response Coordinator**

At all times, there must be at least one employee either at the main plant or on-call to respond to an emergency involving hazardous waste by coordinating all emergency response measures. The Emergency Response Coordinator (or Alternate Emergency Response Coordinator²) has full authority to commit resources needed to respond to emergencies at this facility and to direct other trained employees to assist in the implementation of this Contingency Plan. The President of Kilgore has delegated this authority to the Emergency Response Coordinator to commit resources to incidents affecting or involving hazardous waste.

The Security Officer is responsible for receiving all initial hazardous waste emergency reports through Kilgore's emergency response telephone number and/or two-way radio. Kilgore's internal emergency response telephone number (333) and two-way radio operate 24 hours a day and initiate the internal notification procedure.

All Kilgore employees listed below work at the main plant during operating hours of the HWOBA and can reach the HWOBA within 10 minutes. The Emergency Response Coordinator can reach the HWOBA after work hours within a short period of time. The Emergency Response Coordinator can be contacted 24 hours a day via cellular phones provided by Kilgore. A list of emergency response coordinators is included in Table 4-1.

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² For the purposes of this Contingency Plan, the Alternate Emergency Response Coordinator has the same authority as the Emergency Response Coordinator, and all references to the Emergency Response Coordinator also refers to an alternate coordinator.



**Table 4-1  
Contact Information For the Emergency Response Coordinator  
And Other Emergency Response Personnel**

<b>Name</b>	<b>Home Address</b>	<b>Cell Telephone</b>	<b>Kilgore Telephone</b>
Richard Saut Environmental Manager <b>Emergency Response Coordinator</b>	45 Mulberry Cove Oakland, TN 38060	(731) 267-9298	731-228-5240
Ron Kunkle HSE Vice President <b>Alternate Emergency Response Coordinator</b>	41 Castlegate Drive Jackson, TN 38019	731-217-1167 (cell)	731-228-5331 731-217-1167 (cell)
Kim McFarland Security Officer	655 Pleasant Springs Road Henderson, TN 38340	731-217-2617 (cell)	731-228-5372 731-217-2617 (cell)
Nurse	Not Available	731-645-9835	731-228-5255

A list of the available emergency equipment, locations, and capabilities is included in Table 4-2.

**Table 4-2  
Emergency Equipment**

<b>Type</b>	<b>Size</b>	<b>Quantity</b>	<b>Location</b>
Fire Extinguisher	10 pounds	1	Hazardous Waste Truck
First Aid Kits	Not Applicable	1	Hazardous Waste Truck
Shovels (non-sparking)	Not Applicable	2	Hazardous Waste Truck
Fire Blanket	Approximately 4-foot by 8-foot	1	Hazardous Waste Truck
First Aid Kit	Not Applicable	1	Nurse's Office (Main Plant)
Oxygen Tank	Not Applicable	1	Nurse's Office (Main Plant)
Automatic Electronic Defibrillator-AED	Not Applicable	1	Nurse's Office (Main Plant)
Backboard	Not Applicable	1	Nurse's Office (Main Plant)
Cervical Collars	Not Applicable	Varies	Nurse's Office (Main Plant)
Splints	Not Applicable	Varies	Nurse's Office (Main Plant)

In the event of a fire, explosion, or spill of hazardous waste, the persons responsible or familiar with the incident or hazardous waste shall follow the facility Emergency Action Plan and any necessary release notification procedures in Section 6 of this Contingency Plan. This notification procedure will automatically serve to inform the Emergency Response Coordinator of the emergency. The Emergency Response Coordinator will be responsible for ensuring the Hardeman County Emergency Management Department representatives and all other necessary response organizations are properly notified.

For offsite emergencies involving hazardous waste pyrotechnics, such as transportation incidents from the main plant to the HWOBA, the initial Emergency Response Coordinator may be someone other than a Kilgore employee, until the Kilgore Emergency Response Coordinator arrives on the scene. At such time, consistent with the facility Emergency Action Plan, the Kilgore Emergency

Response Coordinator will assume the responsibility for the response activity. Assigning these ultimate emergencies to the Kilgore Emergency Response Coordinator ensures coordination by someone familiar with the contents of the Part B Permit Application, capable of rallying the necessary resources, cognizant of and having the ability to apply the appropriate regulations, and familiar with the properties of the waste. The Kilgore Emergency Response Coordinator will work closely with the applicable regulatory authorities to provide a cohesive and functional incident command structure that is commensurate to the emergency situation involving hazardous waste

All hazardous waste emergency response personnel receive training in the proper handling and storage of waste pyrotechnics as it applies to their tasks, according to 29 CFR 1910.120, and Section H of the Part B Permit Application. This training provides each individual with the knowledge required to determine the hazard state, if present, of hazardous waste pyrotechnics when managing in accordance with the HWOBA Part B Permit.

Kilgore requires annual training for all individuals involved in hazardous waste pyrotechnic treatment operations. Those individuals not receiving training in an area of hazardous waste pyrotechnic treatment are prohibited from participating until they attend and pass the requisite training requirement.

The following details responsibilities for emergency response activities associated with handling, transporting, and treating hazardous waste at the HWOBA.

## **5. Emergency Procedures and Responsibilities**

### **Hazardous Waste Technicians**

If hazardous waste pyrotechnic is released (leak, spill, fire, etc.), during accumulation, loading, transport, unloading, or treatment, the following procedures must be initiated by the hazardous waste technicians responsible for the pyrotechnic at the time of the release:

- Locate injured personnel, if any, and direct the Security Officer to notify the local hospital to mobilize ambulances and medical personnel, and notify the Emergency Response Coordinator.
- Await additional instructions from the Emergency Response Coordinator.
- Upon approval by the Environmental Manager, implement EMS-352, Emergency Removal Operations Procedure (Appendix 1).

### **Emergency Response Coordinator**

The Emergency Response Coordinator has full authority to commit resources needed to respond to hazardous waste emergencies at the HWOBA and to direct other trained employees to assist in the implementation of this Contingency Plan. The Emergency Response Coordinator shall be responsible for the following emergency, remediation, and administrative activities.

#### ***Emergency Activities***

- Be onsite or on-call at all times to direct and coordinate all on-scene emergency response activities.
- Be thoroughly familiar with this Contingency Plan, the operations and activities occurring at this facility, the physical layout of this facility, the location and characteristics of wastes managed and treated onsite, and the location of all records necessary to implement this plan.
- Determine if you have any injured personnel; if so, direct the Security Officer to notify the Hardeman County Emergency Services.
- In an imminent or actual emergency involving hazardous waste, immediately activate internal facility communications systems to alert facility personnel of the emergency.
- If appropriate, immediately notify spill response contractor(s) with response roles as identified in Section 6 of this Contingency Plan.
- Immediately identify the biological, chemical, and physical properties of any released material, the source of the release, the amount released, and the aerial extent of the material.
- Immediately assess possible direct and indirect hazards to human health and the environment that may result from the incident involving hazardous waste, and identify threatened environmental resources and receptors.
- Determine if the incident could threaten human health or the environment outside the facility and if evacuation of local areas outside of the facility is required.

- Notify as appropriate federal, state, and local emergency reporting agencies:
  - U.S. Environmental Protection Agency National Response Center (1-800-424-8802)
  - Tennessee Emergency Management Agency (1-800-262-3300)
  - Tennessee Emergency Management Agency — Hardeman County (1-731-658-3266)
  - Tennessee Department of Environment and Conservation (TDEC) — Jackson Environmental Field Office (1-888-891-8332)
    - Reporting must include:
      - Name and telephone number of person reporting incident:
      - Name and address of facility.
      - Time and type of incident.
      - Name and quantity of material(s) involved, to the extent known.
      - Extent of injuries, if any.
      - Possible hazards to human health or environment outside the facility.
  
- Take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread.
  - Establish the objectives and priorities for response to the incident:
    - Determine mitigation actions.
    - Identify resources required for response.
    - Mobilize those resources.
    - Stop processes and operations as necessary.
  - Collect and contain released waste.
  - Remove or isolate waste containers.
  
- If facility operations cease, monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes and other equipment.

### ***Remediation Activities***

- Immediately after an emergency, provide cleanup, treatment, storage and/or disposal of recovered waste, contaminated soil or surface water, and other material that results from the incident by following Work Instruction EMS-352 Emergency Removal Operations Involving Explosives and Hazardous Waste Pyrotechnics (Appendix 1).
  
- Ensure all wastes are managed and disposed of in accordance with federal, state, and local requirements.

- Ensure that no waste incompatible with the released material is processed until cleanup procedures are completed.
- Ensure that all emergency equipment is cleaned and fit for its intended use before operations are resumed.

#### ***Administrative Duties***

- Coordinate with federal, state, and local regulatory agencies to determine that appropriate response actions have been successfully completed and terminate emergency response.
- In addition to the data from the initial report to TDEC, coordinate with federal, state, and local regulatory agencies to document the estimated quantity and disposition of recovered material that resulted from the incident.

#### **6. Coordinated Emergency Services with Off-Site Emergency Responders**

Kilgore maintains a Mutual-Aid Agreement with the Toone Volunteer Fire Department. In addition, Kilgore maintains a Memorandum of Understanding with the following agencies: Jackson-Madison County General Hospital, Hardeman County Sheriff's Department, and Tennessee Emergency Management Agency. A copy of the Mutual Aid Agreements and Memoranda of Understanding are included in Appendix 2.

These agreements exist between Kilgore and the specified entities, and outline the type of emergency services each party will provide the other and the means by which those services are summoned and coordinated in the event of an incident involving hazardous waste. The agreement provides Kilgore and the Town of Toone with additional fire-fighting, security, and emergency response assistance when personnel and fire-fighting equipment are available. This agreement does not mandate assistance, but allows for a legal, non-liable method of providing emergency response assistance to entities in a time of need. If any State or local authorities declined to provide emergency response assistance, this has been documented in the facility operating record and may also be included in Appendix 2.

When there is an imminent or actual emergency situation, the Emergency Response Coordinator will immediately notify facility personnel and appropriate state or local agencies with designated response roles, as needed. The Emergency Response Coordinator, with assistance from all response command units, shall establish work zones around the release site and/or area of concern. The Emergency Response Coordinator or a designated representative shall delineate work

zones with fencing, rope, caution tape, or other less formal means, depending on the severity and threat of the release.

Additional agreements may be completed with regional emergency response cleanup contractors to allow for formal review of the emergency response contractor capabilities and expectations prior to the activation of emergency services. This can also help minimize delays in the emergency response process.

## 7. Evacuation Plan

### General Evacuation Procedures

All personnel in the vicinity of an emergency must be evacuated when toxic fumes or gases are released (or a release is imminent), an initiation has occurred (or is imminent), and/or access for emergency responders must be provided. If the Emergency Response Coordinator determines it is necessary to evacuate non-essential personnel from the site of a hazardous waste pyrotechnic incident, then four methods of communicating evacuation orders/procedures exist:

- Voice or hand signals (incident occurs at the HWOBA unit).
- Public address systems (standard equipment on all emergency vehicles).
- Bullhorns (standard equipment on each fire department emergency vehicle).
- Knocking on individual doors in areas of concern (incident occurs en route to treatment facility).

In each instance, emergency coordination personnel will alert the appropriate people of the reason for the evacuation and the evacuation location, and will contact the necessary resources provided in Table 7-1 for assistance in enacting the evacuation process. Evacuation routes and locations will depend on wind direction and the incident location. A map of the primary and alternate evacuation routes from the HWOBA is included as Figure 7-1. The Emergency Response Coordinator will determine the best evacuation route.

**Table 7-1  
Evacuation Alerting Procedures**

<b>List of Potential Organizations to be Alerted if an Evacuation is Required</b>		<b>Day Phone</b>	<b>24-Hour Phone</b>
KILGORE	Emergency Response Coordinator	(731) 228-5240	(731) 267-9298
	Safety Manager	(731) 228-5225	(731) 609-6368
	Security Officer	(731) 228-5372	(731) 217-2617
LOCAL AUTHORITIES (law enforcement, fire,	Hardeman County Sheriff's Office	(731) 658-3971	(731) 658-3971
	Tennessee Highway Patrol	(731) 688-7474	(731) 688-7474

**Table 7-1  
Evacuation Alerting Procedures**

<b>List of Potential Organizations to be Alerted if an Evacuation is Required</b>	<b>Day Phone</b>	<b>24-Hour Phone</b>
emergency planning, etc.) Town of Toone Volunteer Fire Department	(731) 658-5555	(731) 658-5555
NEARBY INSTITUTIONS Bolivar Community Hospital	(731) 658-3100	(731) 658-3100
(schools, hospitals, etc.) Superintendent of Schools, Hardeman County School Board	(731) 658-2510	(731) 658-2510

**Note:**

The area impacted by the spill will be evacuated for a distance of 250 feet. It is not probable that any spill or leak from a container will require greater evacuation.

**HWOBA Evacuation**

Treatment facility evacuation will require all persons to re-enter the vehicles in which they traveled to the HWOBA and travel upwind of the HWOBA away from air contaminant plumes or emergency situations. Two evacuation routes are available for the HWOBA: one from the north gate, which connects directly the gravel road that provides access from Keller Road; and one from the south gate to a gravel road that parallels the east side of the HWOBA north to the Keller Road gravel access road.

The primary evacuation point for the HWOBA is the North Gate to the gravel road that provides access from Keller Road. The open burning observation area, approximately 200 feet northwest of the HWOBA, was chosen due to its distance, upgradient (to the HWOBA) elevation, and accessibility. The secondary evacuation point for the HWOBA is at the gate entrance to the main plant.

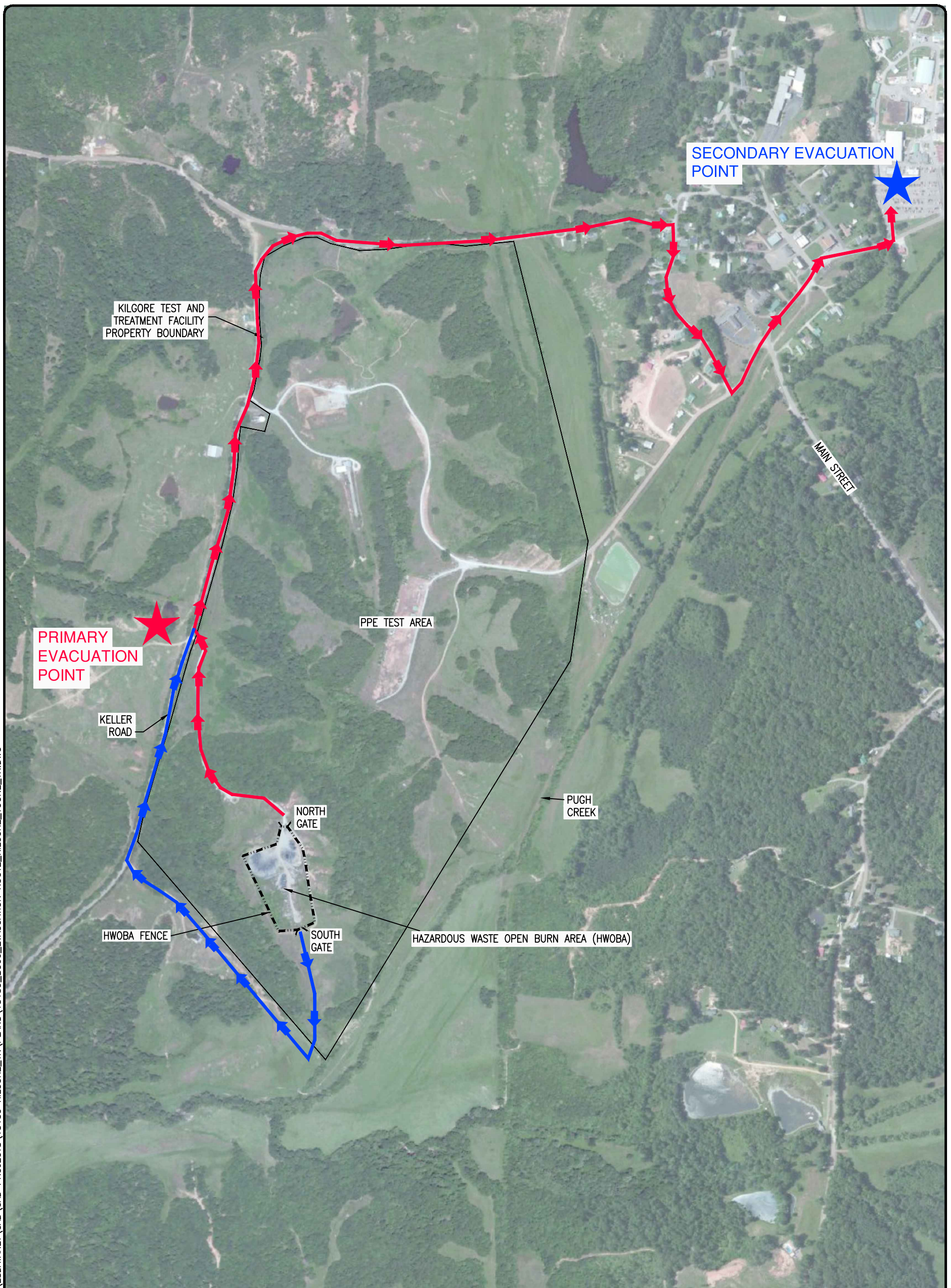
If a more urgent evacuation is necessary (life-threatening injury), a Medevac helicopter is available from the hospital for evacuation of personnel during an emergency incident. The helicopter will land at the Toone Baptist Church or adjoining U.S. Post Office in Toone, Tennessee, approximately 1.5 miles from the HWOBA. Injured personnel will be transported from the HWOBA via vehicles (e.g., ambulance, other emergency vehicle) to that location.

**Town of Toone and County of Hardeman Evacuation**

If the incident occurs in an area outside the HWOBA, evacuation routes will be determined by the Emergency Response Coordinator upon his/her arrival, with assistance from the Hardeman County Emergency Management personnel. Kilgore emergency personnel will assist the Toone and Hardeman County officials with equipment, personnel, and other resources to ensure a safe, timely, and efficient evacuation of civilian personnel from the area of concern.



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World_Imagery - Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

- LEGEND
- PRIMARY EVACUATION ROUTE
  - SECONDARY EVACUATION ROUTE
  - PRIMARY EVACUATION POINT
  - SECONDARY EVACUATION POINT

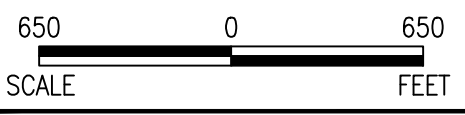
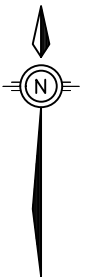


FIGURE 7-1  
HAZARDOUS WASTE OPEN BURN AREA  
EVACUATION ROUTE  
PART B PERMIT APPLICATION  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

REQUESTED BY: J.KNOPF	
DRAWN BY: BRONSON	
DWG DATE: 05/09/15	
DWG NO: 15139_B066	



**Appendix 1**  
**Emergency Removal Operations Procedure**

Level III – Work Instructions		
Procedure: EMERGENCY REMOVAL OPERATIONS INVOLVING EXPLOSIVES AND HAZARDOUS WASTE PYROTECHNICS		
Document ID: EMS- 352	Revision:	Revision Date: 04/01/2014

**I. Purpose**

To establish instructions for emergency removal operations involving hazardous waste pyrotechnics.

**II. Personnel Affected**

Hazardous Waste Technicians  
Environmental  
Safety

**III. Equipment**

Portable Fire Extinguisher  
Portable Water Back Packs  
First Aid Kit  
Fire Blankets  
Non-Sparking Shovels  
Non-Sparking Rakes  
Conductive Containers (i.e. drum lined with velo-stat bag)  
Hand Held Radio  
Scrap Truck and Trailer  
Wheel Chocks  
Diesel Fuel  
Water

**IV. Safety Requirements**

1. Operator must wear safety glasses with side shields
2. Operator must wear safety boots
3. Operator must wear 90% minimum cotton clothing
4. Operator must wear flame retardant coveralls
5. Operator must wear gloves (i.e. cotton, rubber or leather)
6. Operator must wear face shield with apron

**V. Special Requirements**

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 352 EMERGENCY REMOVAL OPERATIONS INVOLVING EXPLOSIVES AND HAZARDOUS WASTE PYROTECHNICS</b>

1. The safe clean-up of accidental spills of waste pyrotechnics will be under the direction of the Environmental Manager and/or the Safety Department
2. The clean-up of a spill must be handled in a safe manner which takes into account the operation being performed when the spill occurred, as well as the specific conditions present.
3. The following procedures are to be followed unless specific conditions dictate otherwise, as determined by the Emergency Coordinator and/or Safety Manger.
4. The designated personnel of the Hazardous Waste Technicians will have an up-to-date medical card and certification.
5. All spill response activities will be attended by the two-person Hazardous Waste Technicians in addition to the Environmental Manager and Safety Manager
6. All spill response attendees will have had the RCRA hazardous waste training before beginning operations.
7. After emergency removal operations, any waste pyrotechnic residual material will be transported and treated in accordance with WI EMS-334 *Transporting and Treatment of Hazardous Waste*.
8. Non-pyrotechnic waste spills will be remediated according to the *Spill Prevention, Control, and Countermeasure Plan*.

## **VI. Procedure**

### **Spill Response procedures for IR/Magnesium Pyrotechnic Compositions**

1. Use a non-sparking conductive rake or shovel to pick up the bulk of the material, if on a hard surface. If the spill occurred on dirt or other soft subsurface, use a non-sparking conductive rake or shovel to dig up the visually impacted surface/subsurface material.
2. Carefully place the material in a conductive container with enough diesel fuel to thoroughly wet the composition.
3. If the spill occurs on dirt or other soft subsurface, the Environmental Manager will collect confirmation samples upon completion of clean-up which will be analyzed for diesel fuel, reactivity, and ignitability. Visual confirmation of adequate remediation of pyrotechnic residuals will also be performed by the Environmental Manager. Results for DRO will be compared to established UST clean-up concentrations of 100 ppm.

### **Spill Response procedures for Red Phosphorous and Compositions containing Red Phosphorous**

1. Use a non-sparking conductive rake or shovel to pick up the bulk of the material, if on a hard surface. If the spill occurred on dirt or other soft subsurface, use a non-sparking conductive rake or shovel to dig up the visually impacted surface/subsurface material.

**Level III – Work Instructions**

**Procedure: EMS – 352 EMERGENCY REMOVAL OPERATIONS INVOLVING EXPLOSIVES AND HAZARDOUS WASTE PYROTECHNICS**

2. Carefully place the material in a conductive container with enough water to thoroughly wet the composition.
3. If the spill occurs on dirt or other soft subsurface, the Environmental Manager will collect confirmation samples upon completion of clean-up to be analyzed for reactivity and ignitability. Visual confirmation of adequate remediation of pyrotechnic residuals will also be performed by the Environmental Manager.

**NOTE:**

**Care must be taken to avoid ramming the non-sparking implements into any hard surface. This would create friction that could ignite the explosive material.**

**Level III – Work Instructions**

**Procedure: EMS – 352 EMERGENCY REMOVAL OPERATIONS INVOLVING EXPLOSIVES AND HAZARDOUS WASTE PYROTECHNICS**

# TRAINING VERIFICATION FORM

Instruction given by: _____  
*Print Name* *Instructor Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel’s comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

**Appendix 2**  
**Copy of Mutual Aid Agreement**



Part of the Chemring Group

**Kilgore Flares Co., LLC**

155 Kilgore Drive Tel 731-228-5240  
Toone, Tennessee 38381 Fax 731-658-4173

**MUTUAL AID AGREEMENT**

**FIRE PROTECTION AND EMERGENCY RESPONSE**

In recognition of the expertise of the parties under this agreement and the need to support the public welfare, the parties will provide the following mutual aid and coordination fire fighting activities:

**Toone Fire Department**

- Advise Kilgore of local community activities related to potential fire fighting support actions and requirements.
- Provide on-site fire fighting support as requested.

**Kilgore Flares Co., LLC**

- Provide safety related training materials in the emergency fire fighting, handling, storage, and transportation of Kilgore pyrotechnic and related energetic material as requested.
- Provide on-site fire protection/emergency response personnel to support community and volunteer fire fighting personnel as requested.

Handwritten signature of William Heinsohn in black ink.

William Heinsohn, President  
Kilgore Flares Co., LLC

Handwritten signature of A.E. Smith in black ink.

A.E. Smith, Mayor  
Toone, Tennessee

Date: 1-15-08

Date: 1-17-08



Part of the Chemring Group

**Kilgore Flares Co., LLC**

155 Kilgore Drive Tel 731-228-5240  
Toone, Tennessee 38381 Fax 731-658-4173

15 January 2008

Jackson-Madison County General Hospital  
708 West Forest Avenue  
Jackson, Tennessee 38301

Re: Memorandum of Understanding  
Emergency Medical Services

To Whom It May Concern:

As required by the Tennessee Department of Environment and Conservation, as part of a RCRA Part B Permit Application, Kilgore is required to obtain a written contractual arrangement from all agencies whose resources Kilgore may rely upon in an emergency situation, including police departments, emergency response teams, and local hospitals.

Kilgore understands that the Jackson-Madison County General Hospital will provide medical services in the event of an emergency. If this Memorandum of Understanding is acceptable, please sign below and return to me at Kilgore. If you should have any questions, please call me at 731.228.5240.

Respectfully submitted,

A handwritten signature in cursive script that reads 'Sherece Williams'.

Sherece Williams  
Environmental/Quality Specialist

Barry Dennis, Administrative Director of Emergency Services  
Name (Print)

A handwritten signature in cursive script that reads 'Barry Dennis'.

Signature

Date: 01/28/2008





Part of the Chemring Group

**Kilgore Flares Co., LLC**

155 Kilgore Drive Tel 731-228-5240  
Toone, Tennessee 38381 Fax 731-658-4173

15 January 2008

Hardeman County Sheriff's Department  
315 East Market Street  
Bolivar, Tennessee 38008

Re: Memorandum of Understanding  
Emergency Medical Services

To Whom It May Concern:

As required by the Tennessee Department of Environment and Conservation, as part of a RCRA Part B Permit Application, Kilgore is required to obtain a written contractual arrangement from all agencies whose resources Kilgore may rely upon in an emergency situation, including police departments, emergency response teams, and local hospitals.

Kilgore understands that the Hardeman County Sheriff's Department will assist in controlling the area in the event of an emergency. If this Memorandum of Understanding is acceptable, please sign below and return to me at Kilgore. If you should have any questions, please call me at 731.228.5240.

Respectfully submitted,

A handwritten signature in cursive script that reads 'Sherece Williams'.

Sherece Williams  
Environmental/Quality Specialist

Tommy A. Code  
Name (Print)

Tommy A. Code Chief Deputy  
Signature

Date: 1-18-2008



Part of the Chemring Group

**Kilgore Flares Co., LLC**

155 Kilgore Drive Tel 731-228-5240  
Toone, Tennessee 38381 Fax 731-658-4173

15 January 2008

Tennessee Emergency Management Association  
Hardeman County EMA  
240 Lake Circle Drive  
Bolivar, Tennessee 38008

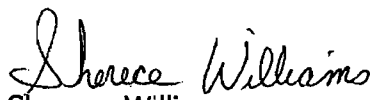
Re: Memorandum of Understanding  
Emergency Services

To Whom It May Concern:

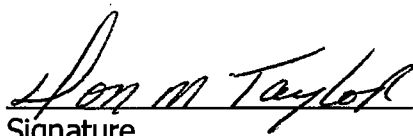
As required by the Tennessee Department of Environment and Conservation, as part of a RCRA Part B Permit Application, Kilgore is required to obtain a written contractual arrangement from all agencies whose resources Kilgore may rely upon in an emergency situation, including police departments, emergency response teams, and local hospitals.

Kilgore understands that the Tennessee Emergency Management Association will provide assistance with respect to spills or releases in the event of an emergency. If this Memorandum of Understanding is acceptable, please sign below and return to me at Kilgore. If you should have any questions, please call me at 731.228.5240.

Respectfully submitted,

  
Sherece Williams  
Environmental/Quality Specialist

Don M Taylor  
Name (Print)

  
Signature

Date: 2-2-08

## **SECTION H PERSONNEL TRAINING**

This section of the Part B Permit Application defines the training program for those involved in the management and treatment of hazardous waste pyrotechnics at the HWOBA as required by 40 CFR 270.14(b)(12) and 264.16, THWMR 0400-12-01-.07(a)1(xii) and 0400-12-01-.06(2)(g), and Occupational Safety and Health Administration (OSHA) regulations at 29 CFR 1910.120 as applicable.

### **H-1 OUTLINE OF TRAINING PROGRAM**

Personnel involved in handling, transporting, or treating hazardous waste at the HWOBA must successfully complete a series of training programs that ensure compliance with WIs and applicable state and federal regulations. Personnel must be trained within six months of the date of their employment with Kilgore, or within six months of their assignment to the HWOBA, and must undergo an annual review of the initial training. The following sections detail introductory and continuing training used to prepare personnel to operate in a safe manner and demonstrate compliance, including:

- Procedures for inspecting HWOBUs at the facility.
- Procedures for loading and unloading hazardous waste.
- Procedures for transporting hazardous waste.
- Procedures for open burning of hazardous waste, including burn initiation and shutdown.
- Procedures for using, inspecting, repairing, and replacing the facility's emergency monitoring and control equipment.
- Communications or alarm systems.
- Safe operating procedures when responding to fires and explosions.
- Response to groundwater and surface water contamination incidents.

- Methods used to minimize the risks from health and safety hazards.
- Selection and use of appropriate PPE.
- Appropriate response to overexposure from health hazards or injury.
- Recognition of symptoms which result from overexposure.
- Emergency/spill response.

An overview of the training content can be found in Section H-1(b).

### **H-1(a) Job Titles and Duties**

Key personnel job descriptions are described in the following sections. Note that one person may hold more than one described position.

## **ENVIRONMENTAL MANAGER**

### **Job Description**

The Environmental Manager at Kilgore is responsible for keeping the facility and its personnel operating in compliance with federal, state, and local environmental regulations. The Environmental Manager reports to the Vice President of Health, Safety and Environment. The hazardous waste technicians report directly to the Environmental Manager.

### **Duties**

- Manage the environmental program.
- Coordinate sampling and testing of any affected lands and waterways to monitor the extent and degree of pollution caused by the incident, including periodic sampling of onsite waterways for background information.
- Ensure that all reports and notifications required by state and federal regulators are accurate and filed in a timely and efficient manner.
- Assess possible hazards to human health and the environment.

- Assist in the supervision and coordination of post-emergency response actions.
- Determine the adequacy of any response efforts, and advise the Emergency Response Coordinator of the scope of any additional cleanup required.
- Ensure proper containerization and labeling of all hazardous waste.
- Maintain official records and photographs documenting the extent of spills and all containment, cleanup, and recovery actions taken and procedures used.
- Maintain a detailed log of events connected with the emergency.
- Coordinate all activities related to hazardous waste management, safety, health, and security.
- Obtain all necessary permits, licenses, and act as a liaison with federal, state, and local environmental regulatory agencies.
- Initiate purchase of emergency equipment, waste handling equipment, and reference materials.
- Acquire analytical tests of wastes and act as a liaison with contract laboratory.
- Conduct classroom training.
- Coordinate HWAAs in accordance with WIs and appropriate regulations and permit conditions.
- Maintain the Contingency Plan and any upgrades or modifications required and review the Contingency Plan after each incident.
- Ensure that all inspections are conducted in accordance with the WIs.
- Prepare or oversee the proper preparation of manifests and hazardous waste reports.

### **Classroom Training Courses**

- 40-Hour Hazardous Waste Operations (HAZWOPER) — initial
- 8-Hour HAZWOPER refresher course (annual)
- Annual RCRA/Emergency Scene Coordinator Training (1- to 2-day course)
- Forklift Safety Training Trained Operator (4 hours)
- U.S. DOT HM-232 Training for Hazmat Employees (4 hours)
- First Aid/Cardiovascular Pulmonary Resuscitation [CPR] (included in First Responder Refresher Training)
- Annual RCRA/Storm Water Training (8-hour)

### **Required Certifications**

The above-mentioned training courses are required for this position.

### **Required Qualifications, Skills, and Prerequisites**

The Environmental Manager must have a thorough knowledge of federal, state, and local regulations, and have at least five years of practical experience in industrial pollution control or related work history.

### **Required Education**

The Environmental Manager must have a four-year Bachelor of Science degree in the field of environmental, safety and health, or other related field; or equivalent experience in lieu of a degree.

## **EMERGENCY RESPONSE COORDINATOR**

### **Job Description**

The Emergency Response Coordinator is responsible for coordinating with state and local emergency response personnel, in the event of emergency incidents for personnel associated with hazardous waste at the HWOBA. During an emergency, the Emergency Response Coordinator

reports to the designated On Scene Commander who will usually be the local or state response commander.

### **Duties**

- Direct and coordinate all on-scene emergency response actions.
- Activate, or authorize the activation, of all or part of the Kilgore emergency response group as required during an incident response.
- Coordinate, with Kilgore's President, all required notifications to federal, state, and local agencies and the news media for hazardous waste incidents.
- Coordinate all required assistance from federal, state, and local response organizations and private contractors for hazardous waste incidents.
- Protect the scene by limiting access.
- Investigate spills and fires to determine causes and prevent reoccurrences.

### **Training Courses**

#### ***Classroom***

- Annual RCRA/Storm Water Training (8-hour)
- U.S. DOT HM-232 Training for Hazmat Employees (4 hours)
- First Aid/CPR (included in First Responder Refresher Training)
- 40-Hour HAZWOPER — initial
- Annual RCRA/Emergency Scene Coordinator Training (1- to 2-day course)

#### ***On-the-Job***

Periodically observe hazardous waste treatment operations in order to ensure activities are properly addressed in facility plans and/or procedures; at least twice per year.

### **Required Certifications**

The above-mentioned training courses are required for this position.

### **Required Qualifications, Skills, and Prerequisites**

No other specific qualifications, skills, or prerequisites, other than the training listed above, are required for this position.

### **Required Education**

No specific education, aside from a high school diploma or General Education Degree (GED), is required for this position.

## **ALTERNATE EMERGENCY COORDINATOR**

### **Job Description**

The Alternate Emergency Coordinator is responsible for performing the duties (described above) of the Emergency Coordinator in his/her absence.

### **Duties**

- Direct and coordinate all on-scene emergency response actions.
- Activate, or authorize the activation, of all or part of the Kilgore emergency response group as required during an incident response.
- Coordinate, with Kilgore's President, all required notifications to federal, state, and local agencies and the news media for hazardous waste incidents.
- Coordinate all required assistance from federal, state, and local response organizations and private contractors for hazardous waste incidents.
- Protect the scene by limiting access.
- Investigate spills and fires to determine causes and prevent reoccurrences.

### **Training Courses**

#### ***Classroom***

- Annual RCRA/Storm Water Training (8-hour)
- U.S. DOT HM-232 Training for Hazmat Employees (4 hours)
- First Aid/CPR (included in First Responder Refresher Training)
- 40-Hour HAZWOPER — initial
- Annual RCRA/Emergency Scene Coordinator Training (1- to 2-day course)



### ***On-the-Job***

- Periodically witness hazardous waste treatment operations, at least twice per year

### **Required Certifications**

The above-mentioned training courses are required for this position.

### **Required Qualifications, Skills, and Prerequisites**

No specific qualifications, skills, or prerequisites are required for this position.

### **Required Education**

No specific education, aside from a high school diploma or GED, is required for this position.

## **SAFETY MANAGER**

### **Job Description**

The Safety Manager is responsible for ensuring that Kilgore maintains a safe working environment compliant with OSHA and Tennessee OSHA regulations.

### **Duties**

- Manages the safety program.
- Assess possible hazards to human health and the environment and advise the Emergency Response Coordinator if evacuation procedures should be initiated.
- Audit hazardous waste technicians' activities with respect to operating in accordance with WIs.

### **Training Courses**

#### ***Classroom***

- Annual RCRA/Storm Water Training (8-hour)
- First Aid (4 hours every 3 years)
- CPR (4 hours every year)
- HAZWOPER 3-day Course or equivalent
- First Aid/CPR (included in First Responder Refresher Training) (every three years)

### ***On-the-Job***

- Observe hazardous waste treatment operations on a semi-annual basis.

### **Required Certifications**

The above-mentioned training courses are required for this position.

### **Required Qualifications, Skills, and Prerequisites**

No specific qualifications, skills, or prerequisites are required for this position.

### **Required Education**

No specific education, aside from a high school diploma or GED, is required for this position.

## **HAZARDOUS WASTE TECHNICIANS**

### **Job Description**

The hazardous waste technicians are responsible for transporting and treating hazardous waste pyrotechnics at the HWOBA. The hazardous waste technicians report to the Environmental Manager.

### **Duties**

- Remove hazardous waste pyrotechnic materials from the HWAAAs at the main plant.
- Inspect the hazardous waste transport vehicle and trailer.
- Transport hazardous waste pyrotechnics to the HWOBA.
- Inspect the HWOBUs (burn pans and concrete containment pads) and surrounding HWOBA before unloading waste.
- Perform treatment operations.
- Perform the post-treatment inspections at the HWOBA and ensure proper ash removal.

## **Training Courses**

### ***Classroom***

- 40-Hour HAZWOPER — initial
- 8-Hour HAZWOPER refresher course (annual)
- RCRA/Storm Water Training (8 hours)
- U.S. DOT HM-232 General Awareness Training for All Hazmat Employees (1-hour)

### ***On-the-Job***

- The hazardous waste technicians are trained to perform their duties according to established WIs by Kilgore. The first six months of a hazardous waste technician's employment are closely supervised by trained hazardous waste technicians and the Environmental Manager.
- Various individuals have been cross-trained to assist with the hazardous waste technicians' responsibilities.

## **Required Certifications**

The above-mentioned training is required for this position.

## **Required Qualifications, Skills, and Prerequisites**

The following qualifications, skills, or prerequisites are required for this position:

- Obtain a valid commercial driver's license with Hazardous Materials Endorsement, and forklift certification.

## **Required Education**

No specific education, aside from a high school diploma or GED, is required for this position.

## **SECURITY OFFICER**

### **Job Description**

The Security Officer provides oversight of maintenance records for DoD and foreign classified information, and is responsible for the communication system at Kilgore.

### **Duties**

- The Security Officer is responsible for receiving all initial hazardous waste emergency reports through Kilgore's emergency response telephone number and two-way radio.
- Notify all internal (i.e., Fire Team) and outside (i.e., Toone Fire Department) emergency response agencies as directed in the Contingency Plan and by the Emergency Coordinator or Environmental Manager.
- Under the direction of the Emergency Coordinator or Environmental Manager, provide traffic control and/or evacuation assistance.

### **On-the-Job Training Courses**

- Periodically observe hazardous waste treatment operations.
- Remain familiar with the Contingency Plan and its implementation.

### **Required Certifications**

No specific certifications are required for this position.

### **Required Qualifications, Skills, and Prerequisites**

The Security Officer must obtain and maintain a security clearance with the DoD. No other qualifications, skills, or prerequisites are required for this position.

### **Required Education**

No specific education, aside from a high school diploma or GED, is required for this position.

### **OTHER EMPLOYEES**

There are a number of other employees whose duties may impact hazardous waste operations at the HWOBA. To ensure that their actions are consistent with the requirements of the applicable regulations and this permit, Kilgore provides on the job training as required when there are relevant impacts. This training is not documented in the formal training program as these employees' duties are not directly applicable to the HWOBA.

### **H-1(b) Training Content, Frequency, and Techniques**

Kilgore has developed a training schedule that consists of classroom instruction and on-the-job training to ensure that personnel who handle hazardous waste are fully knowledgeable in safe and

proper waste management operations. The on-the-job experience ensures Kilgore personnel are current and have received the most recent knowledge and techniques in the area of pyrotechnic-related activities. Personnel must be trained within six months of the date of their employment with Kilgore and will undergo an annual review of the initial training. The following details the training content, frequency, and technique of classes provided by both Kilgore and outside training companies.

### **RCRA/STORM WATER TRAINING SERIES**

This combined course is taught annually by Kilgore's Environmental Manager. This course includes approximately five classroom hours and three site-specific on-the-job training hours for RCRA. The classroom training consists of a three-module, audio-visual training program published by Excel Visual Communications. The RCRA site-specific training is based on WIs prepared and implemented by Kilgore and includes:

- Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment.
- Key parameters for automatic waste feed cut-off systems.
- Communications or alarm systems.
- Response to fires or explosions.
- Response to groundwater contamination incidents.
- Shutdown of operations.

The storm water training also consists of an audio-visual classroom course provided by Kilgore's Environmental Manager, covering the following topics:

- Basic principles of storm water pollution.
- Prevention of storm water pollution.
- Specific scenarios to illustrate incorrect and correct work practices.
- Pollution prevention plan.
- Best management practices.

## Required Documentation of Training

The following documents shall be completed for each employee trained:

- Acknowledgement form
- Attendance sheet

### *Classroom Training*

1. Audio-Visual Training Program

Unit 1: *Life Cycle* (2 hours)

What is Hazardous Waste?

The Resource Conservation and Recovery Act

Hazardous Waste Accumulation

Identification Labels

Identification Numbers

The Manifest

Documentation

Inspections

Unit 2: *Action and Reaction* (2 hours)

Contingency Planning and Emergency/Spill Response

PPE

Prevention and Preparedness

Spill Response

Waste Minimization

2. Waste Identification (½ hour)

- Physical and Chemical Properties of Hazardous Materials Generated at Kilgore
- Proper Identification, Handling, Transportation, and Storage of Hazardous Waste
- Compatibilities and Incompatibilities of the Hazardous Wastes Generated at Kilgore

3. Emergency Response (½ hour)

- Proper Emergency Communications and/or Alarm Procedures and Systems
- Procedures for Using Emergency Response Equipment
- Response to Fires and Explosions

- Response Procedures Required to Contain Hazardous Waste or Hazardous Material Spills

### ***On-the-Job Training***

1. Loading and Transport of Waste
  - A. Inspection of Transport Vehicle
  - B. Inspection of Scrap Staging Areas (HWAAs)
  - C. Loading of Hazardous Waste Pyrotechnic Barrels
  - D. Manifests and Transportation of Waste
2. Unloading and Treatment
  - A. Inspection of HWOBA, HWOBUs, and Emergency Response Equipment
  - B. Proper Loading of Burn Pans
  - C. Procedures for Misfires
3. Cleanup
  - A. Removal of Ash from Burn Pans
  - B. Inspection of HWOBA
  - C. Disposition of Waste Containers

### **Required Documentation of Training**

The following documents shall be completed for each employee trained:

- Completed test
- Attendance sheet

### **40-HOUR HAZWOPER (INITIAL)**

This course is provided by trainers that have satisfactorily completed the requirements set forth in 29 CFR 1910.120(e)(5) and includes the following topics.

- Names of personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on the site
- Use of PPE

- Work practices by which the employee can minimize risk from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements including recognition of symptoms and signs that might indicate overexposure to hazards
- Decontamination procedures
- Emergency response plan
- Confined space entry procedures
- Spill containment program

#### **8-HOUR HAZWOPER REFRESHER COURSE (ANNUAL)**

This course is provided by trainers that have satisfactorily completed the requirements set forth in 29 CFR 1910.120(e)(5) and includes:

- Topics discussed in the 40-hour course, and
- Any critique of incidents that have occurred in the past year that can serve as training examples of related work.

#### **ANNUAL RCRA TRAINING (1- TO 2-DAY COURSE)**

This seminar is provided by outside companies and covers new regulations and prevalent topics with respect to RCRA regulations.

#### **U.S. DOT HM-232 GENERAL AWARENESS TRAINING FOR ALL HAZMAT EMPLOYEES (1 HOUR ANNUALLY)**

This course, provided by an outside vendor, covers the following topics.

- Overview of DOT Hazardous Materials Regulations
- DOT "Persons" and Parts
- Ten Steps to Hazardous Materials Transportation



- Key Acronyms and Abbreviations
- Hazard Classes
- Using "Table 172.101"
- Hazardous Materials Transportation markings
- 49 CFR Part 172, Subpart E — Labeling
- DOT Labels
- Hazardous Materials Shipping Papers
- Example Bill of Lading
- DOT Emergency Response Communications
- 49 CFR Part 172, Subpart F — Placarding
- DOT Placards

### **Required Documentation of Training**

The following documents shall be completed for each employee trained:

- Completed test with 80% passing score
- Attendance sheet

### **FIRST AID AND CPR**

This classroom course is provided by an instructor with a nursing or medical background or experience or certifications in a closely related field, thereby clearly demonstrating a sufficient and current knowledge base in this course subject in order to thoroughly train others.

### **FORKLIFT OPERATOR TRAINING (2 HOURS EVERY 3 YEARS)**

This course, provided by Kilgore staff, covers the following topics.

- Know your forklift
- Stability triangle
- Load capacity
- Load center
- Speed
- Quick turns
- 8-inch rule
- Ramps and inclines
- Driving on various surfaces

- Loading docks
- Parking
- Safety devices
- Daily inspection
- Refueling
- Changing batteries

#### **H-1(c) Relevance of Training to Job Position**

Training is oriented specifically to personnel involved in the management of hazardous waste pyrotechnics at Kilgore. As such, all Kilgore personnel receive the proper training as described above and must meet certain minimum educational and other corporate qualifications, which allows them to perform hazardous waste pyrotechnics treatment and handling operations in the safest manner possible. These minimum qualifications established by Kilgore, based on corporate requirements and current regulations, were detailed in the previous subsections.

#### **H-1(d) Training for Emergency Response**

The training schedule is designed to ensure that personnel are fully trained and are able to respond effectively to emergencies by familiarizing them with emergency equipment and emergency systems including, where applicable, the following parameters.

#### **Facility Emergency and Monitoring Equipment**

Facility personnel are trained to use emergency response equipment that is available for the HWOBA. Where additional emergency equipment is required, but is not immediately available at the HWOBA, personnel have been trained in the proper procedures for notifying Kilgore for requesting additional support and/or emergency equipment. Kilgore personnel are familiar with the route to the HWOBA and are capable of responding to any such call within 10 minutes of notification.

#### **Communications or Alarm Systems/Response to Fires or Explosions**

Hazardous waste technicians are instructed in the proper use of the two-way radio for notifying emergency support personnel at the Kilgore main production plant. In addition, they are trained in fire signal recognition and response procedures.

## **H-2 IMPLEMENTATION OF TRAINING PROGRAM**

### **Training Time Schedule**

Personnel handling hazardous waste at Kilgore must successfully complete the training programs that ensure compliance with WIs and applicable federal, state, and local regulations. Personnel must be trained within six months of the date of their employment with Kilgore and will undergo an annual review of the initial training.

### **Records Documentation**

All personnel involved in hazardous waste pyrotechnics treatment operations must receive certification by attending and passing any examinations related to the occupation-specific training course(s) described Section H-1(b). Records documenting that the required training has been given to, and was completed by, facility personnel are maintained in personnel files or in the Environmental Manager's or designee's office, as appropriate. Training records on personnel will be maintained until closure of the facility; training records on former employees will be kept for at least three years from the date the employee last worked at the facility. Personnel training records may accompany personnel transferred within the same company.

Examples of the training documentation used at the facility may be found in Appendix H-1.

**Appendix H-1**  
**Training Documentation Examples**

Level III – Work Instructions

Procedure: EMS – 332 INSPECTION OF HAZARDOUS WASTE OPEN BURN (OB) UNIT

## TRAINING VERIFICATION FORM

Instruction given by: _____  
*Print Name* *Instructor Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

Level III – Work Instructions
Procedure: EMS – 337 ASH SAMPLING FOR THE OPEN BURN (OB) UNIT

# TRAINING VERIFICATION FORM

Instruction given by: _____  
*Print Name* *Instructor Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

Level III - Work Instructions
Procedure: EMS - 330 Daily Inspection of Explosive Scrap Vehicle and Trailer

### TRAINING VERIFICATION FORM

Instruction given by: _____

*Print Name*
*Instructor Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES - COPIES WILL NOT BE ACCEPTED**

<b>Level III – Work Instructions</b>
<b>Procedure: EMS – 335 EMERGENCY EQUIPMENT REQUIREMENTS FOR THE HAZARDOUS WASTE OB UNIT</b>

# TRAINING VERIFICATION FORM

**Instruction given by:** _____  
*Print Name* *Instructor Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

<b>Clock Number</b>	<b>Employee Name (Print/type)</b>	<b>Employee Signature</b>	<b>Date Training was Completed</b>

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**



Level III – Work Instructions
Procedure: EMS – 352 EMERGENCY REMOVAL OPERATIONS INVOLVING EXPLOSIVES AND HAZARDOUS WASTE PYROTECHNICS

## TRAINING VERIFICATION FORM

Instruction given by: _____  
*Print Name* *Instructor Signature*

Instructor by signing signifies that training was given to and understood by the below listed personnel and that said personnel's' comments will be considered for inclusion in the document, and where deemed necessary added to the next immediate revision.

Clock Number	Employee Name (Print/type)	Employee Signature	Date Training was Completed

**RETURN ORIGINAL FORM TO HUMAN RESOURCES – COPIES WILL NOT BE ACCEPTED**

## **SECTION I CLOSURE AND POST-CLOSURE REQUIREMENTS**

This section is submitted in accordance with the requirements of 40 CFR 264 Subpart G, 264.178, 264.603, and 270.14(b)(13), and THWMR 0400-12-01-.06(7). This Closure Plan identifies all steps necessary to immediately close the existing HWOBA burn pans at any point during their operating life and to perform final closure of the HWOBA and new HWOBUs at the end of their intended operating life.

### **Hazardous Waste Open Burn Area**

The HWOBA is the 5-acre area located in Toone, Tennessee, within the approximately 240-acre TTF, approximately 1.5 miles southwest of Kilgore's main production plant. For the purposes of this Part B Permit Application, the HWOBA is defined as the area surrounded by the existing HWOBA fence, which encompasses the existing 21 interim status HWOBUs and will encompass the 10 proposed HWOBUs (see Figure I-1 in Appendix I-1).

Kilgore has manufactured pyrotechnic devices for the U.S. DoD and commercial users since 1962. Hazardous waste has been treated in the same manner at the 5-acre HWOBA since approximately 1989. Within the HWOBA, there are possibly four unlined burial pits that were formerly used for the historical burning of phosphorous waste, and burial of ash generated from open burning. The exact size and location of the burial pits has not been determined; however, it is believed that the pits were small excavations and the accumulated ash was buried in place. The area is mostly gravel surface with some exposed soil and is accessible from the gravel access road that transects the HWOBA.

The former burial pits were investigated in October 1997 and included advancing soil borings and collecting and analyzing soil samples to identify areas of contamination that would require some level of corrective action prior to construction of concrete burn pads. Those efforts were unsuccessful in locating the pits; however soil analytical data indicated any existing contamination from the pits must be in a highly localized area and has not spread to adjacent areas.

The only source of waste treated at the HWOBA is the hazardous waste pyrotechnics generated during the manufacturing process at Kilgore's main production plant. These wastes are considered RCRA hazardous because they meet the definition of ignitable (D001) and reactive (D003) hazardous wastes per 40 CFR 261.21 and 261.23 and THWMR 0400-12-01-.02(3)(b) and (d),

respectively. Some hazardous wastes generated from the manufacturing process also meet the definition of a toxicity characteristic waste for barium (D005), chromium (D007), and lead (D008), or contain acetone that meets the definition of the listed hazardous waste F003.

Materials determined to be hazardous waste are collected in one of HWAAs located within Kilgore's main production plant. Transportation operations are conducted under Kilgore's main production plant hazardous waste transporter's permit (U.S. EPA ID TND 007020159) from the TDEC DSWM. The HWOBA also operates under a Title V Air Operating permit and is inspected annually by TDEC's DSWM, DAPC, and Division of Water Resources.

WIs have been written and implemented by Kilgore for the following hazardous waste operations:

- DD Form 626 — Motor Vehicle Inspection (Transporting Hazardous Materials).
- Document EMS-332 — Inspection of Hazardous Waste Open Burn (OB) Unit.
- Document EMS-300 — Hazardous Waste OB Treatment Facility Daily Inspection Log.
- Document EMS-330 — Daily Inspection of Explosive Scrap Vehicle and Trailer.
- Document EMS-335 — Emergency Equipment Requirements for the Hazardous Waste OB Unit.

## **I-1 CLOSURE PLAN**

Kilgore intends to close the HWOBA in a manner that:

- Minimizes the need for further maintenance.
- Controls, minimizes, or eliminates, to the extent necessary, to protect human health and the environment and post-closure escape of hazardous wastes or constituents.
- Complies with the requirements of 40 CFR 264 Subpart G.

Historical contamination within the HWOBA has been investigated under RFI/RCRA corrective action investigations. Quantified cleanup goals that are protective of human health and the environment have been established for soil and groundwater. The cleanup goal measures in this Closure Plan are consistent with those resulting from corrective measures.

The historical, unlined burial pits at the OB are co-located with the existing, interim status HWOBUs and the proposed HWOBUs within the HWOBA; which presents a complex situation for closure at the HWOBA. To that end, the following sequence of closure activities is proposed for the HWOBA:

1. Partial closure of the existing, interim status HWOBUs.
2. Construction of the proposed HWOBUs.
3. Operation of the proposed HWOBUs for the remainder of the facility's operational life.
4. Decontamination/Removal of the HWOBUs.
5. Final closure of the existing, interim status HWOBUs and the HWOBUs.
6. Completion of a CMS for final closure of the historical, unlined burial pits.

It is expectation of Kilgore that the final CMS for the historical, unlined burial pits, final closure of the existing, interim status HWOBUs, and final closure of the HWOBUs will be coordinated to occur simultaneously.

### **I-1(a) Partial Closure Activities**

Once the Final Permit is issued by TDEC, Kilgore will implement partial closure of the interim status HWOBUs by decontamination, removal, and disposal of the existing burn pans. These closure activities of the existing interim status HWOBUs will be performed in two stages to accommodate construction of new HWOBUs (concrete containment pads and burn pans).

#### **I-1(a)(1) Interim Status HWOBUs 16-21**

Partial closure of interim status HWOBUs 16-21 will be conducted first (see Figure D-1 in Appendix D-2; to accommodate construction of HWOBUs 6-10 in the southern half of the HWOBA, while allowing OB activities to continue in the northern half of the HWOBA. All remaining ash/residue within each interim status burn pan will be swept clean, collected, and disposed of offsite as appropriate based on the existing TDEC Special Waste Agreement.

Once the ash and residue are removed from each burn pan, the interior of each pan will be subjected to a triple wash/rinse. The initial cycle will involve washing using Liqui-Nox or similar surfactant and wet brushing. The second cycle will consist of a simple water-only wash. The final rinse will be conducted using sparing amounts of water, which will be collected and containerized separately. This rinsate will be analyzed, along with the source water (to establish background levels) for the identified COCs (metals, dioxins, furans, and RDX) to confirm that decontamination of the burn pans was successful.

Following the guidance approach in *Supplemental Guidance to RAGS: Region 4 Bulletins — Human Health Risk Assessment Bulletin No. 1: Data Collection and Evaluation* (U.S. EPA, 1995), if the concentration of the identified COCs in the final rinsate is less than twice the concentration of each COC in the source water (for metals, dioxins, and furans) or less than laboratory PQLs (for RDX), decontamination will be considered successful. If decontamination is successful, the burn pans will be sold for scrap metal.

If decontamination of the burn pans is not successful, the burn pans will be disposed of as solid waste at the Bolivar-Hardeman County Landfill under a TDEC Special Waste Agreement. Wipe samples will be collected from the burn pans as outlined in the SAP in Appendix C-4 of this permit application.

All wash and rinse water will be containerized for characterization, transport, and disposal through a licensed disposal company (to be determined at the time of closure) following sampling methods and parameters listed in the SAP. QA/QC samples will be collected from the rinsate and from the wipe samples at a frequency of 1:10 samples (10%).

Following partial closure of existing, interim status HWOBUs 16-21, the southern half of the HWOBA will be graded and construction of HWOBUs 6-10 will begin in accordance with the plans and specifications provided in Appendix D-1.

#### **I-1(a)(2) Interim Status HWOBUs 1-15**

Once HWOBUs 6-10 placed into service, partial closure of interim status HWOBUs 1-15 will commence (see Figure D-1 in Appendix D-2). All remaining ash/residue within each interim status burn pan will be swept clean, collected, and disposed of offsite as appropriate based on the existing TDEC Special Waste Agreement.

Once the ash and residue are removed from each burn pan, the interior of each pan will be subjected to a triple wash/rinse. The initial cycle will involve washing using Liqui-Nox or similar surfactant and wet brushing. The second cycle will consist of a simple water-only wash. The final rinse will be conducted using sparing amounts of water, which will be collected and containerized separately. This rinsate will be analyzed, along with the source water (to establish background levels) for the identified COCs (metals, dioxins, furans, and RDX) to confirm that decontamination of the burn pans was successful.

Following the guidance approach in *Supplemental Guidance to RAGS: Region 4 Bulletins — Human Health Risk Assessment Bulletin No. 1: Data Collection and Evaluation* (U.S. EPA, 1995), if the concentration of the identified COCs in the final rinsate is less than twice the concentration of each COC in the source water (for metals, dioxins, and furans) or less than laboratory PQLs (for RDX), decontamination will be considered successful. If decontamination is successful, the burn pans will be sold for scrap metal.

If decontamination of the burn pans is not successful, the burn pans will be disposed of as solid waste at the Bolivar-Hardeman County Landfill under a TDEC Special Waste Agreement. Wipe samples will be collected from the burn pans as outlined in the SAP in Appendix C-4 of this permit application.

All wash and rinse water will be containerized for characterization, transport, and disposal through a licensed disposal company (to be determined at the time of closure) following sampling methods and parameters listed in the SAP. QA/QC samples will be collected from the rinsate and from the wipe samples at a frequency of 1:10 samples (10%).

Following partial closure of existing, interim status HWOBUs 1-15, the northern half of the HWOBA will be graded and construction of HWOBUs 1-5 will begin in accordance with the plans and specifications provided in Appendix D-1.

In the event that future circumstances (e.g., change in production capacity or type ordnance produced) require Kilgore to commence final closure on a portion of the HWOBA while the facility is still in operation, a revision in the Closure Plan will be submitted to the appropriate regulatory agencies within the required time limit.

A Tennessee-registered professional engineer will certify to the proper completion of partial closure activities and their adherence to the partial closure plan specification, and a pre-, mid-, and post-review.

### **I-1(b) Final Closure Activities**

Final closure activities will include:

- Treatment of final inventory of waste.
- Removal of ash/residue from the HWOBU burn pans.

- Decontamination/removal of the HWOBUs (burn pans and concrete pads).
- Soil characterization within the HWOBA, to include closure of the locations of the existing, interim status HWOBUs.
- Groundwater characterization at the point of compliance.
- Treatment of contaminated soil (as necessary).
- Re-grading for drainage control.

#### **I-1(b)(1) Treatment of Final Inventory of Waste**

The maximum potential volume of pyrotechnic waste treated at the HWOBA at any time will be equal to the 3,300-pound capacity of a single HWOBUs burn pan.

Before proceeding with the closure process, the final charge of waste will be treated in each burn pan. No untreated pyrotechnic waste will remain in any burn pan. Only ash from the thermal treatment of pyrotechnic wastes will remain within the HWOBA.

#### **I-1(b)(2) Removal of Ash/Residue from the HWOBUs Burn Pans**

Any ash/residue within the burn pans will be swept clean, collected, and managed as it is under operational conditions described in Section D. It will be containerized, sampled, characterized, stored, and disposed as appropriate based on hazardous waste characterization.

#### **I-1(b)(3) Decontamination/Removal of the HWOBUs Burn Pans and Concrete Pads**

The empty burn pans will be decontaminated within their concrete containment pad. Once the ash and residue are removed from each burn pan, it will be subjected to a triple wash/rinse. The initial cycle will involve washing using Liqui-Nox or similar surfactant and wet brushing. The second cycle will consist of a simple water-only wash. The final rinse will be conducted using sparing amounts of water, which will be collected and containerized separately. This rinsate will be analyzed, along with the source water (to establish background levels) for the identified COCs (metals, dioxins, furans, and RDX) to confirm that decontamination of the burn pans was successful. Following the guidance approach in *Supplemental Guidance to RAGS: Region 4 Bulletins — Human Health Risk Assessment Bulletin No. 1: Data Collection and Evaluation* (U.S. EPA, 1995), if the concentration of the identified COCs in the final rinsate is less than twice

the concentration of each COC in the source water (for metals, dioxins, and furans) or less than laboratory PQLs (for RDX), decontamination will be considered successful. If decontamination is successful, the burn pans will be sold for scrap metal.

If decontamination of the burn pans is not successful, the burn pans will be disposed as solid waste at the Bolivar-Hardeman County Landfill under a TDEC Special Waste Agreement. Wipe samples will be collected from the burn pans as outlined in the SAP in Appendix C-4 of this permit application.

All wash and rinse water will be collected and containerized for characterization, transport, and disposal through a licensed disposal company (to be determined at the time of closure) following sampling methods and parameters listed in the SAP.

Following removal of a HWOBUs burn pan, the respective pad will be pressure-washed using clean potable water and Liqui-Nox detergent, followed by two potable water rinses. All wash and rinse water will be containerized for characterization, transport, and disposal through a licensed disposal company (to be determined at the time of closure) following sampling methods and parameters listed in the SAP. The concrete pads will be demolished and disposed offsite at an appropriately permitted facility.

QA/QC samples will be collected from the rinsate, wipe, and concrete samples at a frequency of 1:10 samples (10%).

#### **I-1(b)(4) Soil Characterization within the HWOBA**

The sampling, characterization, and cleanup of soils within the vicinity of the HWOBA will be conducted through the collection of soil samples and comparing site contaminant concentrations against local background concentrations. If the concentrations of identified COCs (metals, dioxins, and furans) in the site samples are less than twice their respective concentrations in the background sample, remediation will be considered unnecessary. For the RDX, which is not naturally occurring, concentrations below laboratory PQLs in soil samples will not require remediation.

#### **Background Sampling**

To establish site-specific background concentrations of metals, dioxins, and furans, soil samples will be collected from multiple locations that are most unlikely to have been impacted by open burning



activities, based upon the air dispersion and deposition modeling results. Sample locations will be collected from the following multiple locations separated vertically and horizontally from the HWOBA and the Test Tunnel to ensure that background criteria are met.

- Outside the byproduct deposition zone for byproducts of the HWOBA, as defined by the dispersion/deposition modeling completed in support of this application, and submitted under separate cover.
- In wooded areas and grassland not previously cultivated for crop production.
- Outside the current and former testing and treatment areas.

Background thresholds for metals, dioxins, and furans in soils will be established by collecting one composite sample comprised of 5 grab samples from locations within the areas meeting the background criteria from 0-6 inches bgs (see Figure I-1 in Appendix I-1).

QA/QC samples will be collected from the background sampling locations at a frequency of 1:10 samples (10%).

#### **Biased Sampling for the Locations of the Existing, Interim Status HWOBUs**

Soils samples will be collected at locations that are most likely to be impacted from historical releases from the existing, interim status HWOBUs.

One composite soil sample will be collected in the vicinity of each existing, interim status burn pan. Each composite sample will be comprised of four grab samples at 25-foot distances from the location of the existing, interim status burn pan from the 0-6 inch bgs depth interval (Figure I-2 in Appendix I-1).

Additional composite samples will be collected at each location across the 6-12 inch bgs, 12-18 inch bgs, and 18-24 inch bgs depth intervals to evaluate the potential vertical extent of impacted soil from deposition following historical OB activities. Composite samples collected from the 12-18 inch bgs and 18-24 inch bgs depth intervals will be held for analysis by the analytical laboratory, pending the analysis of the composite samples collected from the 0-6 inch bgs and 6-12 inch bgs depth intervals. If analysis of the composite samples collected from the 6-12 inch bgs depth

interval does not indicate COC exceedances at this depth, the composite samples collected from the 12-18 inch bgs and 18-24 inch bgs depth intervals will not be analyzed.

QA/QC samples will be collected from the background sampling locations at a frequency of 1:10 samples (10%).

### **Biased Sampling for the HWOBUs**

Soil and sediment samples will be collected at locations that are most likely to be impacted by releases from the HWOBA to confirm successful closure, as follows:

- One composite soil sample will be collected from outside the curbing at 5-, 10-, and 15-foot distances along the centerline of the external, earthen ramp at each HWOBUs concrete pad (Figure I-3 in Appendix I-1). Each composite sample will be comprised of three grab samples (one grab sample from the 5-, 10-, and 15-foot distances) across the 0-6 inch bgs depth interval.

Additional composite samples will be collected at each location across the 6-12 inch bgs, 12-18 inch bgs, and 18-24 inch bgs depth intervals to evaluate the potential vertical extent of impacted soil from deposition from OB activities.

- One composite soil sample will be collected from outside the curbing along each of the non-ramp sides of each HWOBUs concrete pad (Figure I-3 in Appendix I-1). Each composite sample will be comprised of three grab samples spaced 5 feet apart and 5 feet from the curb, across the 0-6 inch bgs depth interval.

Additional composite samples will be collected from each location across the 6-12 inch, 12-18 inch, and 18-24 inch bgs depth intervals to evaluate the potential vertical extent of impacted soil along each non-ramp side.

- One composite sediment sample will be collected from each successive confluence of drainage swales downstream of the HWOBA (Figure I-4 in Appendix I-1), including the confluence of Pugh Creek with Mill Creek. Composite samples will be comprised of one grab samples (one from the center of the creek and one from each bank immediately upstream of the confluence), across the 0-6 inch bgs depth interval.

Additional composite samples will be collected from each location across the 6-12 inches bgs, 12-18 inches bgs, and 18-24 inches bgs depth intervals to evaluate the potential vertical extent of impacted sediment in the drainage swales. Composite samples collected from the 12-18 inch bgs and 18-24 inch bgs depth intervals at each biased sampling location will be held for analysis by the analytical laboratory, pending the analysis of the composite samples collected from the 0-6 inch bgs and 6-12 inch bgs depth intervals. If analysis of the composite samples collected from the 6-12 inch bgs depth interval does not indicate COC exceedances at this depth, the composite samples collected from the 12-18 inch bgs and 18-24 inch bgs depth intervals will not be analyzed.

- Soil discoloration and other visual indicators of potentially impacted soil areas will be used to select up to 30 “worst case locations” for collection of soil samples from the 0-6 inch bgs depth interval for analysis of dioxins and furans. As previously stated in this permit application, Kilgore does not use dioxin or furan precursors in its manufacturing processes; therefore, it is not expected that dioxins or furans would be present following thermal treatment of waste pyrotechnics at the HWOBA. If analysis of the samples collected from these “worst case areas” do not indicate dioxins or furans present at concentrations more than twice their representative concentrations in the background sample, further investigations for dioxins and furans at the HWOBA will not be performed.

QA/QC samples will be collected from the biased sampling locations for soil and sediment at a frequency of 1:10 samples (10%).

### **Unbiased Sampling**

Additional samples will be collected to assess any generalized COC exceedances in soil from airborne fallout from emissions from the HWOBA and will complement the composite samples generated by the biased sampling pattern. The unbiased sampling approach will consist of the following.

- Establish a 200-foot grid over an area extending 600 feet beyond the center of the HWOBA (as shown on Figure I-5 in Appendix I-1).
- At each node outside the HWOBA, collect a composite sample comprised of five grab samples from 0 to 6 inches bgs: one at the node and one along each grid line at a distance of 25 feet from the node. Additional composite samples will also be collected from

each of the five grab sample locations across the 6-12 inch bgs depth interval. Composite samples collected from the 6-12 inch bgs depth interval will be held for analysis by the analytical laboratory, pending the analysis of the composite samples collected from the 0-6 inch bgs depth interval. If analysis of the composite samples collected from the 0-6 inch bgs depth interval does not indicate COC exceedances at this depth, the composite samples collected from the 6-12 inch bgs depth interval will not be analyzed.

QA/QC samples will be collected from the unbiased soil sampling locations at a frequency of 1:10 samples (10%).

### **Follow-Up Sampling (Biased Sampling Locations)**

If any composite sample from the original, biased sampling program contains an identified COC above twice its respective background concentration (for metals, dioxins, and furans) or laboratory PQL (for RDX), additional sampling will be performed to identify the extent of the COC exceedances, as follows.

- ***Locations of the Existing, Interim status HWOBUs:*** At the location of an identified COC exceedance outside of a for interim status burn pan location, additional soil samples will be collected at distances of 10-feet beyond the original sample location. At each location, samples will be collected from same the depth interval(s) containing the COC exceedance at the biased sample location, with each resulting grab sample analyzed individually for the identified COC to define the horizontal extent of localized exceedances.

If vertical delineation samples indicate COC exceedances in the 18-24 inch depth interval, samples will be collected from the 24-30 inch bgs and 30-36 inch bgs depth intervals, with each resulting grab sample analyzed individually for the identified COC to define the vertical extent of localized exceedances.

- ***HWOBUs Samples:*** At the location of an identified COC exceedance outside of a HWOBUs concrete pad, additional soil samples will be collected at distances of 5- and 15-feet beyond the original sample location. At each location, samples will be collected from same the depth interval(s) containing the COC exceedance at the biased sample location, with each resulting grab sample analyzed individually for the identified COC to define the extent of localized exceedances.

If vertical delineation samples indicate COC exceedances in the 18-24 inch depth interval, samples will be collected from the 24-30 inch bgs and 30-36 inch bgs depth intervals, with each resulting grab sample analyzed individually for the identified COC to define the vertical extent of localized exceedances.

- ***Drainage Swale Sediment:*** Three grab samples will be collected from the same depth interval(s) containing the COC exceedance in the original biased sample, one from the location of the original COC exceedance and one each 20 and 50 feet downstream of the original location.

Should the follow-up sampling at any area exceed background levels, additional sampling events will be performed at increasing 10-foot lateral distances and/or 6-inch vertical depth intervals, each successively expanding the sampling network beyond locations still reporting excessive contaminant concentrations, until the outermost and deepest samples are below background concentrations (for metals, dioxins, and furans) or laboratory PQLs (for RDX).

QA/QC samples will be collected from any follow-up sampling at a biased sampling location at a frequency of 1:10 samples (10%).

#### **Follow-Up Sampling (Unbiased Sampling Locations)**

If any composite sample from the original, unbiased sampling program contains an identified COC above twice its respective background concentration (for metals, dioxins, or furans) or laboratory PQL (for RDX), additional sampling will be performed to identify the extent of the exceedances, as follows.

- At the location of the identified COC exceedance, a new grid, extending 100 feet in each direction from the original sample location, will be established, and one sample will be collected at each node along the new grid lines. At each location, samples will be collected from the same depth interval as the initial exceedance, with each of the resulting grab samples analyzed individually for the identified COC to define the extent of localized exceedances.

If vertical delineation samples indicate COC exceedances in the 6-12 inch depth interval, samples will be collected from the 12-18 inch bgs and 18-24 bgs depth intervals, with

each resulting grab sample analyzed individually for the identified COC to define the vertical extent of localized exceedances.

- Should the follow-up sampling at any area fail to define the extent of COC exceedances in soil, additional sampling events will be performed at 10-foot lateral distances and/or 6-inch vertical depth intervals, each successively expanding the sampling network beyond locations still reporting excessive contaminant concentrations, until the outermost samples are below the threshold concentrations.

QA/QC samples will be collected from any follow-up sampling at an unbiased sampling location at a frequency of 1:10 samples (10%).

#### **I-1(b)(5) Groundwater Characterization at the Point of Compliance**

Section E-5 addresses groundwater monitoring during the life of the HWOBA under this permit application. By implementing the groundwater quality detection monitoring-program described in Section E-5, any groundwater quality degradation will be observed during the operational life of the HWOBA, thereby, eliminating the need for closure-specific measures to assess groundwater quality. The groundwater monitoring program applied during the operating life of the HWOBA will continue for at least two years after completion of closure.

#### **I-1(b)(6) Management of Contaminated Soil**

The necessity for treatment of soil will depend on the outcome of the soil characterization described in Section I-1(b)(4). Should the first round of sampling identify no contaminant concentrations exceeding closure thresholds, no soil treatment will be performed.

Should the first round of sampling identify COC exceedances in soil, follow-up sampling will be conducted to define the extent of the exceedances. The extent of the COC exceedances will be considered defined when analytical results quantitatively identify soils beyond the excavation that do not contain COC concentrations above the established closure thresholds.

Once areas of COC exceedances are delineated, the approach to treatment/disposal of soil within each area will be addressed individually. The treatment/disposal approach for each area will depend on the volume of soil within the contaminated area, the cumulative volume of contaminated soil within the HWOBA, proven cleanup technologies available at the time of closure, and costs. The optimum set of remedial technologies (e.g., in-situ and/or ex-situ) for soil treatment/disposal

will be negotiated with TDEC. Excavation with offsite disposal and capping are likely candidate technologies and each is described in this Closure Plan. Other technologies may be proposed at the time of closure following characterization of the HWOBA soils.

### **I-1(b)(7) Excavation and Offsite Disposal**

This approach will most likely be applied to limited areas of soil containing COC exceedances. Kilgore personnel (or qualified contractors) trained and experienced in contaminated soil removal will excavate the soils in the designated localized area(s). If soil removal is required, the extent of impacted soil will be determined based on the results of the samples collected during the soil characterization activities described in this Closure Plan.

Any soil excavation will be performed using backhoes, trackhoes, or other earthmoving equipment, as required. Excavated soil will be containerized (typically in lined 20-cubic-yard roll-off boxes or directly into lined tractor/trailers) for transport offsite to a permitted facility. Excavation will continue until reaching the limits designated by the soil characterization sampling, at which point confirmation samples will be collected. One confirmation sample will be collected for each 1,000 square feet of excavation. Each confirmation sample will be comprised of four grab samples collected from the 1,000 square feet of excavation. Soil samples will be analyzed according to the SAP in Appendix C-4 of this permit application. QA/QC samples will be collected from the confirmation samples collected from each excavation at a frequency of 1:10 samples (10%).

If the confirmatory analytical results indicate that remaining COCs are below established background or PQL concentrations, the excavation will be graded to match the surrounding grade.

If confirmation sampling indicates contaminant concentrations remain above established background or PQL concentrations, excavation and confirmation sampling will continue until contaminant concentrations are acceptable. Over-excavated soils will be managed in the same manner as the excavated soil outlined above.

### **I-1(b)(8) Capping**

Capping the HWOBA as part of closure is not currently anticipated; therefore, estimated costs for capping have not been included in the Closure Plan. If widespread areas of impacted soil are identified during soil characterization activities and it is determined that closure-in-place is an appropriate alternative to excavation and offsite disposal, then a cap design will be prepared and submitted to TDEC prior to implementation of capping as a final remedy for closure.

### **I-1(b)(9) Decontamination Pad**

Equipment decontamination will be required for each proposed soil treatment alternative. A decontamination pad will be constructed outside the entrance to the HWOBA to clean and decontaminate all equipment used onsite. The decontamination pad will be sized to accommodate any earthmoving equipment used for closure, and a berm will be constructed on three sides. The pad will be lined with high-density polyethylene (HDPE), sloped to one corner, and dewatered as necessary into a portable water wagon or tanker truck.

Wastewater, sludge, and solids removed from the decontamination pad will be collected, sampled, and analyzed for the identified COCs (metals, dioxins, furans, and RDX). Decontamination wastewater, sludge, and solids will be containerized and transported offsite to a permitted treatment or disposal facility. All equipment used during closure will be pressure-washed and triple-rinsed using potable water prior to demobilization from the site. Once equipment decontamination is completed and wastewater, sludge, and solids are removed, the HDPE liner will be removed from the decontamination pad and containerized for disposal.

### **I-1(b)(10) Re-Grading for Drainage Control**

Once contaminated soils are no longer present at the HWOBA, the site will be finish-graded to manage surface water drainage. The finished grade will tie into any vegetated areas that were present during the soil excavation. Naturally vegetated areas will be disturbed as little as possible. Those graded areas will then be fertilized with 500 pounds-per-acre 15 percent nitrogen-phosphorus-potassium fertilizer and sown with a minimum of 8 pounds-per-acre of Kentucky 31 Tall Fescue grass. After fertilization and grass sowing, the seeds will be incorporated using a harrow.



### **I-1(c) Description of Closure Schedule**

Within 90 days after receiving the final volume of hazardous wastes, Kilgore will treat and remove from the site all hazardous waste in accordance with the approved Closure Plan.

Kilgore will notify the U.S. EPA Regional Administrator and TDEC Commissioner at least 180 days prior to the date final closure is expected to begin.

Upon completion of closure, Kilgore will submit to the U.S. EPA Regional Administrator and the TDEC Commissioner a certification by a Tennessee-registered professional engineer that the facility has been closed in accordance with the specifications in the approved Closure Plan.

The proposed schedule for final closure of the permitted HWOBA is provided in Appendix I-2.

### **I-1(d) Closure Plan Retention/Notification**

Kilgore will maintain a copy of the approved closure plan onsite at the Vice President Health, Safety and Environmental's office and/or Environmental Manager's office, and all revisions to the plan until the certification of closure completeness has been submitted and accepted by U.S. EPA Region 4 and TDEC. If changes in operation or facility design affect the Closure Plan, it will be amended. It will also be amended if there is a change in the expected year of closure. Modification requests, if required, will be made within 60 days after the change in operation or design occurs.

## **I-2 POST-CLOSURE PLAN**

It is the intent of Kilgore to remove any contaminated soil identified during closure activities. Therefore, in accordance with 40 CFR 264.603 and THWMR 0400-12-01-.06(7) and 0400-12-01-.06(27)(d), which exempts miscellaneous units at which no soil contamination remains from post-closure requirements, Kilgore is not submitting a post-closure care plan for the HWOBA.

## **I-3 CERTIFICATION OF CLOSURE**

40 CFR 264.115 and THWMR 0400-12-01-06(7)(f) do not require closure certification for miscellaneous treatment units; however, Kilgore will retain a Tennessee-registered professional engineer to certify the proper completion of closure activities, and adherence to the Closure Plan specification, and a pre-, mid-, and post-review.

After completion of closure activities, Kilgore will retain a Tennessee-registered professional engineer to visit the site and perform an annual inspection to confirm that the site was monitored and maintained in accordance with the approved Closure Plan and applicable regulations, and that any deficiencies noted have been addressed.

#### **I-4 CLOSURE COST ESTIMATE**

In accordance with cost estimation guidance for closure, it must be assumed that closure activities will be performed by a third party. In addition, “worst-case” circumstances must be accounted for as they pertain to the amount of material that must be handled and the existence of viable markets for scrap materials.

The costs presented in this section for partial closure of the existing, interim status HWOBUs and for final closure of the proposed HWOBUs were estimated using the *CostPro Closure and Post-Closure Care Cost Estimating Software*, Version 6.1 (CostPro), as provided by the U.S. EPA. The default labor rates and other remedial costs standard to CostPro were used, unless a particular rate was not built into the software. For example, a cost for laboratory analysis of explosives in soil was not part of the CostPro application. As directed by the U.S. EPA., laboratory costs for explosives were entered into CostPro in place of another analysis that was not utilized. Instances where substitutions of site-specific data were entered into CostPro are documented on the output sheets.

##### **I-4(a) Partial Closure of the Existing Interim Status HWOBUS Pan Decontamination and Disposal**

As described in Section I-1(a) partial closure of the existing, interim status HWOBUs will be as follows:

- Removal and disposal of ash at the Bolivar-Hardeman County Landfill under a TDEC Special Waste Agreement.
- Containerizing, sampling, and offsite disposal of decontamination liquids from decontamination of the existing burn pans.

- Disposal of the burn pans by either a commercial scrap metal recycler or disposal at the Hardeman County Landfill under a TDEC Special Waste Agreement.

**A. PARTIAL CLOSURE CERTIFICATION**

A Tennessee-registered professional engineer will certify to the proper completion of partial closure activities and their adherence to the partial Closure Plan specification, and a pre-, mid-, and post-review.

**B. SUMMARY**

A summary of the costs estimated by CostPro for partial closure of the existing, interim status HWOBUs is provided in the following table. A complete copy of the output file generated by CostPro for the partial closure of the existing, interim status HWOBUs is provided in Appendix I-3.

<b>Cost Summary for Partial Closure of the Existing, Interim Status HWOBUS</b>	
<b>Description</b>	<b>Amount</b>
A. Decontamination of Interim status HWOBUs	\$19,047
B. Sampling and Analysis	\$19,461
C. Ash and Burn Pan Disposal	\$10,000
<b>Subtotal</b>	<b>\$48,508</b>
D. Engineering Expenses (10%)	\$4,850
E. Partial Closure Certification	\$6,000
<b>Subtotal</b>	<b>\$59,359</b>
F. Contingency Allowance (15%)	\$8,904
<b>Total</b>	<b>\$68,263</b>

**I-4(b) Final Closure of Proposed HWOBUS and HWOBA**

**A. Removal of Ash/Residue from HWOBU Burn Pans; Decontamination/Removal of the HWOBU Burn Pans and Concrete Pads**

As described in Section I-1(b) final closure of the proposed HWOBUs and the HWOBA will be as follows:

- Removal and disposal of ash at the Bolivar-Hardeman County Landfill under a TDEC Special Waste Agreement.

- Sampling and characterizing soils within the vicinity of the HWOBA by comparison of site contaminant concentrations with closure threshold concentrations (described in Section I-1(b)(4)).
- Management of soils within the vicinity of the HWOBA where site characterization sampling identified COCs above closure thresholds. For the purposes of providing “worst case” estimated costs of closure, the quantity of impacted soil to be excavated for offsite disposal from the HWOBA is estimated to extend 25 feet out from the location of each existing, interim status burn pan and 20 feet around the perimeter of each proposed HWOBUs. Estimating the volume of impacted soil for management assumes one round of additional excavation and sample collection from 25 percent of the existing, interim status burn pan locations and proposed HWOBUs locations following initial excavation and sample collection and at depths of no more than 6 inches bgs.

#### **Existing Interim status HWOBUs**

Initial sampling distance (25 feet)

Each sampling area =  $\pi \times r^2 = 3.14 \times (25 \text{ feet})^2 = 1,963 \text{ square feet}$

1,963 square feet X 0.5 feet deep = 982 cubic feet = 36 cubic yards (per pan)

36 cubic yards / pan X 21 pans = 756 cubic yards of soil for excavation and disposal (initial)

#### **Proposed HWOBUS**

Follow-up sampling interval (20 feet) + Pad dimensions (18 feet X 30 feet)

Each sampling area (20 feet + 18 feet + 20 feet) X (20 feet + 30 feet + 20 feet) =  
58 feet X 70 feet = 4,060 square feet

4,060 square feet X 0.5 feet deep = 2,030 cubic feet = 76 cubic yards (per pad)

76 cubic yards / pad X 10 concrete pads = 760 cubic yards of soil for excavation and disposal (initial)

(756 cubic yards of soil + 760 cubic yards of soil) X 1.25 = 1,895 cubic yards of soil for  
excavation and disposal (total)

While this is a “worst case” estimate of the soil to be excavated, it is conservatively assumed that up to 10% of estimated volume of impacted soil associated with the existing, interim status HWOBUs may overlap the areas of impacted soil associated with the proposed HWOBUs; and will only require one remedial excavation to address both areas of impacted soil (as permitted by THWMR 0400-12-01-06(7)(a)3). Therefore, a more realistic “worst case” estimate of volume of impacted soil to be excavated is:

1,895 cubic yards of soil X 0.90 = 1,706 cubic yards of soil for excavation and disposal (total)

**B. Groundwater Characterization Within the Waste Management Area**

As previously discussed, the groundwater quality detection monitoring program described in Section E-5 will be implemented during the operational life of the HWOBA; thereby, eliminating the need for closure-specific measures to assess groundwater quality.

**C. Final Closure Certification**

A Tennessee-registered professional engineer will certify to the proper completion of closure activities and their adherence to the Closure Plan specification, and a pre-, mid-, and post-review.

**D. Summary**

A summary of the costs estimated by CostPro for final closure of the proposed HWOBUs and HWOBA is provided in the following table. A complete copy of the output file generated by CostPro for the final closure of the proposed HWOBUs and HWOBA is provided in Appendix I-3.

<b>Cost Summary for Final Closure Of HWOBUS And HWOBA</b>	
<b>Description</b>	<b>Amount</b>
A. Decontamination of HWOBUs	\$30,617
B. Demolition and Removal of HWOBUS Pans and Pads	\$150,844
C. Removal and Off-Site Disposal of Impacted Soil	\$171,495
D. Final Grading	\$4,610
E. Sampling and Analysis	\$266,101
F. Treatment and Disposal of Decontamination Fluids	\$5,650
<b>Subtotal</b>	<b>\$629,317</b>
G. Engineering Expenses (10%)	\$62,932
H. Final Closure Certification	\$6,000
<b>Subtotal</b>	<b>\$698,249</b>
F. Contingency Allowance (15%)	\$104,737
G. Soil Cover Installation	\$30,210
<b>Total</b>	<b>\$833,196</b>

#### **I-5 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE**

Kilgore will use an irrevocable standby letter of credit for financial assurance of closure. The company's documentation of its financial assurance mechanism for closure is provided in Appendix I-4.

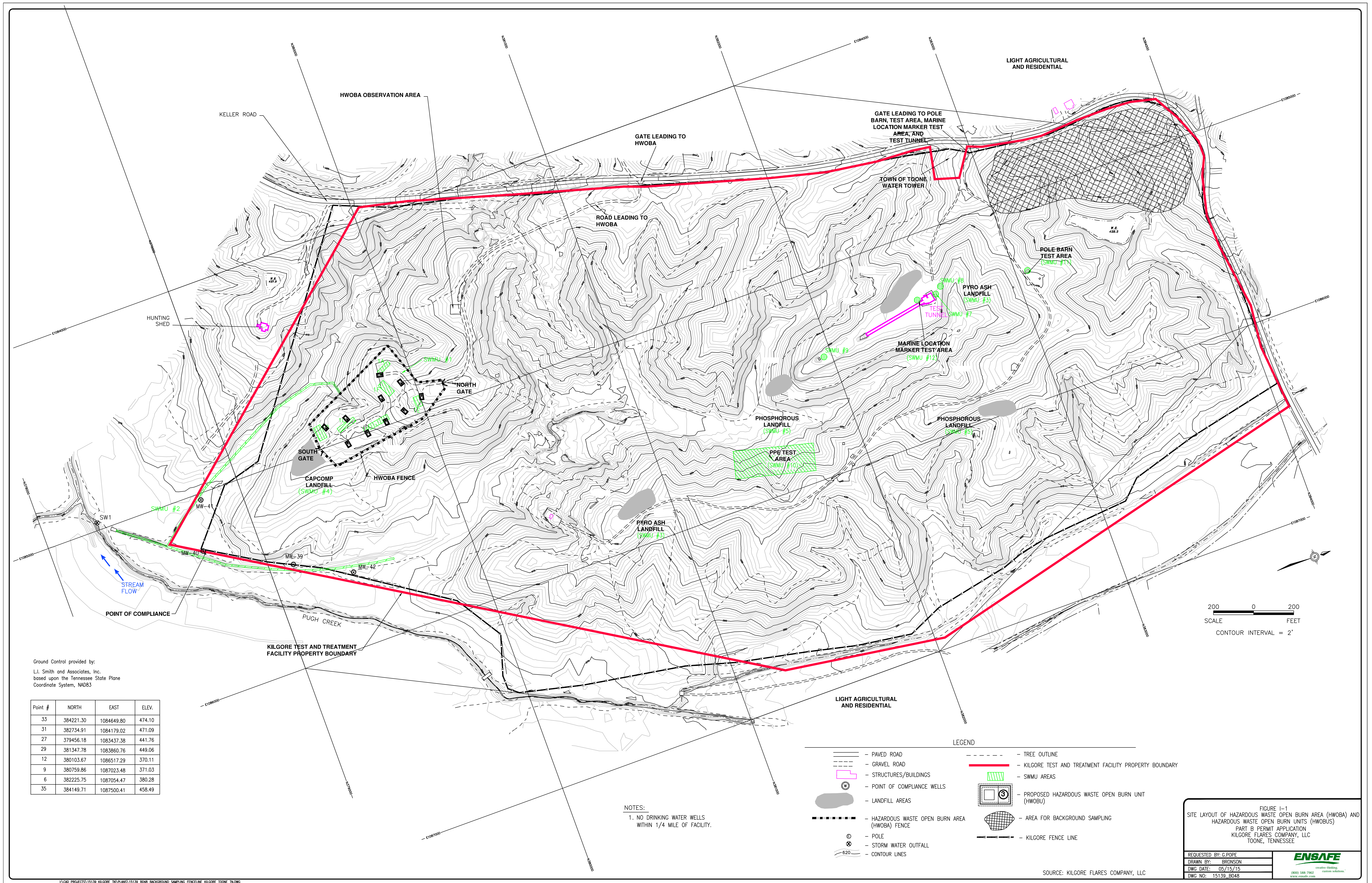
#### **I-6 LIABILITY REQUIREMENTS**

Documentation of the facility's liability insurance policy is submitted in Appendix I-4 in accordance with 40 CFR 264 Subpart H and THWMR 0400-12-01-.06(8). This information is the same information used to determine financial assurance for closure.

The U.S. EPA Regional Administrator may adjust the liability requirements and financial responsibility provisions of this permit based upon an evaluation of the degree and duration of risk as ascertained from information provided.

**Appendix I-1**  
**Figures**





Ground Control provided by:  
 L.I. Smith and Associates, Inc.  
 based upon the Tennessee State Plane  
 Coordinate System, NAD83

Point #	NORTH	EAST	ELEV.
33	384221.30	1084649.80	474.10
31	382734.91	1084179.02	471.09
27	379456.18	1083437.38	441.76
29	381347.78	1083860.76	449.06
12	380103.67	1086517.29	370.11
9	380759.86	1087023.48	371.03
6	382225.75	1087054.47	380.28
35	384149.71	1087500.41	458.49

NOTES:  
 1. NO DRINKING WATER WELLS  
 WITHIN 1/4 MILE OF FACILITY.

- LEGEND
- PAVED ROAD
  - GRAVEL ROAD
  - STRUCTURES/BUILDINGS
  - POINT OF COMPLIANCE WELLS
  - LANDFILL AREAS
  - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
  - POLE
  - STORM WATER OUTFALL
  - CONTOUR LINES
  - TREE OUTLINE
  - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
  - SWMU AREAS
  - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
  - AREA FOR BACKGROUND SAMPLING
  - KILGORE FENCE LINE

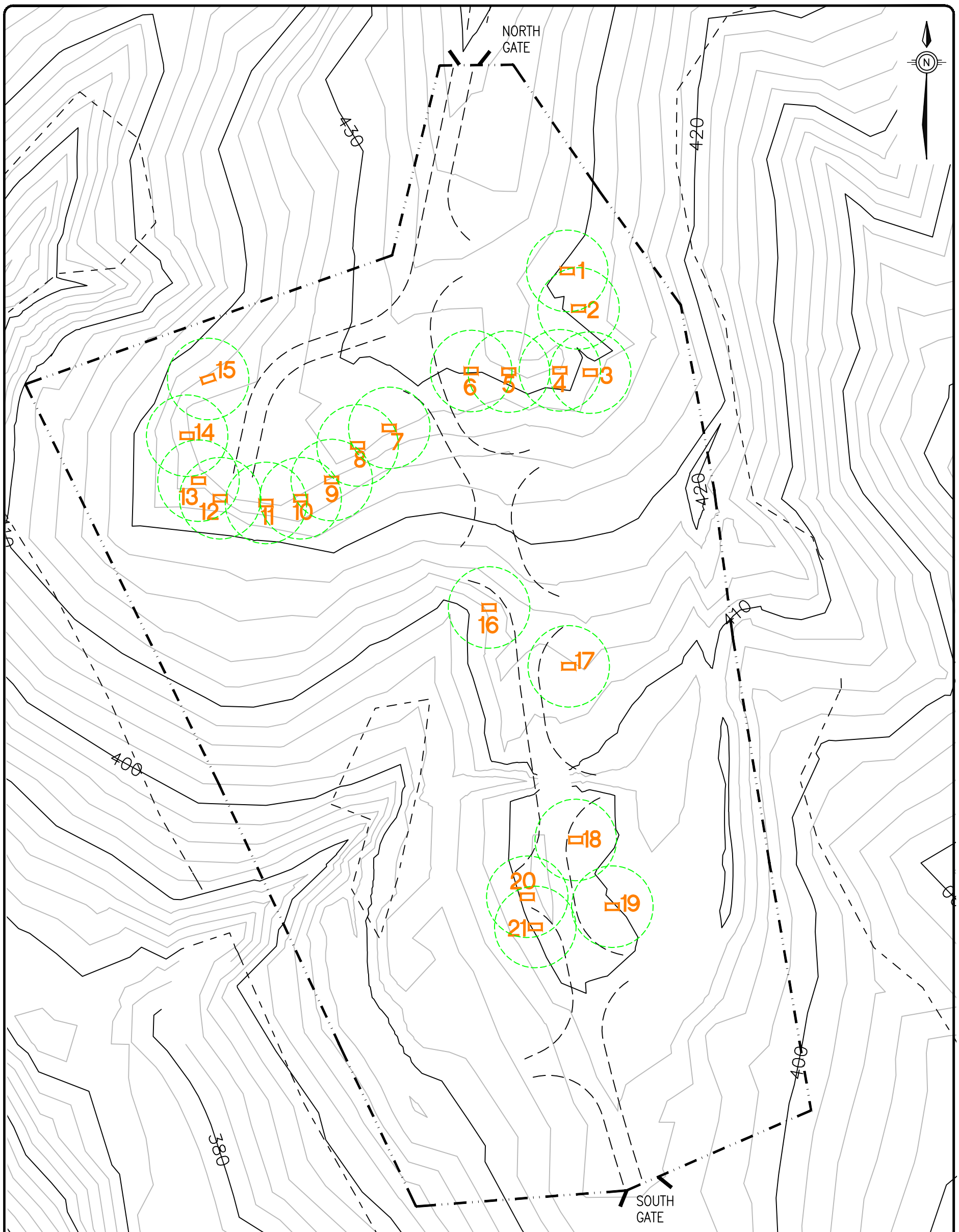
200 0 200  
 SCALE FEET  
 CONTOUR INTERVAL = 2'

FIGURE I-1  
 SITE LAYOUT OF HAZARDOUS WASTE OPEN BURN AREA (HWOBA) AND  
 HAZARDOUS WASTE OPEN BURN UNITS (HWOBU)  
 PART B PERMIT APPLICATION  
 KILGORE FLARES COMPANY, LLC  
 TOONE, TENNESSEE

REQUESTED BY:	G. POPE
DRAWN BY:	BRONSON
DWG DATE:	05/15/15
DWG NO.:	15139_B048

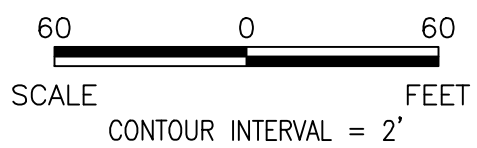
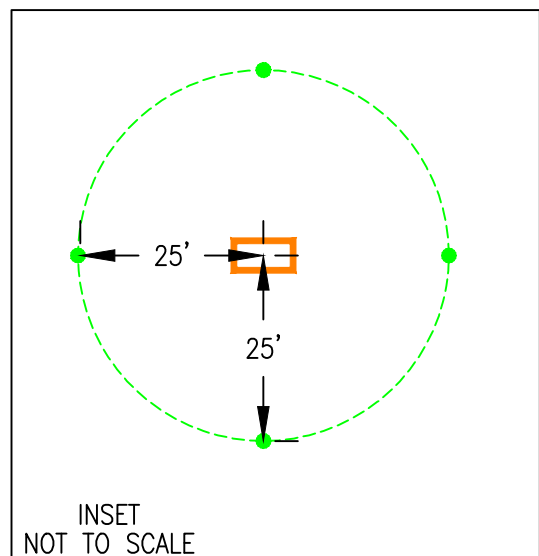
SOURCE: KILGORE FLARES COMPANY, LLC





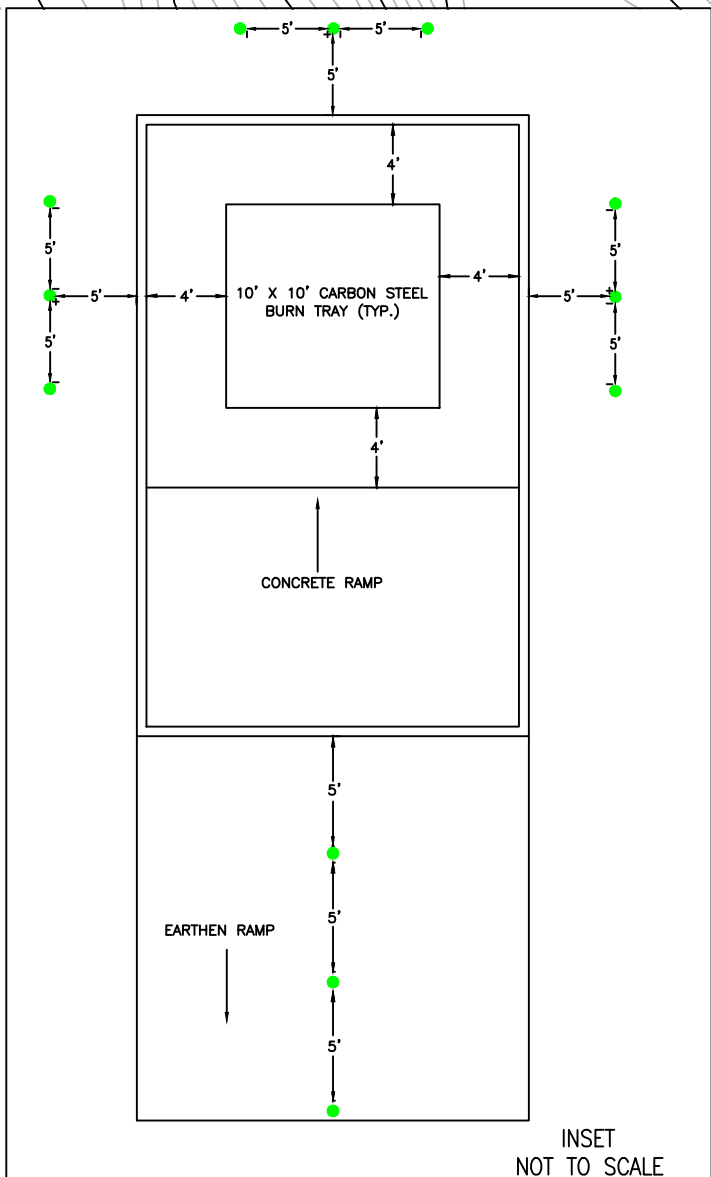
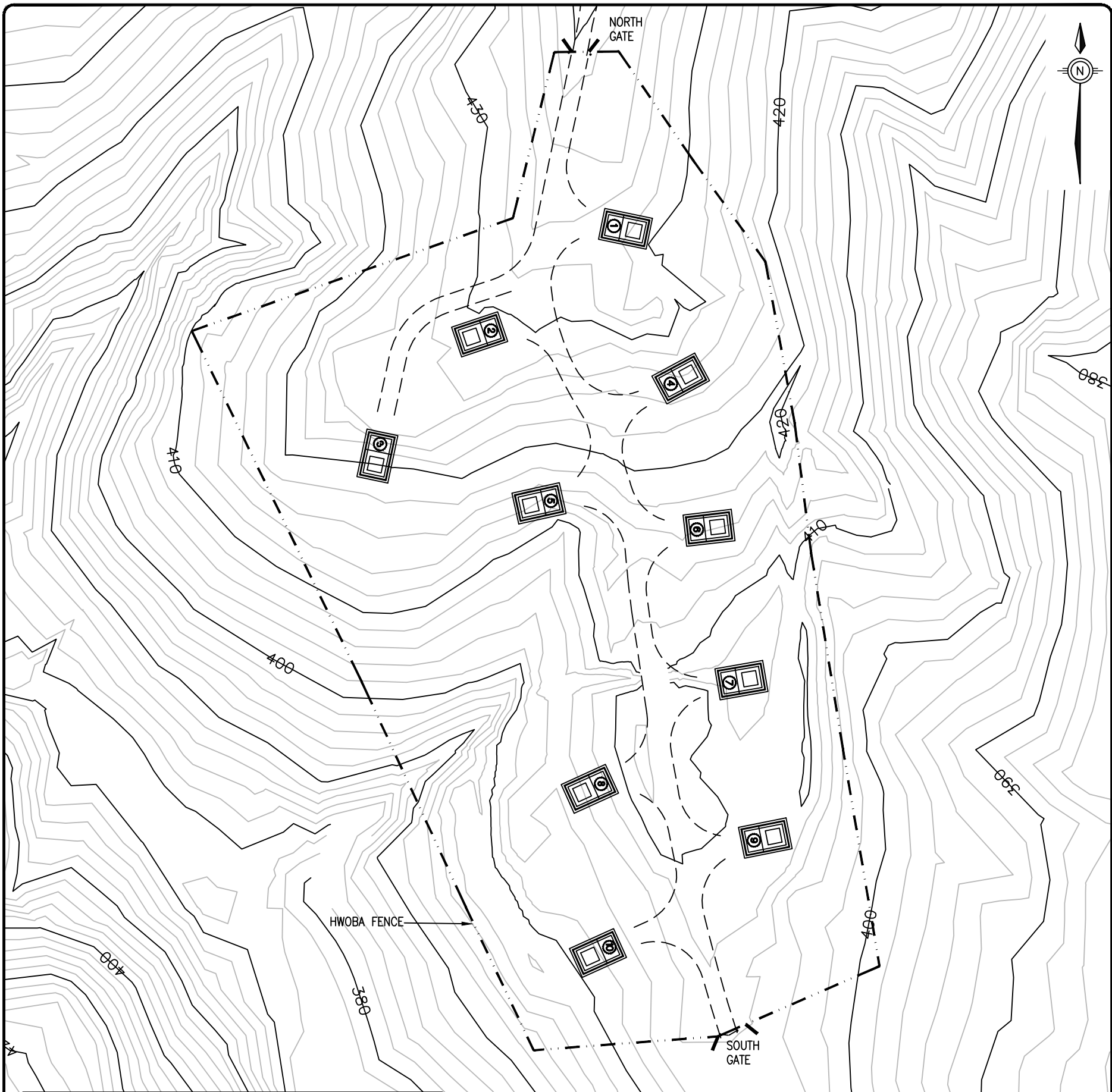
LEGEND

- HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
- GRAVEL ROAD
- CONTOUR LINES
- EXISTING INTERIM STATUS BURN PAN
- GRAB SAMPLE LOCATIONS



SOURCE: KILGORE FLARES COMPANY, LLC

FIGURE I-2 BIASED SOIL SAMPLING LOCATIONS EXISTING INTERIM STATUS HAZARDOUS WASTE OPEN BURN UNITS (HWOBUS) PART B PERMIT APPLICATION KILGORE FLARES COMPANY, LLC TOONE, TENNESSEE	
REQUESTED BY: G. POPE	 creative thinking. custom solutions. (800) 588-7962 www.ensafe.com
DRAWN BY: BRONSON	
DWG DATE: 05/16/15	
DWG NO: 15139_B073	



INSET  
NOT TO SCALE

SOURCE: KILGORE FLARES COMPANY, LLC

LEGEND

- PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOB)
- HAZARDOUS WASTE OPEN BURN AREA (HWOB) FENCE
- GRAVEL ROAD
- CONTOUR LINES
- GRAB SAMPLE LOCATIONS

NOTE: BIASED SAMPLING TO BE PERFORMED AT EACH PAD AS SHOWN IN INSET

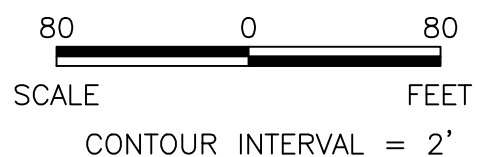
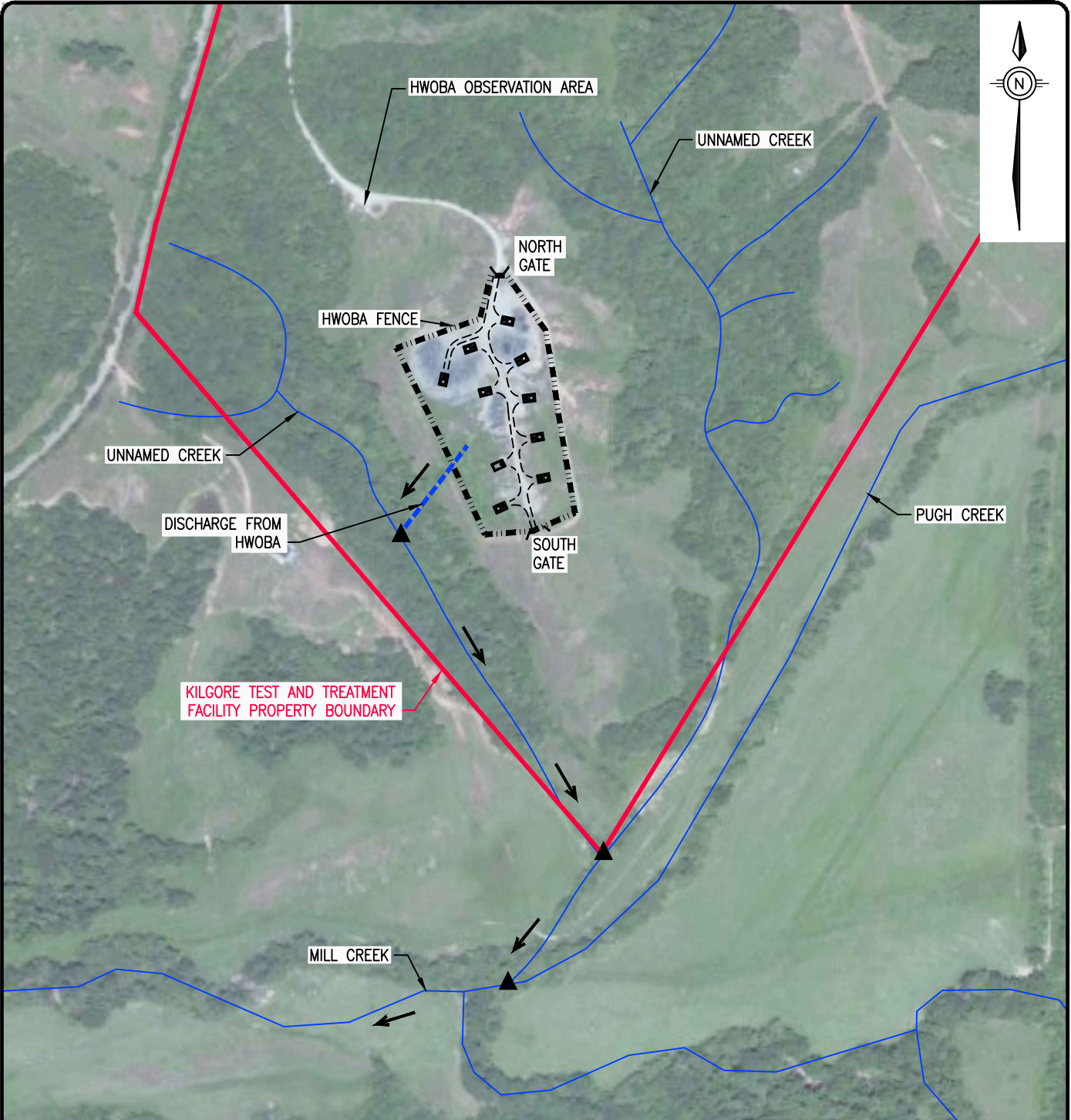


FIGURE I-3  
BIASED SOIL SAMPLING LOCATIONS  
OUTSIDE OF HAZARDOUS WASTE OPEN BURN UNIT  
(HWOB) CURBING  
PART B PERMIT APPLICATION  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

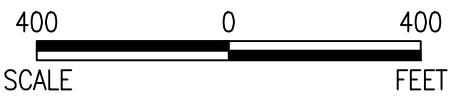
REQUESTED BY: G. POPE	
DRAWN BY: BRONSON	
DWG DATE: 05/15/15	
DWG NO: 15139_B049	



I:\CAD PROJECTS\15139_KILGORE_TN\PLANS\15139_B050_DRAINAGE_SWALES_AND_CREEKS_PART_B_KILGORE_TOONE_TN.DWG



World Imagery - Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

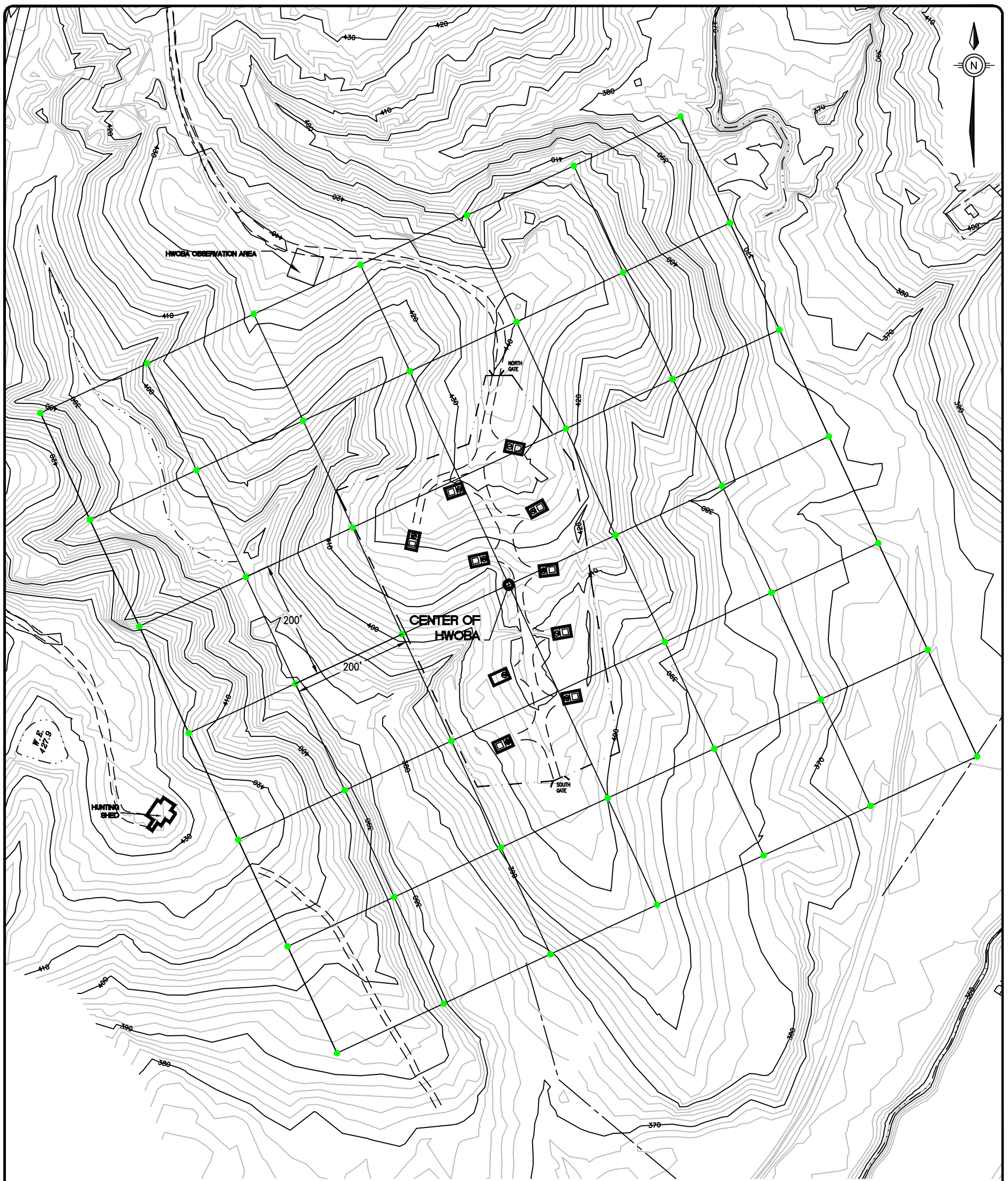


- LEGEND**
- PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
  - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
  - CREEK
  - DRAINAGE SWALE
  - SEDIMENT SAMPLING LOCATION
  - KILGORE TEST AND TREATMENT FACILITY PROPERTY BOUNDARY
  - FLOW DIRECTION

FIGURE I-4  
 BIASED DRAINAGE SWALE AND  
 CREEK SAMPLING LOCATIONS  
 PART B PERMIT APPLICATION  
 KILGORE FLARES COMPANY, LLC  
 TOONE, TENNESSEE

REQUESTED BY: G. POPE	<p>creative thinking.          custom solutions.™</p> <p>(800) 588-7962          www.ensafe.com</p>
DRAWN BY: BRONSON	
DWG DATE: 05/15/15	
DWG NO: 15139_B050	

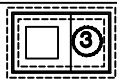


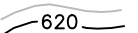





175 0 175  
SCALE FEET

CONTOUR INTERVAL = 2'

LEGEND

-  - PROPOSED HAZARDOUS WASTE OPEN BURN UNIT (HWOBU)
-  - HAZARDOUS WASTE OPEN BURN AREA (HWOBA) FENCE
-  - GRAVEL ROAD
-  - CONTOUR LINES
-  - GRAB SAMPLE LOCATIONS

NOTE: SOIL SAMPLING TO BE PERFORMED AT EACH GRID NODE AS SHOWN IN INSET

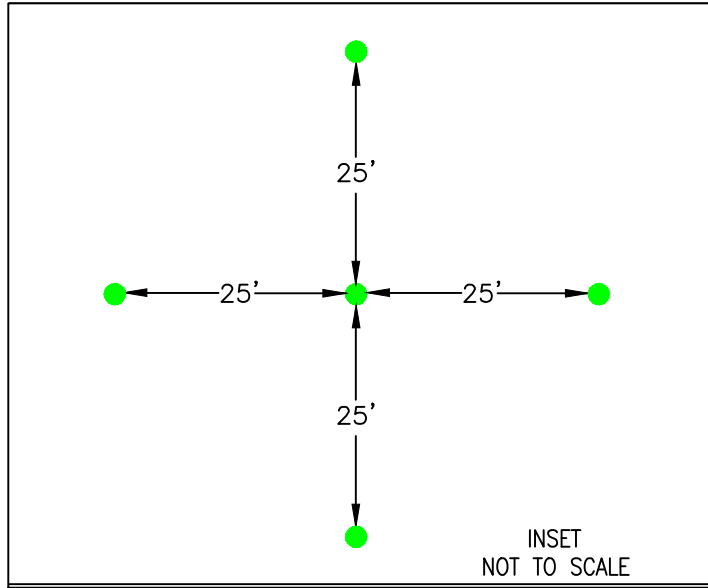



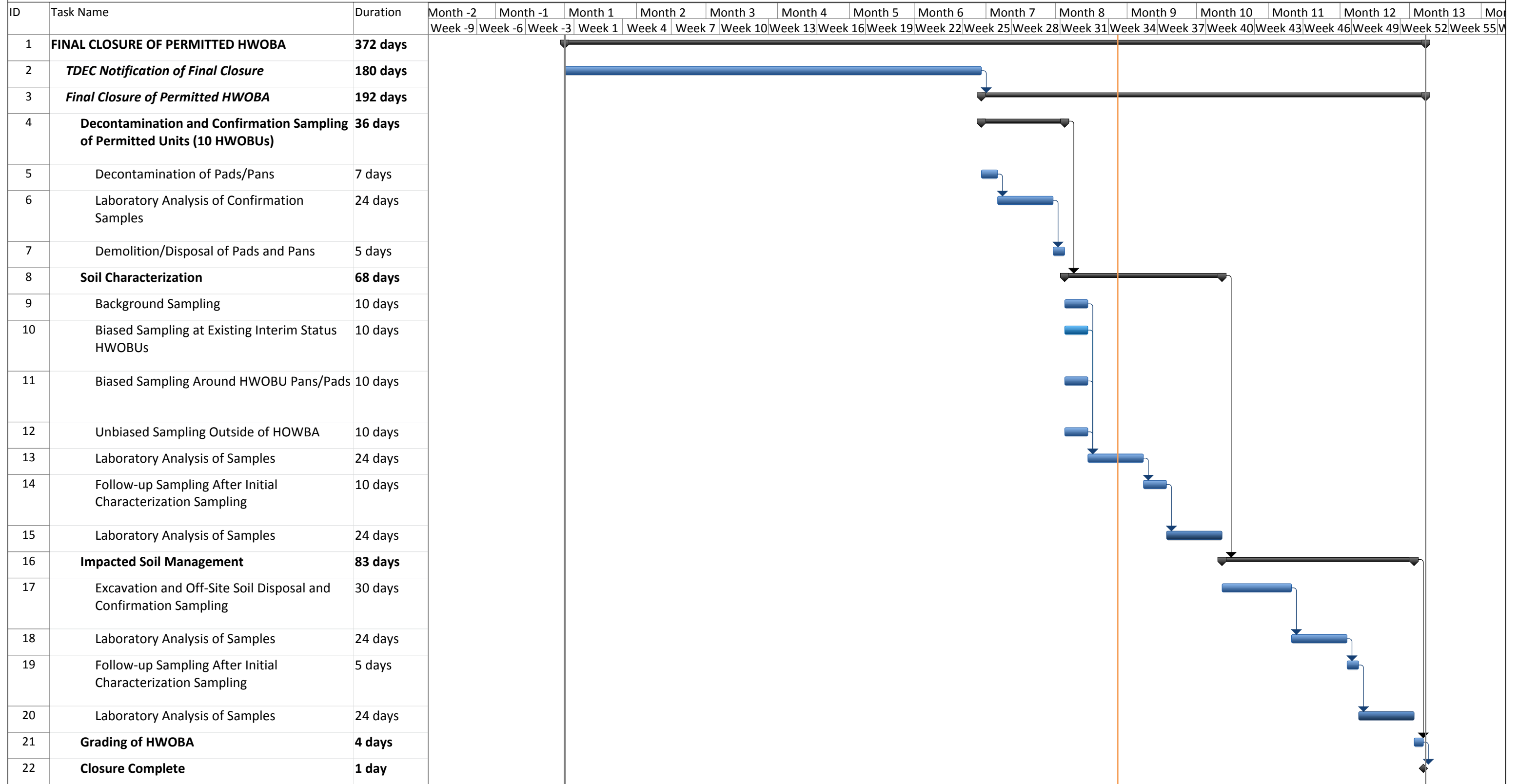
FIGURE I-5  
UNBIASED SAMPLING GRID  
PART B PERMIT APPLICATION  
KILGORE FLARES COMPANY, LLC  
TOONE, TENNESSEE

REQUESTED BY: G. POPE	 <small>creative thinking. custom solutions.</small> (800) 588-7962 www.ensafe.com
DRAWN BY: BRONSON	
DWG DATE: 05/15/15	
DWG NO: 15139_B051	

SOURCE: KILGORE FLARES COMPANY, LLC

**Appendix I-2**  
**Proposed Schedule for Final and Partial Closure**

**PROPOSED FINAL CLOSURE SCHEDULE  
PERMITTED HAZARDOUS WASTE OPEN BURN AREA**



Thu 5/28/15 Page 1 of 1	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

**Appendix I-3**  
**CostPro Output**

**Kilgore Flares Company, LLC**  
**TND981026594**

---

Address: 155 Kilgore Drive  
Toone  
TENNESSEE  
38381

Contact: Ron Kunkle  
731-228-5331

Comments:

---

<b>Activity</b>	<b>Units</b>	<b>Closure Cost</b>
Incinerators/BIFs	1	\$833,195.56

---

**\$833,195.56**

Additional Costs \$0.00

---

Total Estimated Cost **\$833,195.56**



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**Incinerators and BIFs Summary (IB_02-1)**

Removal of Waste Residue (IB-03)	\$0.00	
Decontamination of the Unit (IB-04)	\$30,617.00	
Disassembly of Ancillary Piping (IB-05)	\$0.00	
Demolition and Removal (IB-06)	\$150,843.76	
Removal of Soil (IB-07)	\$171,494.56	
Backfill and Grading (BF-01)	\$4,610.00	
Decontamination (DC-01)	\$0.00	
Sampling and Analysis (SA-02)	\$266,100.95	
Monitoring Well Installation (MW-01)	\$0.00	
Transportation (TR-01)	\$0.00	
Treatment and Disposal (TD-01)	\$5,650.00	
User Defined Cost (UD-01)	\$0.00	
Subtotal of Closure Costs	\$629,316.27	
Percentage of Engineering Expenses	10.0	%
Engineering Expenses	\$62,931.63	
Certification of Closure (IB-08)	\$6,000.00	
Subtotal	\$698,247.90	
Percentage of Contingency Allowance	15.0	%
Contingency Allowance	\$104,737.18	
Landfill Closure (Cover Installation) (CI-02)	\$30,210.48	
<b>TOTAL COST OF CLOSURE</b>	<b>\$833,195.56</b>	

## Incinerators and BIFs Inventory (IB_01-1)

### UNIT DESCRIPTION

Type of incinerator or BIF	Open burn pans	
Type of Air Pollution Control Device (APCD)	NA	
Type of heat recovery system	NA	
Length of ancillary piping	0.0	ft

### MAXIMUM VOLUME OF SCRUBBER LIQUID

Maximum Volume of Scrubber Liquid	0.0	gal
-----------------------------------	-----	-----

### MAXIMUM VOLUME OF NONLIQUID WASTE

Volume of incinerator or BIF ash	75.0	yd3
Volume of baghouse/cyclone/ESP dust	0.0	yd3
Volume of Nonliquid Waste	75.0	yd3

### SURFACE AREA OF INCINERATOR OR BIF

Surface area of combustion chamber(s)	2,000.0	ft2
Surface area of APCD	0.0	ft2
Surface area of heat recovery equipment	0.0	ft2
Surface area of exhaust gas duct	0.0	ft2
Surface area of stack	0.0	ft2
Surface Area of Incinerator or BIF	2,000.0	ft2

### SURFACE AREA OF ANCILLARY PIPING AND CONTAINMENT AREAS

Surface area of ancillary piping	0.0	ft2
Surface area of containment areas	0.0	ft2
Surface area of other structures	0.0	ft2
Surface Area of Ancillary Piping and Containment Areas	0.0	ft2

### VOLUME OF MATERIAL TO BE DEMOLISHED AND REMOVED

Volume of materials constituting the incineration system	9,180.0	ft3
Volume of ancillary piping materials	0.0	ft3
Volume of other miscellaneous materials (such as containment areas) to be removed	0.0	ft3
Volume of Materials to be Demolished and Removed	9,180.0	ft3
Volume of Materials to be Demolished and Removed in yd3	340.0	yd3

### VOLUME OF CONTAMINATED SOIL TO BE REMOVED

Length	700.0	ft
Width	58.0	ft

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

	Depth	0.5	ft
Volume of Contaminated Soil to be Removed		20,300.0	ft3
Volume of Contaminated Soil to be Removed in yd3		751.9	yd3

**Notes:** There are 10 70' x 58' burn areas where soil will be removed.

---

### Incinerators and BIFs Decontamination of the Unit (IB_04-1)

Surface area of unit to be cleaned	2,000.0	ft
Choose the appropriate level of PPE:		Protection Level C
Labor and equipment cost per work hour	\$699.00	per Work Hour
Work rate required to clean the unit	0.0040	Work hr per ft2
Number of hours required to clean the unit	8.0	Work hrs
Subtotal of labor and equipment cost to clean unit by steam cleaning	\$5,592.00	
Rate	2.5	gals per ft2
Volume of decontamination fluid	5,000.0	gal
Decontamination fluid is contained in:		Drums
Number of drums required to contain decontamination fluid	91	Drums
Cost of one drum	\$275.00	
Cost of drums needed to contain decontamination fluid	\$25,025.00	
TOTAL COST OF DECONTAMINATION OF THE UNIT	\$30,617.00	

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

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### Incinerators and BIFs Demolition and Removal (IB_06-1)

Total volume of unit to be demolished	340.0	yd3
Choose the appropriate level of PPE		Protection Level C
Labor and equipment cost per work hour	\$2,684.71	per Work Hour
Work rate required to demolish and remove one ft3	0.1647	Work hr per yd3
Number of hours required to demolish and remove the unit	56.0	Work hrs
Subtotal of labor and equipment cost to demolish and remove the unit	\$150,343.76	
Cost of mobilization and demobilization (flat rate)	\$500.00	
<b>TOTAL COST OF DEMOLITION AND REMOVAL</b>	<b>\$150,843.76</b>	

**Notes:** Labor and equipment cost per work hour includes the disposal costs for Concrete Pad Demolition Ash Transport Burn Tray and Debris Removal.

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

---

### Incinerators and BIFs Removal of Soil (IB_07-1)

Volume of contaminated soil to be removed	1,705.5	yd3
Choose the appropriate level of PPE	Protection Level C	
Labor and equipment cost per work hour	\$674.56	per Work Hour
Work rate required to remove one yd3	0.0739	Work hr per yd3
Number of hours required to remove soil	126.0	Work hrs
Cost to remove soil	\$84,994.56	
Number of debris box containers needed to hold soil	86	Containers
Cost of one 20-yd3 -capacity debris box container (rent per week)	\$1,000.00	per Container
Cost of debris box containers	\$86,000.00	
Cost of mobilization and demobilization (flat rate)	\$500.00	
<b>TOTAL COST OF REMOVAL OF SOIL</b>	<b>\$171,494.56</b>	

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

---

**Incinerators and BIFs Certification of Closure (IB_08-1)**

Number of units requiring certification of closure	1	Units
Cost of certification of closure per unit	\$6,000.00	
TOTAL COST OF CERTIFICATION OF CLOSURE	\$6,000.00	

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

---

**Backfill and Grading Summary (BF_01-1)**

Backfilling Excavated Areas (BF-02)	\$0.00
Grading to Provide Positive Slope (BF-03)	\$4,610.00
Backfilling Storage, Process, and Containment Pits (BF-04)	\$0.00
<b>TOTAL COST OF BACKFILL AND GRADING</b>	<b>\$4,610.00</b>



**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

---

### Grading To Provide Positive Slope (BF_03-1)

**AREA OF SITE TO BE GRADED WITH SLIGHT POSITIVE SLOPE**

Area of site	24,200.0	yd2
Area of site in acres (minimum of 1)	5	Acres

**COST FOR GRADING**

Labor and equipment cost per acre	\$822.00	per Acres
Subtotal of labor and equipment cost to grade site	\$4,110.00	

**EQUIPMENT FOR MOBILIZATION AND DEMOBILIZATION**

Cost of mobilization and demobilization (flat rate)	\$500.00	
<b>TOTAL COST OF GRADING SITE</b>	<b>\$4,610.00</b>	

---

### Cover Installation Summary (CI_02-1)

Installation of Undifferentiated Fill (CI-03)	\$0.00	
Installation of Clay Layer (CI-04)	\$0.00	
Installation of Geomembrane (CI-05)	\$0.00	
Installation of Drainage Layer (CI-06)	\$0.00	
Installation of Earthen Layer (CI-07)	\$0.00	
Installation of Topsoil (CI-08)	\$0.00	
Establishment of Vegetative Cover (CI-09)	\$22,886.73	
Installation of Colloid Clay Liner (CI-10)	\$0.00	
Installation of Asphalt Cover (CI-11)	\$0.00	
Subtotal of Closure Costs	\$22,886.73	
Percentage of Engineering Expenses	10.0	%
Engineering Expenses	\$2,288.67	
Survey Plat (CI-12)	\$0.00	
Subtotal	\$25,175.40	
Percentage of Contingency Allowance	20.0	%
Contingency Allowance	\$5,035.08	
TOTAL COST OF COVER	\$30,210.48	

---

## Establishment of Vegetative Cover (CI_09-1)

### SOIL PREPARATION

Area of cover	217,800.0	ft2
Area of cover in thousand square feet (MSF)	217.8	MSF
Labor and equipment cost per MSF	\$26.57	per MSF
Subtotal of labor and equipment cost to prepare soil	\$5,786.95	
Cost of mobilization and demobilization (flat rate)	\$500.00	
Cost to Prepare Soil	\$6,286.95	

### SEEDING, FERTILIZING, AND MULCHING

Labor, material, and equipment cost per MSF	\$73.92	per MSF
Subtotal of labor and equipment cost to seed, fertilize, and mulch	\$16,099.78	
Cost of mobilization and demobilization (flat rate)	\$500.00	
Cost to Seed, Fertilize, and Mulch	\$16,599.78	
TOTAL COST OF ESTABLISHMENT OF VEGETATIVE COVER	\$22,886.73	

---

### Sampling and Analysis Summary (SA_02-1)

Drilling and Subsurface Soil Sample - 2.5-Inch-Diameter-Holes (SA-03)	\$0.00
Drilling and Subsurface Soil Sample - 4-Inch-Diameter-Holes (SA- 04)	\$247,014.80
Concrete Core Sample (SA-05)	\$7,354.50
Wipe Sample (SA-06)	\$6,145.15
Surface Water and Liquid Sample (SA-07)	\$5,586.50
Soil, Sludge, and Sediment Sample (SA-08)	\$0.00
Groundwater Sample (SA-09)	\$0.00
Soil-Pore Liquid Sample (SA-10)	\$0.00
Analysis of Subsurface Soil Sample (SA-11)	\$0.00
TOTAL SAMPLING AND ANALYSIS COST	\$266,100.95

**Drilling and Subsurface Soil Samples - 4-Inch-Diameter-Holes (SA_04-2)**

**DRILLING AND SUBSURFACE SOIL SAMPLE COSTS - 4-INCH-DIAMETER-HOLES**

Number of borings to be drilled	29	Borings
Enter depth of boreholes (sum of all)	15	ft
Choose the appropriate drilling method	Auger Boring - Level C	
Labor and equipment cost per work hour	\$313.60	per Work Hour
Choose the appropriate drilling method	Hollow-Stem Auger 4-Inch	
Work rate to drill 4-inch-diameter hole	0.5333	Work hr per Ft
Number of hours required to drill 4-inch diameter hole	8.0	Work hrs
Cost of Drilling 4-Inch Borings per Sampling Event	\$2,508.80	per Event

**ANALYSIS OF DRILLING SAMPLE**

Cost of Analysis per Sampling Event	\$10,125.00	per Event
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**SAMPLING EVENTS**

Number of sampling events	1	Events
TOTAL COST OF S&A OF DRILLING AND SUBSURFACE SOIL SAMPLES FOR CLOSURE - 4-INCH-DIAMETER-HOLES	\$12,633.80	
TOTAL COST OF S&A OF DRILLING AND SUBSURFACE SOIL SAMPLES PER EVENT - 4-INCH-DIAMETER-HOLES	\$12,633.80	per Event

**Notes:** Analysis of Ignitability (SW 1010/1020) presented as a place holder for Explosives (SW 846 8330) since Explosives (SW 846 8330) are not included in the CostPro's Sampling and Analysis Costs . The cost listed for Ignitability correlates with the cost for explosives with the listed method. Analytical cost estimates are from Test America and sample quantities include a 10% increase for QA/QC. Analysis of Paint Filter Test (SW 9095) presented as a place holder for Perchlorate (SW 8650) since Perchlorate (8650) are not included in the CostPro's Sampling and Analysis Costs

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

**Drilling and Subsurface Soil Samples - 4-Inch-Diameter-Holes (SA_04)**  
**Cost of Analysis per Sampling Event**

<b>Method</b>		<b>Standard</b>	<b>Qty</b>	<b>Quick</b>	<b>Qty</b>	<b>Total</b>
Ignitability (SW 1010/1020)	Both	\$213.00	15	\$238.00	0	\$3,195.00
Paint filter test (SW 9095)	Solid	\$180.00	15	\$48.06	0	\$2,700.00
TAL metals (SW 6010/7000s)	Both	\$144.00	15	\$166.00	0	\$2,160.00
TCLP (RCRA) (SW 1311)	Both	\$138.00	15	\$133.00	0	\$2,070.00

**Drilling and Subsurface Soil Samples - 4-Inch-Diameter-Holes (SA_04-1)**

**DRILLING AND SUBSURFACE SOIL SAMPLE COSTS - 4-INCH-DIAMETER-HOLES**

Number of borings to be drilled	490	Borings
Enter depth of boreholes (sum of all)	980	ft
Choose the appropriate drilling method	Auger Boring - Level D	
Labor and equipment cost per work hour	\$405.36	per Work Hour
Choose the appropriate drilling method	Hollow-Stem Auger 4-Inch	
Work rate to drill 4-inch-diameter hole	0.1020	Work hr per Ft
Number of hours required to drill 4-inch diameter hole	100.0	Work hrs
Cost of Drilling 4-Inch Borings per Sampling Event	\$40,536.00	per Event

**ANALYSIS OF DRILLING SAMPLE**

Cost of Analysis per Sampling Event	\$193,845.00	per Event
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**SAMPLING EVENTS**

Number of sampling events	1	Events
TOTAL COST OF S&A OF DRILLING AND SUBSURFACE SOIL SAMPLES FOR CLOSURE - 4-INCH-DIAMETER-HOLES	\$234,381.00	
TOTAL COST OF S&A OF DRILLING AND SUBSURFACE SOIL SAMPLES PER EVENT - 4-INCH-DIAMETER-HOLES	\$234,381.00	per Event

**Notes:** Analysis of Ignitability (SW 1010/1020) presented as a place holder for Explosives (SW 846 8330) since Explosives (SW 846 8330) are not included in the CostPro's Sampling and Analysis Costs . The cost listed for Ignitability correlates with the cost for explosives with the listed method. Analytical cost estimates are from Test America and sample quantities include a 10% increase for QA/QC. Analysis of Paint Filter Test (SW 9095) presented as a place holder for Perchlorate (SW 8650) since Perchlorate (8650) are not included in the CostPro's Sampling and Analysis Costs

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

**Drilling and Subsurface Soil Samples - 4-Inch-Diameter-Holes (SA_04)**  
**Cost of Analysis per Sampling Event**

<b>Method</b>		<b>Standard</b>	<b>Qty</b>	<b>Quick</b>	<b>Qty</b>	<b>Total</b>
Dioxins & Dibenzofurans (SW 3550/SW 8280)	Solid	\$949.00	30	\$1,092.00	0	\$28,470.00
Ignitability (SW 1010/1020)	Both	\$213.00	245	\$238.00	0	\$52,185.00
Paint filter test (SW 9095)	Solid	\$180.00	245	\$48.06	0	\$44,100.00
TAL metals (SW 6010/7000s)	Both	\$144.00	245	\$166.00	0	\$35,280.00
TCLP (RCRA) (SW 1311)	Both	\$138.00	245	\$133.00	0	\$33,810.00



## Concrete Core Samples (SA_05-1)

### COLLECTION OF CORE SAMPLES

Number of corings to be drilled	11	Coring Samples
Choose the appropriate level of PPE		Protection Level C
Labor and equipment cost per work hour	\$636.50	per Work Hour
Work rate to drill each core sample to a 6-inch depth	0.2727	Work hrs per Sample
Number of hours required to drill 3-inch-diameter boring	3.0	Work hrs
Cost of Collection per Sampling Event	\$1,909.50	per Event

### ANALYSIS OF DRILLING SAMPLE

Cost of Analysis per Sampling Event	\$5,445.00	per Event
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### SAMPLING EVENTS

Number of sampling events	1	Events per yr
<b>TOTAL COST OF SAMPLING AND ANALYSIS OF CORE SAMPLES</b>	<b>\$7,354.50</b>	

**Notes:** Analysis of Ignitability (SW 1010/1020) presented as a place holder for Explosives (SW 846 8330) since Explosives (SW 846 8330) are not included in the CostPro's Sampling and Analysis Costs . The cost listed for Ignitability correlates with the cost for explosives with the listed method. Analytical cost estimates are from Test America and sample quantities include a 10% increase for QA/QC.

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

**Concrete Core Samples (SA_05)  
Cost of Analysis per Sampling Event**

<b>Method</b>		<b>Standard</b>	<b>Qty</b>	<b>Quick</b>	<b>Qty</b>	<b>Total</b>
Ignitability (SW 1010/1020)	Both	\$213.00	11	\$238.00	0	\$2,343.00
TAL metals (SW 6010/7000s)	Both	\$144.00	11	\$166.00	0	\$1,584.00
TCLP (RCRA) (SW 1311)	Both	\$138.00	11	\$133.00	0	\$1,518.00

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

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## Wipe Samples (SA_06-1)

### COLLECTION OF WIPE SAMPLES

Number of sampling locations	11	Sample Location
Choose the appropriate level of PPE		Protection Level C
Labor and equipment cost per work hour	\$636.50	per Work Hour
Work rate required to collect samples from one sampling location	0.1000	Work hrs per Sample
Number of hours required to collect all samples	1.1	Work hrs
Cost of Collection per Sampling Event	\$700.15	per Event

### ANALYSIS OF WIPE SAMPLE

Cost of Analysis per Sampling Event	\$5,445.00	per Event
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### SAMPLING EVENTS

Number of sampling events	1	Events
TOTAL COST OF SAMPLING AND ANALYSIS OF WIPE SAMPLES	\$6,145.15	

**Notes:** Analysis of Ignitability (SW 1010/1020) presented as a place holder for Explosives (SW 846 8330) since Explosives (SW 846 8330) are not included in the CostPro's Sampling and Analysis Costs . The cost listed for Ignitability correlates with the cost for explosives with the listed method. Analytical cost estimates are from Test America and sample quantities include a 10% increase for QA/QC.

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

**Wipe Samples (SA_06)**  
**Cost of Analysis per Sampling Event**

<b>Method</b>		<b>Standard</b>	<b>Qty</b>	<b>Quick</b>	<b>Qty</b>	<b>Total</b>
Ignitability (SW 1010/1020)	Both	\$213.00	11	\$238.00	0	\$2,343.00
TAL metals (SW 6010/7000s)	Both	\$144.00	11	\$166.00	0	\$1,584.00
TCLP (RCRA) (SW 1311)	Both	\$138.00	11	\$133.00	0	\$1,518.00

## Surface Water and Liquid Samples (SA_07-2)

### COLLECTION OF SURFACE WATER AND LIQUID SAMPLES

Number of sampling locations	3	Sample Location
Choose the appropriate level of PPE		Protection Level D
Labor and equipment cost per work hour	\$313.16	per Work Hour
Work rate required to collect samples from one sampling location	0.6667	Work hrs per Sample
Number of hours required to collect all samples	2.0	Work hrs
Cost of Collection per Sampling Event	\$626.32	per Event

### ANALYSIS OF SURFACE WATER AND LIQUID SAMPLES

Cost of Analysis per Sampling Event	\$1,485.00	per Event
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### SAMPLING EVENTS

Number of sampling events	0	Events
TOTAL COST OF SAMPLING AND ANALYSIS OF SURFACE WATER AND LIQUID SAMPLES	\$0.00	

**Notes:** Analysis of Ignitability (SW 1010/1020) presented as a place holder for Explosives (SW 846 8330) since Explosives (SW 846 8330) are not included in the CostPro's Sampling and Analysis Costs . The cost listed for Ignitability correlates with the cost for explosives with the listed method. Analytical cost estimates are from Test America.

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

**Surface Water and Liquid Samples (SA_07)**  
**Cost of Analysis per Sampling Event**

<b>Method</b>		<b>Standard</b>	<b>Qty</b>	<b>Quick</b>	<b>Qty</b>	<b>Total</b>
Ignitability (SW 1010/1020)	Both	\$213.00	3	\$238.00	0	\$639.00
TAL metals (SW 6010/7000s)	Both	\$144.00	3	\$166.00	0	\$432.00
TCLP (RCRA) (SW 1311)	Both	\$138.00	3	\$133.00	0	\$414.00

**Surface Water and Liquid Samples (SA_07-1)**

**COLLECTION OF SURFACE WATER AND LIQUID SAMPLES**

Number of sampling locations	10	Sample Location
Choose the appropriate level of PPE		Protection Level C
Labor and equipment cost per work hour	\$636.50	per Work Hour
Work rate required to collect samples from one sampling location	0.1000	Work hrs per Sample
Number of hours required to collect all samples	1.0	Work hrs
Cost of Collection per Sampling Event	\$636.50	per Event

**ANALYSIS OF SURFACE WATER AND LIQUID SAMPLES**

Cost of Analysis per Sampling Event	\$4,950.00	per Event
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**SAMPLING EVENTS**

Number of sampling events	1	Events
<b>TOTAL COST OF SAMPLING AND ANALYSIS OF SURFACE WATER AND LIQUID SAMPLES</b>	<b>\$5,586.50</b>	

**Notes:** Analysis of Ignitability (SW 1010/1020) presented as a place holder for Explosives (SW 846 8330) since Explosives (SW 846 8330) are not included in the CostPro's Sampling and Analysis Costs . The cost listed for Ignitability correlates with the cost for explosives with the listed method. Analytical cost estimates are from Test America.

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

**Surface Water and Liquid Samples (SA_07)**  
**Cost of Analysis per Sampling Event**

<b>Method</b>		<b>Standard</b>	<b>Qty</b>	<b>Quick</b>	<b>Qty</b>	<b>Total</b>
Ignitability (SW 1010/1020)	Both	\$213.00	10	\$238.00	0	\$2,130.00
TAL metals (SW 6010/7000s)	Both	\$144.00	10	\$166.00	0	\$1,440.00
TCLP (RCRA) (SW 1311)	Both	\$138.00	10	\$133.00	0	\$1,380.00



**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Final Closure

05/27/2015

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**Treatment and Disposal Summary (TD_01-1)**

Treatment and Disposal of Wastes (TD-02)	\$0.00
Treatment and Disposal of Decontamination Fluids (TD-03)	\$5,650.00
Total Cost of Treatment and Disposal	\$5,650.00

### Treatment and Disposal of Decon Fluid (TD_03-1)

**Volume of decontamination fluid generated from closure activities**

Volume of decontamination fluid from Primary Unit	0.0	gal
Volume of decontamination fluid generated by steam cleaning or pressure washing (DC-02)	0.0	gal
Volume of decontamination fluid from heavy equipment (DC-04)	0.0	gal
Total Volume of Decontamination Fluid	1,000.0	gal
Choose the appropriate level of PPE		Protection Level D
Labor and equipment cost per hour	\$100.00	per Work Hour
Work rate to pump decontamination fluid to a holding tank	0.0040	Work hr per gal
Number of hours required to pump decontamination fluid to a holding tank	4	Work hrs
Subtotal of labor and equipment costs to pump decontamination fluid to a holding tank	\$400.00	
Number of days required to rent a holding tank	1	Days
Holding tank rental fee (10,000 gal tank per day)	\$250.00	per Day
Number of tanks required	1	Tanks
Subtotal of tank rental costs	\$250.00	
Cost for treatment and disposal	\$5.00	per Gallon
Treatment and disposal costs for bulk liquid	\$5,000.00	
<b>TOTAL COST TO TREAT AND DISPOSE OF DECONTAMINATION FLUID AS A BULK LIQUID</b>	<b>\$5,650.00</b>	

**Kilgore Flares Company, LLC**  
**TND981026594**

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Address: 155 Kilgore Drive  
Toone  
TENNESSEE  
38381

Contact: Ron Kunkle  
731-228-5331

Comments:

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<b>Activity</b>	<b>Units</b>	<b>Closure Cost</b>
Incinerators/BIFs	1	\$68,262.98

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**\$68,262.98**

Additional Costs \$0.00

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Total Estimated Cost **\$68,262.98**

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**Incinerators and BIFs Summary (IB_02-1)**

Removal of Waste Residue (IB-03)	\$0.00	
Decontamination of the Unit (IB-04)	\$19,047.08	
Disassembly of Ancillary Piping (IB-05)	\$0.00	
Demolition and Removal (IB-06)	\$0.00	
Removal of Soil (IB-07)	\$0.00	
Backfill and Grading (BF-01)	\$0.00	
Decontamination (DC-01)	\$0.00	
Sampling and Analysis (SA-02)	\$19,461.20	
Monitoring Well Installation (MW-01)	\$0.00	
Transportation (TR-01)	\$0.00	
Treatment and Disposal (TD-01)	\$10,000.00	
User Defined Cost (UD-01)	\$0.00	
Subtotal of Closure Costs	\$48,508.28	
Percentage of Engineering Expenses	10.0	%
Engineering Expenses	\$4,850.83	
Certification of Closure (IB-08)	\$6,000.00	
Subtotal	\$59,359.11	
Percentage of Contingency Allowance	15.0	%
Contingency Allowance	\$8,903.87	
Landfill Closure (Cover Installation) (CI-02)	\$0.00	
<b>TOTAL COST OF CLOSURE</b>	<b>\$68,262.98</b>	

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## Incinerators and BIFs Inventory (IB_01-1)

### UNIT DESCRIPTION

	Type of incinerator or BIF	Inteirm Status	
		OB Pans	
	Type of Air Pollution Control Device (APCD)	NA	
	Type of heat recovery system	NA	
	Length of ancillary piping	0.0	ft
<b>MAXIMUM VOLUME OF SCRUBBER LIQUID</b>			
	Maximum Volume of Scrubber Liquid	0.0	gal
<b>MAXIMUM VOLUME OF NONLIQUID WASTE</b>			
	Volume of incinerator or BIF ash	50.0	yd3
	Volume of baghouse/cyclone/ESP dust	0.0	yd3
	Volume of Nonliquid Waste	50.0	yd3
<b>SURFACE AREA OF INCINERATOR OR BIF</b>			
	Surface area of combustion chamber(s)	1,680.0	ft2
	Surface area of APCD	0.0	ft2
	Surface area of heat recovery equipment	0.0	ft2
	Surface area of exhaust gas duct	0.0	ft2
	Surface area of stack	0.0	ft2
	Surface Area of Incinerator or BIF	1,680.0	ft2
<b>SURFACE AREA OF ANCILLARY PIPING AND CONTAINMENT AREAS</b>			
	Surface area of ancillary piping	0.0	ft2
	Surface area of containment areas	0.0	ft2
	Surface area of other structures	0.0	ft2
	Surface Area of Ancillary Piping and Containment Areas	0.0	ft2
<b>VOLUME OF MATERIAL TO BE DEMOLISHED AND REMOVED</b>			
	Volume of materials constituting the incineration system	0.0	ft3
	Volume of ancillary piping materials	0.0	ft3
	Volume of other miscellaneous materials (such as containment areas) to be removed	0.0	ft3
	Volume of Materials to be Demolished and Removed	0.0	ft3
	Volume of Materials to be Demolished and Removed in yd3	0.0	yd3
<b>VOLUME OF CONTAMINATED SOIL TO BE REMOVED</b>			
	Length	0.0	ft

**Facility:** Kilgore Flares Company, LLC      **Unit:** Partial Closure Activities      05/27/2015

Width	0.0	ft
Depth	0.0	ft
Volume of Contaminated Soil to be Removed	0.0	ft3
Volume of Contaminated Soil to be Removed in yd3	0.0	yd3

**Incinerators and BIFs Decontamination of the Unit (IB_04-1)**

Surface area of unit to be cleaned	1,680.0	ft
Choose the appropriate level of PPE:		Protection Level C
Labor and equipment cost per work hour	\$438.42	per Work Hour
Work rate required to clean the unit	0.0143	Work hr per ft2
Number of hours required to clean the unit	24.0	Work hrs
Subtotal of labor and equipment cost to clean unit by steam cleaning	\$10,522.08	
Rate	1.0	gals per ft2
Volume of decontamination fluid	1,680.0	gal
Decontamination fluid is contained in:		Drums
Number of drums required to contain decontamination fluid	31	Drums
Cost of one drum	\$275.00	
Cost of drums needed to contain decontamination fluid	\$8,525.00	
<b>TOTAL COST OF DECONTAMINATION OF THE UNIT</b>	<b>\$19,047.08</b>	

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Partial Closure Activities

05/27/2015

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**Incinerators and BIFs Certification of Closure (IB_08-1)**

Number of units requiring certification of closure	1	Units
Cost of certification of closure per unit	\$6,000.00	
TOTAL COST OF CERTIFICATION OF CLOSURE	\$6,000.00	



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### Sampling and Analysis Summary (SA_02-1)

Drilling and Subsurface Soil Sample - 2.5-Inch-Diameter-Holes (SA-03)	\$0.00
Drilling and Subsurface Soil Sample - 4-Inch-Diameter-Holes (SA- 04)	\$0.00
Concrete Core Sample (SA-05)	\$0.00
Wipe Sample (SA-06)	\$17,615.20
Surface Water and Liquid Sample (SA-07)	\$1,846.00
Soil, Sludge, and Sediment Sample (SA-08)	\$0.00
Groundwater Sample (SA-09)	\$0.00
Soil-Pore Liquid Sample (SA-10)	\$0.00
Analysis of Subsurface Soil Sample (SA-11)	\$0.00
TOTAL SAMPLING AND ANALYSIS COST	\$19,461.20

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Partial Closure Activities

05/27/2015

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## Wipe Samples (SA_06-1)

### COLLECTION OF WIPE SAMPLES

Number of sampling locations	24	Sample Location
Choose the appropriate level of PPE		Protection Level C
Labor and equipment cost per work hour	\$428.00	per Work Hour
Work rate required to collect samples from one sampling location	0.5600	Work hrs per Sample
Number of hours required to collect all samples	13.4	Work hrs
Cost of Collection per Sampling Event	\$5,735.20	per Event

### ANALYSIS OF WIPE SAMPLE

Cost of Analysis per Sampling Event	\$11,880.00	per Event
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### SAMPLING EVENTS

Number of sampling events	1	Events
TOTAL COST OF SAMPLING AND ANALYSIS OF WIPE SAMPLES	\$17,615.20	

**Notes:** Analysis of Ignitability (SW 1010/1020) presented as a place holder for Explosives (SW 846 8330) since Explosives (SW 846 8330) are not included in the Cost Pro's Sampling and Analysis Costs . The cost listed for Ignitability correlates with the cost for explosives with the listed method. Analytical cost estimates are from Test America and sample quantities include a 10% increase for QA/QC.

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Partial Closure Activities

05/27/2015

**Wipe Samples (SA_06)**  
**Cost of Analysis per Sampling Event**

<b>Method</b>		<b>Standard</b>	<b>Qty</b>	<b>Quick</b>	<b>Qty</b>	<b>Total</b>
Ignitability (SW 1010/1020)	Both	\$213.00	24	\$61.80	0	\$5,112.00
TAL metals (SW 6010/7000s)	Both	\$144.00	24	\$596.72	0	\$3,456.00
TCLP (RCRA) (SW 1311)	Both	\$138.00	24	\$1,138.50	0	\$3,312.00

## Surface Water and Liquid Samples (SA_07-1)

### COLLECTION OF SURFACE WATER AND LIQUID SAMPLES

Number of sampling locations	2	Sample Location
Choose the appropriate level of PPE		Protection Level C
Labor and equipment cost per work hour	\$428.00	per Work Hour
Work rate required to collect samples from one sampling location	1.0000	Work hrs per Sample
Number of hours required to collect all samples	2.0	Work hrs
Cost of Collection per Sampling Event	\$856.00	per Event

### ANALYSIS OF SURFACE WATER AND LIQUID SAMPLES

Cost of Analysis per Sampling Event	\$990.00	per Event
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### SAMPLING EVENTS

Number of sampling events	1	Events
TOTAL COST OF SAMPLING AND ANALYSIS OF SURFACE WATER AND LIQUID SAMPLES	\$1,846.00	

**Notes:** Analysis of Ignitability (SW 1010/1020) presented as a place holder for Explosives (SW 846 8330) since Explosives (SW 846 8330) are not included in the Cost Pro's Sampling and Analysis Costs . The cost listed for Ignitability correlates with the cost for explosives with the listed method. Analytical cost estimates are from Test America.

**Facility:** Kilgore Flares Company, LLC      **Unit:** Partial Closure Activities      05/27/2015

**Surface Water and Liquid Samples (SA_07)**  
**Cost of Analysis per Sampling Event**

<b>Method</b>		<b>Standard</b>	<b>Qty</b>	<b>Quick</b>	<b>Qty</b>	<b>Total</b>
Ignitability (SW 1010/1020)	Both	\$213.00	2	\$238.00	0	\$426.00
TAL metals (SW 6010/7000s)	Both	\$144.00	2	\$166.00	0	\$288.00
TCLP (RCRA) (SW 1311)	Both	\$138.00	2	\$133.00	0	\$276.00

**Facility:** Kilgore Flares Company,  
LLC

**Unit:** Partial Closure Activities

05/27/2015

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### Treatment and Disposal Summary (TD_01-1)

Treatment and Disposal of Wastes (TD-02)	\$10,000.00
Treatment and Disposal of Decontamination Fluids (TD-03)	\$0.00
Total Cost of Treatment and Disposal	\$10,000.00

## Treatment and Disposal of Waste (TD_02-1)

### SOLID WASTE TREATMENT AND DISPOSAL

Solid Waste Type (Optional: Enter Name)	Ash and Burn Trays	
Volume in yd3 of solid waste to be treated and disposed of	50.0	yd3
Treatment and disposal costs per yd3	\$200.00	per yd3
Cost to Treat and Dispose of Solid Waste	\$10,000.00	

### LIQUID WASTE TREATMENT AND DISPOSAL

Liquid Waste Type (Optional: Enter Name)	0	
Volume in gallons of liquid waste to be treated and disposed of	0.0	gal
Treatment and disposal costs per gallon	\$0.00	per Gallon
Cost to Treat and Dispose of Liquid Waste	\$0.00	

### DRUMMED WASTE TREATMENT AND DISPOSAL

Drummed Waste Type (Optional: Enter Name)	0	
Number of drums to be treated and disposed of	0	Drums
Treatment and disposal costs per drum	\$0.00	per Drum
Cost to Treat and Dispose of Drummed Waste	\$0.00	
<b>TOTAL COST FOR TREATMENT AND DISPOSAL OF WASTE</b>	<b>\$10,000.00</b>	

**Notes:** Volume in yd3 of solid waste to be treated and disposed of consists of 20 yd3 of ash and 1 yd3 for each burn tray on site.

**Appendix I-4**  
**Financial Assurance Mechanism**



AMENDMENT TO IRREVOCABLE STANDBY LETTER OF CREDIT

ISSUING BANK:  
CITIZENS BANK OF PENNSYLVANIA  
INTERNATIONAL TRADE DEPT.  
20 CABOT ROAD, M/S MMF470  
MEDFORD, MA 02155 U.S.A.

L/C NUMBER: S905146  
AMENDMENT NO. 007

DATE OF ISSUE:  
OCTOBER 31, 2007

DATE OF THIS AMENDMENT:  
NOVEMBER 21, 2013

BENEFICIARY:  
TENNESSEE DEPARTMENT OF ENVIRONMENT  
AND CONSERVATION, DIV. OF SOLID  
WASTE MANAGEMENT. 5TH FL, L&C TOWER,  
401 CHURCH STREET,  
NASHVILLE, TN 37243  
ATTN: MIKE APPLE, DIRECTOR

APPLICANT:  
KILGORE FLARES COMPANY LLC  
155 KILGORE DRIVE  
TOONE, TN 38381

LADIES AND GENTLEMEN:

WE HEREBY AMEND OUR LETTER OF CREDIT AS FOLLOWS:

THE AGGREGATE AMOUNT OF THE CREDIT BEFORE ANY DRAWINGS IS NOW  
INCREASED BY 15,080.66 USD

THE AGGREGATE AMOUNT OF THE CREDIT BEFORE ANY DRAWINGS IS NOW  
808,803.33 USD

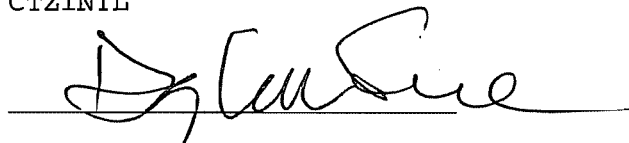
THIS AMENDMENT IS TO BE CONSIDERED AS PART OF THE ABOVE  
MENTIONED CREDIT, AND MUST BE ATTACHED THERETO.

ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.

PLEASE ADDRESS ANY INQUIRIES OR CORRESPONDENCE TO ATTN: MAYRA  
ALMADA, INTERNATIONAL DEPT., QUOTING OUR REFERENCE NO: S905146  
BY PHONE: (781) 655-4378, BY FAX: (781) 391-8701  
BY SWIFT: CTZIUS33, BY TELEX: 211047 CTZINTL



AUTHORIZED SIGNATURE



AUTHORIZED SIGNATURE



International Division  
20 Cabot Road  
Medford, MA 02155 USA  
888 868.0212 tel  
SWIFT: CTZIUS33 TELEX 211047 CTZINTL

AMENDMENT DEBIT ADVICE

KILGORE FLARES COMPANY LLC  
155 KILGORE DRIVE  
TOONE, TN 38381

NOVEMBER 21, 2013

RE: IRREVOCABLE STANDBY LETTER OF CREDIT: S905146  
CREDIT AMOUNT AFTER AMENDMENT: 808,803.33 USD  
AGGREGATE AMOUNT: INCREASE BY 15,080.66 USD  
AMENDMENT NUMBER: 007  
BENEFICIARY: TENNESSEE DEPARTMENT OF ENVIRONMENT

OUR CHARGES AT THIS TIME ARE AS FOLLOWS:

COMMISSION FEES ON THE ABOVE LETTER OF CREDIT ARE NOW DUE IN  
ADVANCE FOR A BILLING PERIOD STARTING ON NOVEMBER 21, 2013  
THROUGH NOVEMBER 01, 2014.

FEE ON THE ABOVE BALANCE	
AT % 2.250000000.....USD	328.00
AT % 0.300000000.....USD	2,427.47
(DUE TO RATE INCREASE FROM 1.95% TO 2.25%	
FOR PERIOD OF 110213-110314)	
STANDBY AMENDMENT FEE	250.00
DOMESTIC COURIER FEE	40.00
TOTAL COMMISSIONS AND CHARGES.....USD	3,045.47

THE ABOVE CHARGES HAVE BEEN DEBITED TO ACCOUNT 6220234697

PLEASE ADDRESS ANY INQUIRIES OR CORRESPONDENCE TO ATTN: MAYRA  
ALMADA, INTERNATIONAL DEPT., QUOTING OUR REFERENCE NO: S905146  
BY PHONE: (781) 655-4378, BY FAX: (781) 391-8701  
BY SWIFT: CTZIUS33, BY TELEX: 211047 CTZINTL

THIS COMPUTER GENERATED ADVICE REQUIRES NO MANUAL SIGNATURE.

## **SECTION J OTHER FEDERAL AND STATE LAWS**

This information has been provided in accordance with the requirements of 40 CFR 270.14(b)(20) and 270.3. Treatment of hazardous waste pyrotechnics by open burning is a multidisciplinary issue, potentially spanning a number of federal and state regulations. In addition to the hazardous waste permitting requirements set forth under RCRA regarding miscellaneous units (40 CFR 264 Subpart X), other federal and state laws must be reviewed to determine if they are relevant to the permitting process including, but not limited to, the Clean Air Act, Coastal Zone Management Act, Endangered Species Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, the Clean Water Act, Wetlands, and Wild and Scenic Rivers Act.

### **J-1 CLEAN AIR ACT**

Regulations governing open burning are found in TDEC Bureau of Environment, DAPC Chapter 1200-3-4. These regulations prohibit open burning in connection with industrial, commercial, or municipal operations, unless it meets an exemption listed in the regulations, and has been given prior approval by TDEC. Kilgore operates under Title V Air Operating Permit No. 548350, which was issued in July 2001 and expired in July 2006. The Title V Air Operating Permit allows Kilgore to conduct open burning of waste pyrotechnic composition in accordance with specific conditions in the permit. Kilgore submitted a timely Title V Air Operating Permit renewal application in January 2006 and a modification in September 2013 and is waiting for the new permit to be issued. Until the new Title V Air Operating Permit is issued, Kilgore will continue to operate under the expired permit.

### **J-2 COASTAL ZONE MANAGEMENT ACT**

The Coastal Zone Management Act (16 United States Code [U.S.C.] 1451, et seq.) and the regulations regarding its implementation (15 CFR 930) do not apply to Kilgore, since the facility does not lie in a coastal zone as defined in Section 304(1) of 16 U.S.C. 1453.

### **J-3 ENDANGERED SPECIES ACT**

The U.S. Fish and Wildlife Service, under the Endangered Species Act (16 U.S.C. 1531, et seq.), must survey the land for "species of concern" and endangered species. Regulations governing the provisions of this act are in 50 CFR 402. According to the U.S. Fish and Wildlife Service (USFWS) Threatened and Endangered Species Listing for Hardeman County, Tennessee, the Indiana bat (*Myotis Sodalis*) is listed as an endangered species and the Northern Long-Eared Bat

*(Myotis Septentrionalis)* is listed as a proposed endangered species. Specific data from the USFWS Web site is in Appendix J-1. All open burning occurs within the 5-acre HWOBA and as confirmed by the air dispersion modeling and risk assessment, does not impact the wooded areas or potential habitat of the bats.

Appendix J-2 lists state species located in Hardeman County identified on the TDEC National Heritage Inventory Program Web Site.

Since wetlands have not been identified at the HWOBA, the aquatic species or their habitats as identified in Appendix J-2 should not be impacted. Terrestrial and avian species, while potentially present, have not been identified within the HWOBA.

#### **J-4 FISH AND WILDLIFE COORDINATION ACT**

The Fish and Wildlife Coordination Act (16 U.S.C. 661, et seq.) pertains to activities that might adversely affect fish and wildlife, such as diverting, impounding, or controlling waters. Operations at the HWOBA and TTF are not expected to impound, divert, control, or modify any surface water. The only waters that are diverted, impounded, or controlled as a part of the treatment of hazardous waste pyrotechnics at Kilgore are less than 10 acres and are, therefore, exempt per 16 U.S.C. 662(h).

#### **J-5 NATIONAL HISTORIC PRESERVATION ACT OF 1966**

The National Historic Preservation Act of 1966 (16 U.S.C 470, et seq.), includes a federal review process pertaining to activities that may affect cultural resources. The regulations ensuring compliance with the provisions of the act are in 36 CFR 800. The National Register of Historic Places, National Register Information System lists 12 properties and districts in Hardeman County, with one as a National Historic Landmark. A List of the National Register of Historic Places can be found in Appendix J-3. The properties listed on the National Register of Historic Places are more than 10 miles from the HWOBA and will not be affected by the hazardous waste pyrotechnic treatment operations.

#### **J-6 CLEAN WATER ACT**

The HWOBA discharges storm water associated with industrial activity as defined in the U.S. EPA National Pollutant Discharge Elimination System (NPDES) program established pursuant to the Federal Water Pollution Control Act, as amended by the Clean Water Act (33 U.S.C. 1251 et seq.), and codified in 40 CFR Part 122. Specifically, the Standard Industrial Classification Code 2899,

Miscellaneous Chemical Product, which applies to the HWOBA is included in the definition of industrial activity areas in 40 CFR 122.26(b)(14)(xi).

Tennessee is a delegated state with NPDES permitting authority. The state's NPDES program is administered by the TDEC Division of Water Resources. Tennessee storm water regulations for storm water discharges associated with industrial activity are codified in the Tennessee Code Annotated 69-3-101 et seq., and set forth in the Tennessee Water Quality Control Act of 1977, as amended. The HWOBA is covered under Sector C (Storm Water Discharges Associated with Industrial Activity from Chemical and Allied Products Manufacturing Facilities) of the TMSP.

#### **J-7 WETLANDS**

According to the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory, one 0.46-acre freshwater pond is within the TTF property boundary, approximately 3,500 feet north-northeast of the HWOBA. A copy of the USFWS Wetlands Map for this area is in Appendix J-4. The federal and state laws that govern wetland issues are the Clean Water Act (33 U.S.C. 1251, et seq.), NPDES program, and the State of Tennessee's regulatory equivalent, cited in Water Quality Control Act 1200-4-1.

#### **J-8 WILD AND SCENIC RIVERS ACT**

The Wild and Scenic Rivers Act (16 U.S.C. 1273, et seq.) does not apply to Kilgore since its hazardous waste pyrotechnic treatment operations will not affect any water bodies designated as wild and scenic rivers.

**Appendix J-1**  
**Endangered Species**  
**for Hardeman County, Tennessee**



**U.S. Fish & Wildlife Service**

Environmental Conservation Online System  
 Conserving the Nature of America

Enter Search Term(s):

- [ECOS](#)>
- [Species Reports](#)>
- Species By County Report

**Species By County Report**

The following report contains Species that are known to or are believed to occur in this county. Species with range unrefined past the state level are now excluded from this report. If you are looking for the Section 7 range (for Section 7 Consultations), please visit the [IPaC](#) application.

**County: Hardeman, TN**

<a href="#">Group</a>	<a href="#">Name</a>	<a href="#">Population</a>	<a href="#">Status</a>	<a href="#">Lead Office</a>	<a href="#">Recovery Plan Name</a>	<a href="#">Recovery Plan Action Status</a>	<a href="#">Recovery Plan Stage</a>
Mammals	<a href="#">Indiana bat</a> <i>(Myotis sodalis)</i>	Entire	Endangered	<a href="#">Bloomington Ecological Services Field Office</a>	<a href="#">Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision</a>	<a href="#">View Implementation Progress</a>	Draft Revision 1
	<a href="#">Northern Long-eared Bat</a> <i>(Myotis septentrionalis)</i>		Proposed Endangered	<a href="#">Green Bay Ecological Services Field Office</a>	-	-	-

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**Appendix J-2**  
**Rare Species**



**Natural Heritage Inventory Program – Rare Species in Hardeman County, Tennessee**

Type	Category	Scientific Name	Common Name	Global Rank	State Rank	Fed. Status	State Status	Habitat	Wet Habitat Flag
Vertebrate Animal	Amphibian	<i>Acris gryllus</i>	Southern Cricket Frog	G5	S2S3	—	Rare, Not State Listed	Grassy margins of swamps, marshes, lakes, ponds, streams, ditches, and nearby temporary pools; far SW Tennessee.	Aquatic
Vertebrate Animal	Amphibian	<i>Hyla gratiosa</i>	Barking Tree frog	G5	S3	—	D	Low wet woods and swamps esp. with ephemeral ponds.	Possible
Vertebrate Animal	Amphibian	<i>Hemidactylium scutatum</i>	Four-toed Salamander	G5	S3	—	D	Woodland swamps, shallow depressions, & sphagnum mats on acidic soils; middle & east Tennessee.	Possible
Vertebrate Animal	Bird	<i>Dendroica cerulea</i>	Cerulean Warbler	G4	S3B	—	D	Mature deciduous forest, particularly in floodplains or mesic conditions.	Upland
Vertebrate Animal	Bird	<i>Limnothlypis swainsonii</i>	Swainson's Warbler	G4	S3	—	D	Mature, rich, damp, deciduous floodplain and swamp forests.	Possible
Vertebrate Animal	Bird	<i>Chondestes grammacus</i>	Lark Sparrow	G5	S1B	—	T	Open habitats with scattered bushes and trees, prairie, cultivated areas, fields with bushy borders; ground nester.	Upland
Vertebrate Animal	Fish	<i>Cycleptus elongatus</i>	Blue Sucker	G3G4	S2	—	T	Swift waters over firm substrates in big rivers.	Aquatic
Vertebrate Animal	Fish	<i>Noturus gladiator</i>	Piebald Madtom	G3	S3	—	D	Large creeks & rivers in moderate-swift currents with clean sand or gravel substrates; Mississippi River tributaries.	Aquatic
Vertebrate Animal	Fish	<i>Ammocrypta beani</i>	Naked Sand Darter	G5	S2	—	D	Shifting sand bottoms & sandy runs; Hatchie & Wolf rivers & their larger tribs.	Aquatic
Vertebrate Animal	Fish	<i>Ammocrypta vivax</i>	Scaly Sand Darter	G5	S2	—	D	Small to medium rivers with sandy substrate; Hatchie & Buffalo rivers.	Aquatic
Vertebrate Animal	Fish	<i>Etheostoma brevirostrum</i>	Holiday Darter	G2	S1	—	T	Bedrock & gravel pools of creeks and small to medium rivers; Conasauga River watershed.	Aquatic
Vertebrate Animal	Mammal	<i>Sorex longirostris</i>	Southeastern Shrew	G5	S4	—	D	Various habitats including wet meadows, damp woods, and uplands; statewide.	Possible
Vertebrate Animal	Mammal	<i>Myotis grisescens</i>	Gray Myotis	G3	S2	LE	E	Cave obligate year-round; frequents forested areas; migratory.	Upland
Vertebrate Animal	Mammal	<i>Synaptomys cooperi</i>	Southern Bog Lemming	G5	S4	—	D	Marshy meadows, wet balds, & rich upland forests.	Possible
Vertebrate Animal	Mammal	<i>Zapus hudsonius</i>	Meadow Jumping Mouse	G5	S4	No Status	D	Open grassy fields; often abundant in thick vegetation near water bodies; statewide.	Possible
Vertebrate Animal	Reptile	<i>Ophisaurus attenuatus longicaudus</i>	Eastern Slender Glass Lizard	G5T5	S3	—	D	Dry upland areas including brushy, cut-over woodlands and grassy fields; nearly statewide but obscure; fossorial.	Upland
Vertebrate Animal	Reptile	<i>Sistrurus miliarius streckeri</i>	Western Pygmy Rattlesnake	G5T5	S2S3	—	T	Usually near water in river floodplains, swamps, marshes, and wet prairies; occas drier wooded uplands; W half of Tenn., generally.	Possible
Invertebrate Animal	Crustacean	<i>Fallicambarus hortonii</i>	Hatchie Burrowing Crayfish	G1	S1	—	E	Primary burrower; uses saturated or seasonally saturated soils associated with permanent bodies of water; Mississippi River tributaries, Coastal Plain.	Aquatic
Invertebrate Animal	Insect	<i>Ophiogomphus howei</i>	Pygmy Snaketail	G3	S3?	—	Rare, Not State Listed	Clear rivers with strong current over coarse cobbles and with periodic rapids; possible in Southern Appalachians.	Aquatic
Invertebrate Animal	Mollusc	<i>Villosa vibex</i>	Southern Rainbow	G5Q	S2	—	Rare, Not State Listed	Mud or soft sand in small rivers & creeks in areas with moderate current; Conasauga, Hatchie, and Wolf (Miss. R.) river systems.	Aquatic
Vascular Plant	Flowering Plant	<i>Ceratophyllum echinatum</i>	Prickly Hornwort	G4?	S1	—	S	Slow Moving Streams	Aquatic
Vascular Plant	Flowering Plant	<i>Magnolia virginiana</i>	Sweetbay Magnolia	G5	S2	—	T	Forested Acidic Wetlands	Possible
Vascular Plant	Flowering Plant	<i>Symplocos tinctoria</i>	Horse-sugar	G5	S2	—	S	Floodplains And Moist Ravines	Possible
Other (Ecological)	Heron Rookery	Heron rookery	Heron Rookery	GNR	SNR	—	Rare, Not State Listed	No Data	No Data

# Natural Heritage Inventory Program

## Helpful Links

[Explanation of Rank and Status Code \(docs/status_ranks.pdf\)](#)

[Rare and Endangered Animal List of Tennessee \(docs/animal_list.pdf\)](#)

[Tennessee Rare Plant List \(docs/plant_list.pdf\)](#)

[Tennessee Rare Species Survey Form \(http://environment-online.state.tn.us/etdec/DownloadFile.aspx?row_id=CN-1154\)](http://environment-online.state.tn.us/etdec/DownloadFile.aspx?row_id=CN-1154)

[Natural Areas Home \(index.shtml\)](#)

**NEW!** – Interactive Rare Species Database for Environmental Review. [Search and download data by County, Quadrangle, or Watershed. \(http://environment-online.state.tn.us:8080/pls/enf_reports/f?p=9014:3:2083109232364451\)](#)

The Natural Heritage Inventory Program operates under authority of the [Rare Plant Protection and Conservation Act of 1985 \(../permits/tcalink.shtml\)](#), and the [Rare Plant Protection and Conservation Regulations \(/sos/rules/0400/0400-06/0400-06-02.pdf\)](#). The Program maintains a GIS database with information on the distribution and ecology of rare plants, animals and ecological communities across Tennessee.

The Program uses Heritage Methodology - based on that of its parent organization [NatureServe \(http://www.natureserve.org\)](#) - for the most recent taxonomic information, ecological community classification, methodology, and software development.

The database currently contains over 14,000 rare species and plant community occurrence records as well as information on hundreds of conservation sites. Information gathered by program biologists, assists in directing conservation, restoration, and management activities of other programs in the Division.

Through the Natural Heritage Inventory Program, the Department of Environment and Conservation publishes the state's rare plant list. The ability to legally list plants as Threatened, Endangered, and Special Concern is granted by the [Rare Plant Protection and Conservation Act of 1985 \(../permits/tcalink.shtml\)](#).

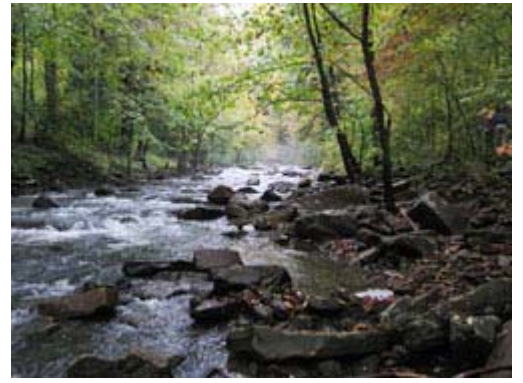
The program also publishes a list of the rare animals of Tennessee, but the legal listing of animals as Threatened, Endangered, or Deemed in Need of Management is handled by the Tennessee Wildlife Resources Agency.

To view available data, forms, information on environmental review procedures, and publications resulting from Natural Heritage Inventory Program work [click here \(data.shtml\)](#).

The Division uses information from the Program and other sources for various conservation initiatives including identifying areas for inclusion in the Natural Areas System. Rare species data are also used by state, federal and local governments for conducting environmental reviews. Natural Heritage Program staff direct and conduct field surveys of species, natural communities, and natural areas of special concern. Staff also conduct workshops and provide technical assistance to state and federal agencies, local governments, private conservation groups, and industrial and private landowners, for use in the management of their lands. The Program issues [scientific collecting permits \(../permits/parkcoll.shtml\)](#) for research on state parks and state natural areas, and issues [rare plant dealer licenses \(../permits/enddeal.shtml\)](#).

The [Rare Plant Protection and Conservation Act of 1985 \(../permits/tcalink.shtml\)](#) also allows the Division to enter into agreements with other agencies “with respect to programs designed to conserve rare plants. . .” A formal cooperative agreement between the U.S. Fish and Wildlife Service and the State establishes the Division as the lead state agency in the process of listing and recovery efforts for federally endangered or threatened species of plants. Independent of this agreement, the Program also conducts U.S. Fish and Wildlife Service-funded projects to conserve and protect federal concern animal species. Through extensive field investigations, research and management

activities, the Division seeks to prevent imperiled species of plants and animals from becoming further imperiled, to effect the recovery of federally listed species so that they may be de-listed, and to prevent the extirpation of critically imperiled species.



## Global Rank

CODE	DESCRIPTION
G1	Extremely rare and critically imperiled in the world with five or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extinction
G2	Very rare and imperiled within the world, six to twenty occurrences, or few remaining individuals, or because of some factor(s) making it vulnerable to extinction
G3	Rare and uncommon in its range or found locally in a restricted range, generally from 21-100 occurrences
G4	Widespread, abundant, and apparently secure globally, but with cause for long-term concern
G5	Demonstrably widespread and secure globally
GH	Of historical occurrence throughout its range, e.g. formally part of the established biota, with the expectation that it may be rediscovered
GU	Cannot be ranked using available information
GX	Believed to be extirpated throughout its range
HYB	Hybrid within its range in Tennessee
SSYN	Synonym for another species
_Q	Questionable taxonomy (GRANKs only)
_T#	Sub-specific taxon rank (GRANKs only)

## State Rank

CODE	DESCRIPTION
S1	Extremely rare and critically imperiled in the state with five or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extinction
S2	Very rare and imperiled within the state, six to twenty occurrences, or few remaining individuals, or because of some factor(s) making it vulnerable to extinction
S3	Rare and uncommon in the state, from 21-100 occurrences
S4	Widespread, abundant, and apparently secure within the state, but with cause for long-term concern
S5	Demonstrably widespread and secure in the state
SH	Of historical occurrence in Tennessee, e.g. formally part of the established biota, with the expectation that it may be rediscovered
SU	Cannot be ranked using available information
SX	Believed to be extirpated from the state
S#S#	Denotes a ?range rank? because the rarity of the species is uncertain (e.g. S1S3)
S?, S_?	Unranked at this time or rank uncertain
SE	Exotic species established in the state
SE#	Exotic numeric (e.g. the Asian clam <i>Corbicula fluminea</i> would be SE5)
SP	Potentially occurring in Tennessee, but not yet documented by DNH
_N	Occurs in Tennessee in a non-breeding status (mostly applies to vertebrates)
_B	Breeds in Tennessee
SA	Accidental or casual in the state (several birds)

SR	Reported from the state, but insufficient data to assign rank
SRF	Reported falsely from the state
HYB	Hybrid within its range in Tennessee
SSYN	Synonym for another species
_Q	Questionable taxonomy (GRANKs only)
_T#	Sub-specific taxon rank (GRANKs only)

### Federal Status

CODE	DESCRIPTION
LE, Listed Endangered	Taxon is threatened by extinction throughout all or a significant portion of its range
E/SA, Endangered by Similarity of Appearance	Taxon is treated as an endangered species because it may not be easily distinguished from a listed species
LT, Listed Threatened	Taxon is likely to become an endangered species in the foreseeable future
T/SA, Threatened by Similarity of Appearance	Taxon is treated as a threatened species because it may not be easily distinguished from a listed species
PE, Proposed Endangered	Taxon proposed for listing as endangered
PT, Proposed Threatened	Taxon proposed for listing as threatened
C, Candidate species***	Taxon for which the USFWS has sufficient information to support proposals to list the species as threatened or endangered, and for which the Service anticipates a listing proposal
(PS) Partial Status	Taxon which is listed in part of its range, but for which Tennessee subspecies are not included in the Federal designation (based on taxonomy)
(PS: status) Partial Status	Taxon which is listed in part of its range, but for which Tennessee populations are not included in the Federal designation e.g. (PS:LE)(based on political boundaries)
(XN) Non-essential experimental population in portion of range	Taxon which has been introduced or re-introduced in an area from which it has been extirpated, and for which certain provisions of the Act may not apply

### State Status, Animals

CODE	DESCRIPTION
E, Endangered	Any species or subspecies whose prospects of survival or recruitment within the state are in jeopardy or are likely to become so within the foreseeable future
T, Threatened	Any species or subspecies that is likely to become an endangered species within the foreseeable future
D, Deemed in Need of Management	Any species or subspecies of nongame wildlife which the executive director of the TWRA believes should be investigated in order to develop information relating to populations, distribution, habitat needs, limiting factors, and other biological and ecological data to determine management measures necessary for their continued ability to sustain themselves successfully. This category is analogous to Special Concern.

## State Status, Plants

CODE	DESCRIPTION
E, Endangered	Any species or subspecies whose prospects of survival or recruitment within the state are in jeopardy or are likely to become so within the foreseeable future
T, Threatened	Any species or subspecies that is likely to become an endangered species within the foreseeable future
S, Special Concern	Any species or subspecies of plant that is uncommon in Tennessee, or has unique or highly specific habitat requirements or scientific value and therefore requires careful monitoring of its status.

## State Status, Plants Modifier

CODE	DESCRIPTION
PE, Proposed Endangered	Any species or subspecies of plant nominated by the Scientific Advisory Committee to be added to the list of Tennessee's endangered species. After approval by the commissioner of the Dept. of Environment & Conservation and the concurrence of the commissioner of Agriculture, these plants will formally become State endangered.
PT, Proposed Threatened	Any species or subspecies of a plant nominated by the Scientific Advisory Committee to be added to the list of Tennessee threatened species. After a public hearing, these plants will formally become State threatened.
E-PT, Endangered-Proposed Threatened	Species which are currently on the state list of endangered plants, but are proposed by the Scientific Advisory Committee to be down-listed to threatened. After approval by the commissioner of the Dept. of Environment & Conservation and the concurrence of the commissioner of Agriculture, these plants will formally become State threatened.
E-PS, Endangered Proposed Special Concern	Species which are currently on the state list of endangered plants, but are proposed by the Scientific Advisory Committee to be down-listed to special concern. After approval by the commissioner of the Dept. of Environment & Conservation and the concurrence of the commissioner of Agriculture, these plants will formally become State special concern.
T-PE, Threatened Proposed Endangered	Species which are currently on the state list of threatened plants, but are proposed by the Scientific Advisory Committee to be listed on the state endangered list. After approval by the commissioner of the Dept. of Environment & Conservation and the concurrence of the commissioner of Agriculture, these plants will formally become State endangered.
T-PS, Threatened Proposed Special Concern	Species which are currently on the state list of threatened plants, but are proposed by the Scientific Advisory Committee to be down-listed to special concern. After a public hearing, these plants will formally become State special concern.
P, Possibly Extirpated	Species or subspecies that have not been seen in Tennessee for the past 20 years. May no longer occur in Tennessee.
C, Commercially Exploited	Due to large numbers being taken from the wild and propagation or cultivation insufficient to meet market demand. These plants are of long-term conservation concern, but the Division of Natural Heritage does not recommend they be included in the normal environmental review process.

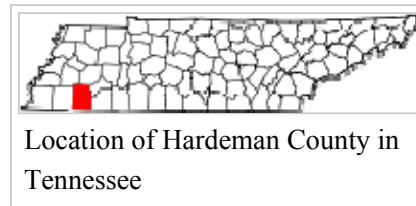
**Appendix J-3**  
**National Register of Historic Place — Hardeman County, Tennessee**

# National Register of Historic Places listings in Hardeman County, Tennessee

From Wikipedia, the free encyclopedia

This is a list of the **National Register of Historic Places listings in Hardeman County, Tennessee**.

This is intended to be a complete list of the properties and districts on the National Register of Historic Places in Hardeman County, Tennessee, United States. Latitude and longitude coordinates are provided for many National Register properties and districts; these locations may be seen together in a Google map.^[1]



There are 12 properties and districts listed on the National Register in the county, including 1 National Historic Landmark.


## Contents: Counties in Tennessee

Anderson – Bedford – Benton – Bledsoe – Blount – Bradley – Campbell – Cannon – Carroll – Carter – Cheatham – Chester – Claiborne – Clay – Cocke – Coffee – Crockett – Cumberland – Davidson – Decatur – DeKalb – Dickson – Dyer – Fayette – Fentress – Franklin – Gibson – Giles – Grainger – Greene – Grundy – Hamblen – Hamilton – Hancock – **Hardeman** – Hardin – Hawkins – Haywood – Henderson – Henry – Hickman – Houston – Humphreys – Jackson – Jefferson – Johnson – Knox – Lake – Lauderdale – Lawrence – Lewis – Lincoln – Loudon – Macon – Madison – Marion – Marshall – Maury – McMinn – McNairy – Meigs – Monroe – Montgomery – Moore – Morgan – Obion – Overton – Perry – Pickett – Polk – Putnam – Rhea – Roane – Robertson – Rutherford – Scott – Sequatchie – Sevier – Shelby – Smith – Stewart – Sullivan – Sumner – Tipton – Trousdale – Unicoi – Union – Van Buren – Warren – Washington – Wayne – Weakley – White – Williamson – Wilson

*This National Park Service list is complete through NPS recent listings (<http://www.nps.gov/history/nr/nrlist.htm>) posted March 14, 2014.^[2]*



## **Current listings**

[3]	<b>Name on the Register</b> [4]	<b>Image</b>	<b>Date listed</b> ^[5]	<b>Loca</b>
1	Allen-White School		November 9, 2005 (#05001214 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=05001214&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=05001214&amp;natregadvancedsearch=Search</a> ))	100 E Exter St. 35°20′89°08′
2	James Monroe Avent House		April 25, 2001 (#01000436 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=01000436&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=01000436&amp;natregadvancedsearch=Search</a> ))	220 Railroad Ave. 35°09′89°07′
3	Bills-McNeal Historic District		February 12, 1980 (#80003829 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=80003829&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=80003829&amp;natregadvancedsearch=Search</a> ))	Irregular pattern along Lafayette, McNair, Bills, Union, Laud and Wash Sts. 35°15′88°59′
4	Bolivar Court Square Historic District		January 10, 1980 (#80003830 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=80003830&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=80003830&amp;natregadvancedsearch=Search</a> ))	U.S. 164 and State 125 35°15′88°59′
5	Bolivar-Somerville Stage Road		August 7, 2005 (#05000802 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=05000802&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=05000802&amp;natregadvancedsearch=Search</a> ))	Herrington Stewarts Rd., 4 miles south of White 35°15′89°11′

[3]	Name on the Register [4]	Image	Date listed ^[5]	Loca
6	Davis Bridge Battlefield		July 13, 1998 (#97001549 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=97001549&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=97001549&amp;natregadvancedsearch=Search</a> ))	Roug along Riple Pocal and E Sprin 35°01' 88°47'
7	Hatchie River Ferry		August 7, 2005 (#05000800 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=05000800&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=05000800&amp;natregadvancedsearch=Search</a> ))	End c Bend 1.0 m south State 15 35°13' 88°55'
8	North Main Street Historic District		March 20, 1980 (#80003831 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=80003831&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=80003831&amp;natregadvancedsearch=Search</a> ))	N. M Sycar Jeffer Wash and V Sts. 35°15' 88°59'
9	Pocahontas School		July 19, 2007 (#07000706 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=07000706&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=07000706&amp;natregadvancedsearch=Search</a> ))	2255: Route 35°02' 88°48'
10	Robertson Family Farm		November 8, 2007 (#07001164 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=07001164&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=07001164&amp;natregadvancedsearch=Search</a> ))	2715 News Rd.
11	United Sons and Daughters of Charity Lodge Hall		November 9, 2005 (#05001222 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=05001222&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=05001222&amp;natregadvancedsearch=Search</a> ))	322 V McNo 35°15' 88°59'
12	Western State Hospital Historic District		June 25, 1987 (#87001057 ( <a href="http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=87001057&amp;natregadvancedsearch=Search">http://nrhp.focus.nps.gov/natregadvancedsearch.do?searchType=natregadvanced&amp;selectedCollections=NPS%20Digital%20Library&amp;referenceNumber=87001057&amp;natregadvancedsearch=Search</a> ))	U.S. 1 64 35°16' 88°59'

## Former listings

<span>[3]</span>	Name on the Register	Image	Date listed/removed	Location	City or town	Summary
<b>1</b>	Campbell House	<span></span>	Listed August 6, 1975, removed May 21, 1986 (#75001758)	607 W. Market St.	Bolivar	

## See also

- List of National Historic Landmarks in Tennessee
- National Register of Historic Places listings in Tennessee

## References

- ↑ The latitude and longitude information provided in this table was derived originally from the National Register Information System, which has been found to be fairly accurate for about 99% of listings. For about 1% of NRIS original coordinates, experience has shown that one or both coordinates are typos or otherwise extremely far off; some corrections may have been made. A more subtle problem causes many locations to be off by up to 150 yards, depending on location in the country: most NRIS coordinates were derived from tracing out latitude and longitudes off of USGS topographical quadrant maps created under the North American Datum of 1927 (<http://www.ngs.noaa.gov/TOOLS/Nadcon/Nadcon.html>), which differs from the current, highly accurate WGS84 GPS system used by most on-line maps. Chicago is about right, but NRIS longitudes in Washington are higher by about 4.5 seconds, and are lower by about 2.0 seconds in Maine. Latitudes differ by about 1.0 second in Florida. Some locations in this table may have been corrected to current GPS standards.
- ↑ "National Register of Historic Places: Weekly List Actions" (<http://www.cr.nps.gov/nr/nrlist.htm>). National Park Service, United States Department of the Interior. Retrieved on March 14, 2014.
- ↑ ^{*a*} ^{*b*} Numbers represent an ordering by significant words. Various colorings, defined here, differentiate National Historic Landmarks and historic districts from other NRHP buildings, structures, sites or objects.
- ↑ "National Register Information System" ([http://nrhp.focus.nps.gov/natreg/docs/All_Data.html](http://nrhp.focus.nps.gov/natreg/docs/All_Data.html)). *National Register of Historic Places*. National Park Service. 2008-04-24.
- ↑ The eight-digit number below each date is the number assigned to each location in the National Register Information System database, which can be viewed by clicking the number.

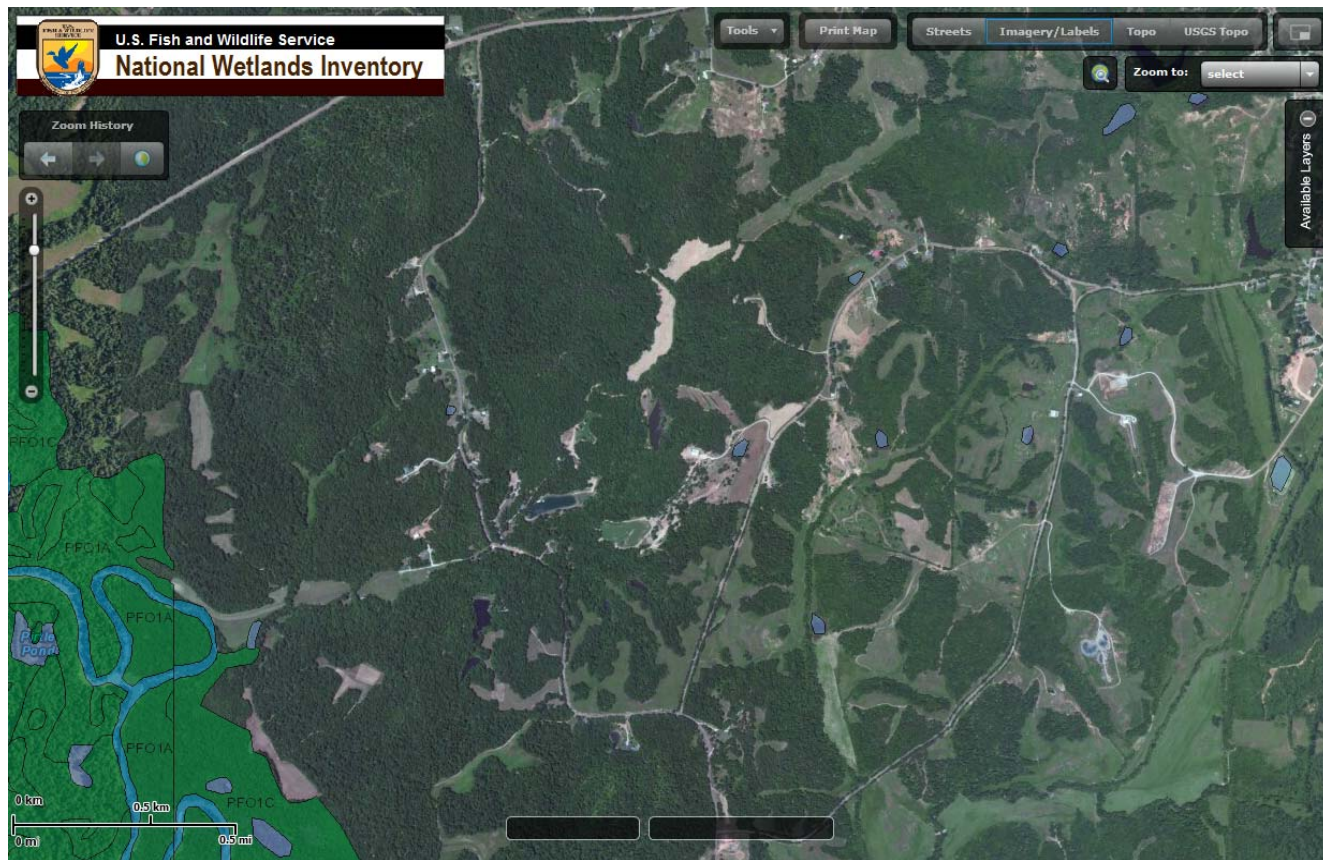
Retrieved from "[http://en.wikipedia.org/w/index.php?title=National_Register_of_Historic_Places_listings_in_Hardeman_County,_Tennessee&oldid=5456488](http://en.wikipedia.org/w/index.php?title=National_Register_of_Historic_Places_listings_in_Hardeman_County,_Tennessee&oldid=5456488)

Categories: National Register of Historic Places in Tennessee by county

| Hardeman County, Tennessee

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**Appendix J-4**  
**USFWS Wetlands Map**



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**SECTION L**  
**PART B PERMIT APPLICATION CERTIFICATION**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

  
_____  
Mr. Chuck Stout  
Vice President of Operations/General Manager

05/28/2015  
_____  
Date