

# *Remedial Action Work Plan and Project Operations Plan Burgess Brothers Superfund Site Woodford and Bennington, Vermont*

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**November 7, 2013**



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REPORT

# Remedial Action Work Plan and Project Operations Plan

*Burgess Brothers Superfund Site  
Bennington, Vermont*

*Prepared for:  
Burgess Brothers Settling Defendants*

*November 7, 2013*



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## ***EXECUTIVE SUMMARY***

This report presents the Remedial Action Work Plan (RAWP) and Project Operations Plan (POP) for the EPA-selected remedy at the Burgess Brothers Superfund Site (the Site). This document has been prepared in accordance with Section VI.A and Attachment A of the Statement of Work (SOW) associated with the First Modification of Consent Decree issued by the Environmental Protection Agency (EPA) and the Vermont Department of Environmental Conservation (VtDEC).

In accordance with Section VI.A of the SOW, this RAWP includes:

- a description of all activities necessary to implement the selected remedy;
- a detailed schedule for the completion of activities;
- a revised Project Operations Plan (POP) in support of all fieldwork to be conducted, including a Site Management Plan (SMP), Sampling and Analysis Plan (SAP) and site-specific Health and Safety Plan (HASP).

The Burgess Brothers Settling Defendants anticipates that the construction work described herein will be implemented and completed during 2013.

In accordance with the project specifications, project contractors have made several submittals to the Construction Management Team for review. These submittals include a work plan; cost breakdowns; lists of proposed subcontractors; subcontractor qualifications; and proposed subtask schedules. These submittals are included in Appendices A and B.

## **1.0 INTRODUCTION**

### **1.1 BACKGROUND**

This document is the draft Remedial Action Work Plan (RAWP) and Draft Project Operations Plan (POP) for the Burgess Brothers Superfund Site (the Site) in Bennington, Vermont. The Construction Management Team of Environmental Partners Group, Inc. and Xpert Design and Diagnostics (XDD), Inc. has prepared this report on behalf of the Burgess Brothers Settling Defendants. A site location plan is included as Figure 1-1. The report has been prepared in accordance with the First Modification of Consent Decree issued by the EPA and the Vermont Department of Environmental Conservation (VtDEC) Appendix B RD/RA Statement of Work (SOW) Section VI.A.

### **1.2 REPORT PURPOSE AND OBJECTIVE**

The purpose of this report is to describe the work and procedures to be completed under each component of the Remedial Action (RA). This document outlines the organization and roles of parties involved in completing the RA, a Site Management Plan (SMP), and activities and protocols for implementing the approved Remedial Design Plan.

The RAWP and POP include:

- a description of all activities necessary to implement the selected remedy,
- a detailed schedule for the completion of activities,
- details concerning the coordination of the work and preparation of progress reports,
- methodology for implementation of the approved Remedial Design Plan;
- a Project Operations Plan (POP) in support of all fieldwork to be conducted, including a Site Management Plan (SMP); and
- a site-specific Health and Safety Plan

Following EPA approval of this report, the Burgess Brothers Settling Defendants anticipates that the RA construction work will be implemented and completed

during the 2013 construction season in accordance with the schedule described in Section 2.3.

### **1.3 PROJECT ORGANIZATION**

To manage all phases of the RA construction, the Burgess Brothers Settling Defendants have entered into an Agreement with the Construction Management Team. During construction of the RA, work will be coordinated through the parties as defined below and as shown on Figure 1-2, the Organization Chart:

#### **Environmental Protection Agency (EPA)**

Region I EPA New England  
Project Regulatory Coordination  
Contact: Terrence Connelly

#### **State of Vermont Department of Environmental Conservation (VtDEC)**

Waste Management Division  
Regulatory Agency  
Contact: Gerold Noyes

#### **The Burgess Brothers Settling Defendants**

Overall Implementation of the Remedy  
Contact: Geoff C. Seibel, C.P.G., *de maximis*, inc.

#### **Construction Management Team**

Environmental Partners Group Inc.  
Engineering  
Contacts: Mark White, Supervising Engineer  
Paul F. Gabriel, P.E., Construction Quality Assurance Officer  
Wesley Stinson, Resident Project Engineer  
Ann Marie Petricca, C.P.G., Site Safety Officer

Xpert Design and Diagnostics, Inc. (XDD)

Engineering

Contacts: Matthew Walsh, P.E., Project Manager

#### **Construction Contractor**

Geo-Solutions, Inc.

Contact: Robert Winters, CSP, Project Manager  
Bruce George, Site Superintendent  
Josh Bonetto, Project Engineer

#### **Treatment System Contractor**

Remediation Equipment and Services, Inc. (RES)

Contact: Gary J. Sheridan, Construction and Operations Manager

For a detailed list of suppliers, manufacturers, vendor and installers for the collection trench system, utility conduits, toe of slope swale lining, and excavated soils area lining and capping materials, refer to Appendix A. For a detailed list of suppliers, manufacturers, vendor and installers for the treatment system, refer to Appendix B.

## ***1.4 ROLES AND RESPONSIBILITIES***

### ***1.4.1 Regulatory Agencies***

The lead regulatory agency involved with the RA is EPA. EPA will solicit input and review comments from VtDEC concerning the RA. EPA's primary role is to provide oversight, review, and approval of the RA plans, construction activities and deliverables described in the Consent Decree and SOW. EPA is also the primary regulatory agency contact with the public.

EPA will have the responsibility and authority to review and approve or disapprove design revisions or requests for variance that are submitted after the RA design has been approved.

### ***1.4.2 Burgess Brothers Settling Defendants and Project Coordinator***

The Burgess Brothers Settling Defendants are responsible for the design, construction and maintenance of the RA. The Burgess Brothers Settling Defendants have authority to select non-regulatory organizations involved in the RA and is responsible for providing assurance that the RA is constructed in accordance with the Consent Decree. The Burgess Brothers Settling Defendants primary contact for the project will be *de maximis, inc's* project coordinator.

The Burgess Brothers Settling Defendants are requiring that the Construction Management Team be responsible for ensuring that all labor, equipment, material and supervision be committed to complete the RA activities in accordance with the approved RD and Consent Decree. The RA activities are shown on the Plans and Specifications approved by EPA. The Construction Management Team will also be responsible for documenting the quality of work.

### ***1.4.3 Construction Management Team***

#### ***1.4.3.2 Engineer (Environmental Partners Group and XDD)***

In the role of Engineer, Environmental Partners and XDD will perform construction oversight to ensure that the project is completed in accordance with the approved RD and Consent Decree. Environmental Partners will perform construction management, engineering and QA/QC activities.

Environmental Partners will be the Construction Quality Assurance Officer (CQAO) for the project and will provide a full-time Resident Project Engineer (RPE). They will be responsible for addressing technical issues related to the collector trenches, toe of slope lining and excavated soils management. Environmental Partners will also evaluate and approve technical submittals to determine their compliance with the contract documents.

XDD will be the Engineer responsible for fabrication, installation and testing of groundwater treatment system. XDD will provide staff as necessary to oversee installation, startup and testing of the treatment system.

As the CQAO, Environmental Partners will provide general oversight of the construction activities and will provide a full-time Resident Project Engineer (RPE) while the construction activities are ongoing. The CQAO responsibilities include monitoring the progress of the work and assessing the extent to which activities are in conformance with the project plans and specifications. The CQAO will attend the pre-construction meeting, project progress meetings and additional meetings as may be necessary to assess the quality and progress of the work. The CQAO will also be responsible for communicating the progress and quality of the work with the regulatory agencies and Burgess Brothers Settling Defendants. The RPE will be on site during all RA construction and will report directly to the CQAO. The CQAO will be onsite as necessary throughout the construction activities.

Environmental Partners will also be responsible for the oversight of all testing required by the technical specification or by manufacturer recommendations. All construction submittals for quality control will be made to Environmental Partners for approval, before initiation of the work at the Site. The Quality Assurance/Quality Control during construction will include oversight of construction activities; regular meetings; field testing on the actual materials used during the construction; extensive documentation of construction activities; and adherence to warranty provisions.

#### *1.4.3.3 Groundwater Collection Trench Construction Program Contractor*

The collector trench construction activities to be completed at the site will be conducted by Geo-Solutions, Inc. This work will include grubbing and clearing, site preparation, installation of temporary work platform, installation of collection trenches using the Bio-Polymer (BP) trenching method, consolidation and capping on the landfill of trench spoils and excess impacted materials, installation of electrical conduits, installation of a lined storm water swale and miscellaneous earthwork. Geo-Solutions suppliers and subcontractors for the construction activities are provided in the attached Remedial Action Plan, Appendix A.

#### *1.4.3.4 Treatment System Contractor*

Remediation Equipment and Services, Inc. (RES) will be responsible for fabrication and installation of the groundwater treatment system designed to meet requirements for discharging to surface water. This will include installation of the following components: pumps in the two trenches, electrical connections, and groundwater treatment system components, as well as making modifications to the existing site building, as required, to accommodate the treatment system. RES will also be responsible for start-up and testing of the treatment system. RES suppliers and subcontractors for the treatment system are provided in Appendix B.

#### *1.3.4.5 Other Subcontractors*

The specification requirements for material subcontractors (BP slurry, collector trench sumps, piping, lining and capping of trench spoils, and treatment system components) include minimum manufacturer qualifications, installer qualifications, compliance with codes and standards, and material testing compliance. The material subcontractors must meet the following specification requirements:

- firms regularly engaged in manufacturing of products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years;
- firms with at least 3 years of successful installation experience on projects with systems similar to that required for the project; and

In addition, all material and installation subcontractors will be required to comply with applicable portions of standards pertaining to selection and installation of system materials and products. For certain specified materials (e.g., PB slurry, Geosynthetic Liner, Triaxial drainage geocomposite), Geo-Solutions will also be required to submit certificates of compliance with ASTM Standard Specifications and certifications.

## **2.0 PROJECT DESCRIPTION AND SCHEDULE**

### **2.1 SITE HISTORY**

The Burgess Brothers Superfund Site is located in the towns of Bennington and Woodford between Burgess Road and the Walloomsac Brook, as shown on Figure 1-1. The Site consists of approximately three acres, approximately half of which is a landfill. A small lagoon was located within the landfill where liquid sludge wastes were disposed. The Landfill Area is enclosed by a perimeter fence that encompasses 3.26 acres. Figure 1-3 is a site base map showing topography and key site features.

In September 1998 the United States Environmental Protection Agency's (EPA) issued a Record of Decision (ROD) for the Site that included implementation of a remedy to address landfill waste and impacts to groundwater, surface water and sediment. The major components of the remedy included:

- Grading and capping of the Landfill and Marshy Area;
- installation and operation of a soil vapor extraction/air sparging system (SVE/AS);
- long-term monitoring to determine the effectiveness of natural attenuation;
- institutional controls; and
- five-year reviews to assess the protectiveness of the selected remedy.

Since implementation of these remedial actions groundwater and surface water has continued to be monitored through a Post-Closure Environmental Monitoring Program on a semi-annual basis, starting in 2000 and continuing through 2012. The results of the long-term monitoring showed that VOCs continue to be present beyond the compliance boundary as of EPA's five-year review of the remedy (Five Year Review Report for Burgess Brothers Superfund Site, Woodford and Bennington, Vermont dated March 2005). EPA raised concerns regarding the capability of the current remedy to be protective in the long term and stated that modifications to the remedy may be required to achieve the Remedial Action Objectives described in the Record of Decision.

A Focused Feasibility Study (FFS) was prepared to evaluate possible measures to prevent migration of contaminated groundwater by controlling the source of the contamination so as to meet Interim Cleanup Levels (ICLs) at the landfill compliance boundary, and to protect surface water from exceedances of the

Performance Levels. Originally submitted in June 2007 and finalized in 2011, the FFS characterizes groundwater conditions at the site according to three broad areas (shown in Figure 1-3):

**Area A – Upgradient of Landfill Compliance Boundary** – The area upgradient of the Landfill Compliance Boundary includes the Landfill Area, former Lagoon Area and the capped portion of the former Marshy Area. Area A contains elevated levels of VOCs in groundwater that are orders of magnitude above Interim Clean-Up Levels (ICLs) set forth in the ROD. The former Marshy Area is located hydraulically downgradient of the former Lagoon Area and Landfill Area. Prior to landfill closure, this area was a low-lying marsh with natural surface water drainage swales and landfill leachate seeps, and was the primary area of discharge for groundwater moving beneath the landfill. The landfill capping system was extended over that portion of the former Marshy Area in Area A. In addition, surface water drainage features within Area A were realigned.

**Area B – Downgradient of Landfill Compliance Boundary** – This area is located immediately downgradient of the Landfill Compliance Boundary and extends southward approximately 200 feet to the W-09 well cluster location. It encompasses part of the Marshy Area described above. This area contains elevated levels of VOCs in groundwater that are orders of magnitude above the ICLs. At the time of the ROD, these elevated levels were found in wells adjacent to the Landfill Compliance Boundary and now exist 100 - 200 feet southward beyond the compliance boundary. Since the ROD the groundwater contaminant plume also expanded approximately 30 feet to the southeast, towards W-06D.

**Area C – Downgradient Plume Area** – This area extends downgradient from the W-09 location and to where the VOC plume reaches ICLs, between P-02 and P-08. The Area C plume is essentially unchanged since the ROD was issued in 1998.

EPAs second Five-Year Review, completed in 2010, concluded that that the original remedy was not effective and that an alternate remedial action needed to be evaluated and implemented. EPA selected the remedy alternative described in the FFS that consists of a barrier system at the landfill compliance boundary to contain further migration from the source area (Area A), and a second barrier system downgradient of the highly contaminant plume beyond the landfill (Area B). Monitored natural attenuation remains the remedy for the area downgradient of the second barrier system (Area C).

In September 2011 EPA issued an Amendment to the 1998 ROD requiring that these supplemental actions be performed, and in May 2012 the Settling Defendants entered into a Modified Consent Decree for this purpose. The

Modified Consent Decree was accompanied by a Remedial Design/Remedial Action Statement of Work (SOW) that defines the response activities and deliverables that the Settling Defendants shall perform to implement the required work.

## **2.2 SELECTED REMEDY**

The Remedial Action for the Site is described in Part I, Section E of the United States Environmental Protection Agency's (EPA) Record of Decision (ROD) Amendment for the Site signed by the EPA Regional Administrator, Region I, on September 30, 2011 and in Section III of the SOW and consists of:

- Containment Barrier System at the Landfill Compliance Boundary. A containment barrier system will be constructed and maintained at the Landfill Compliance Boundary to prevent further migration of contaminated groundwater from beneath the landfill and marshy area cap (Landfill Compliance Barrier System).
- Barrier System at the Downgradient Edge of the Highly Contaminated Groundwater. To address the contamination that has migrated beyond the Landfill Compliance Boundary, a permeable reactive barrier (PRB) will be constructed. This component of the remedy will rely on the existing groundwater flow to transport the contaminants to the second barrier. In addition to preventing further downgradient migration, the second barrier system will prevent discharge of contaminated groundwater to the Unnamed Stream and is referred to herein as the Downgradient Barrier System.
- Natural attenuation for the area downgradient of the second barrier

A Pre-Design Investigation (PDI) was performed to determine the appropriate Compliance Boundary Barrier System technology. The results of the PDI are summarized in the Pre-Design Investigation Report dated May 13, 2013 and concluded that, although Site conditions are amenable to a zero-valent iron (ZVI) PRB technology, the amount of ZVI needed for the PRB construction and for long-term maintenance is significantly greater than originally estimated in the Focused Feasibility Study, dated July 2011. Therefore, the PDI recommended groundwater collector trench technology at the Landfill Compliance Boundary. Based on subsequent discussions with EPA and VtDEC, the barrier system at the downgradient edge of the highly contaminated groundwater has been changed from a PRB to a groundwater collector trench.

A Draft Final Remedial Design Report, dated July 2013, has been prepared for the collector trench and groundwater treatment remedy. Based on these design plans

### ***2.2.1 Collector Trench System***

The proposed remedy consists of the following:

1. Installation of two groundwater collector trenches (one at the Landfill Compliance Boundary and one Downgradient), including the installation of extraction wells, force main, and power and control conduits
2. Excavated soils management, including dewatering, stockpiling, and capping;
3. Treatment of extracted groundwater to reduce the contaminant concentrations to levels suitable for discharge to the surface water of the Unnamed Stream
4. Lining of the toe-of-slope swale between the limit of the existing landfill cap to where the swale discharges into the Unnamed Stream, to prevent surface water runoff from entering the collector trench.

## ***2.3 PROJECT DELIVERABLES AND MILESTONES***

The remedial action deliverables and required milestones are described in Section VI of the SOW. The deliverables and milestone events are described below.

### ***2.3.1 Remedial Action Work Plan and Project Operations Plan***

This RAWP and POP is being submitted to EPA for review and approval. The RAWP and POP contain the following:

1. A description of all activities necessary to implement the Remedial Action in accordance with the Remedial Design and the SOW, including the following:
  - a. contractor mobilization/site preparation
  - b. collection trench system installation
  - c. construction, shake-down, and start-up of the treatment system system

- d. site demobilization activities
2. A detailed schedule for the completion of the RA activities and milestones, including:
- a. Pre-construction conference
  - b. Construction Meetings During Construction;
  - c. Construction Activities
  - d. Treatment System Installation and Startup
  - e. Final Construction Inspection
  - f. Final Remedial Construction Report
  - g. Operation and Maintenance Plan
3. The POP has been prepared in support of all fieldwork to be conducted in accordance with the Remedial Action Work Plan and includes:
- a. a Site Management Plan (SMP);
  - b. a Sampling and Analysis Plan (SAP) which includes a Field Sampling Plan (FSP)
  - c. a site-specific Health and Safety Plan (HSP)

### ***2.3.2 Pre-construction Conference***

A Pre-construction Conference was held on August 27, 2013 and included all significant parties involved with the RA as described in Section 1.3, including representatives from EPA, VTDEC, Burgess Brothers Settling Defendants, and the Construction Management Team.

### ***2.3.3 Initiation of Construction***

Within 30 days of the date of EPA's approval or modification of the Remedial Action Work Plan and POP and after conducting the pre-construction meeting, the RA activities will commence as specified in the proposed schedule.

### **2.3.4 Construction Meetings**

During the construction period, the Construction Management Team will meet at least monthly with EPA and VTDEC to review the construction progress. These meetings will either be in person or via conference call, as needed. If conditions warrant modifications to the design, construction, or schedule, the Construction Management Team may propose modifications that will be discussed at these meetings. Following review and approval or modification by EPA, after reasonable opportunity for review and comment by VTDEC, the Construction Management Team will implement the design or construction or schedule modifications required.

### **2.3.5 Operation and Maintenance Plan**

Within 30 days after the final construction inspection, the Burgess Brothers Settling Defendants will submit to EPA for review and approval or modification, after reasonable opportunity for review and comment by the VTDEC:

1. A Draft Remedial Construction Report documenting all remedial activities performed and conclusions regarding conformance of the treatment system with Performance Standards for the Site.
2. An Operation and Maintenance (O&M) Plan to ensure the long-term, continued effectiveness of each component of the Remedial Action.

The requirements for these future plans are outlined in the SOW.

### **2.3.6 Final Remedial Construction Report**

Within 30 days after the final inspection, the Construction Management Team will prepare a Remedial Action Construction Report that will include:

1. A summary, in chronological order, of all procedures actually used during construction activities, including, but not limited to, collection trench installation, lining of the Toe of Slope swale, capping of trench spoils, groundwater treatment system installation, and new monitoring well installations.
2. Tabulation of all analytical data and field notes prepared during the course of the Remedial Action activities including:
  - a. QA/QC documentation of these results and;
  - b. presentation of these results in appropriate figures.

- c. a description, with appropriate photographs, maps and tables of the disposition of the Site (including areas and volumes of groundwater saturated soil treated etc.);
- d. final, detailed cost breakdowns for all treatment process components;
- e. conclusions regarding conformance of treatment processes with the Performance Standards; and
- f. description of actions taken and a schedule of any potential future actions to be taken.

### ***2.3.7 Operation and Maintenance***

Within 30 days after the final construction inspection, the Burgess Brothers Settling Defendants will submit to EPA and VTDEC for review and approval by EPA a revised O&M Plan. The two collector trenches and the treatment system will be operated and maintained in accordance with this plan. The purpose of the O&M Plan is to ensure that flow rates into the trenches are sustained and targeted groundwater flows into the collector trenches (i.e., preventing flow bypass around, under, or over the barrier systems), as well as to ensure that the treatment system is treating the groundwater to below PLs and air discharges are below PLs. In addition, the O&M Plan will present a conceptual approach for implementation of the Optimization Approach remedy for the Active Treatment Zone (Areas A and B).

Operations and Maintenance Progress Reports shall be submitted quarterly for the first two years following approval of the O&M Plan. Thereafter, the O&M reports shall be submitted annually. Progress Reports shall contain, at a minimum:

- 1. A list of all O&M activities that were performed since submittal of the previous O&M Progress Report;
- 2. A list of those O&M activities that will be performed in the time period until the next O&M Progress Report;
- 3. A description of any operational problems encountered and measures taken to address those problems;
- 4. A discussion of the condition of the components of the remedy, including the collector trenches, the stockpiled soils landfill cap, and the air stripper water treatment system; and

5. The results of any analyses or evaluation of system performance, including all data.

#### **2.4 PROJECT SCHEDULE**

The project schedule showing the selected remedy implementation, deliverables and milestones described above is provided on Figure 2-1. The proposed RA construction activities will be completed during 2013.

### **3.0 SUMMARY OF CONSTRUCTION ACTIVITIES**

#### **3.1 REMEDIAL ACTION ACTIVITIES**

The RA construction activities are shown on the attached schedule and are described in detail in the RD Report. The purpose of the RA is to remediate overburden groundwater contamination. The RA includes installation of a groundwater collection trench at the landfill compliance boundary and downgradient of the compliance boundary, disposal and final capping of soils excavated from the trenches within the existing landfill, installation and testing of an on-site treatment system for the extracted groundwater, lining of the toe-of-slope swale between the landfill cap and Unnamed Stream, and discharge of the treated groundwater: via onsite surface water discharge.

The collection trenches are to extend across the groundwater plume at the landfill compliance boundary and the area downgradient of the compliance boundary in the area of the W-09 well cluster. The collection trenches will be excavated to the surface of the lodgement till and backfilled with a highly porous media (pea stone). Extraction wells within each trench will convey groundwater to a treatment system located in the existing treatment building on the Site.

Soils excavated from the collector trenches will be temporarily stockpiled at an area within the capped landfill. Groundwater draining from the stockpiled soils and surface water that comes in contact with these soils prior to capping will be collected and pretreated prior to discharge. The soils will be final graded and capped with an impervious geomembrane clay liner, drainage system and vegetative support soils overlying and connected to the existing landfill capping system.

The extracted groundwater is to be treated prior to discharge. The treatment system is designed to reduce volatile organic compound (VOC) concentrations prior to discharge to onsite surface water. VOC treatment is to be provided by an air stripper with granular activated carbon for the off-gas treatment. Additional treatment to comply with surface water discharge requirements will include, liquid-phase granular activated carbon (LGAC) polishing of effluent VOCs, and liquid -phase activated alumina (AA) to remove trace levels of arsenic.

The toe-of-slope swale will be lined between the existing landfill cap and the Unnamed Stream to prevent surface water being carried by the swale from discharging into the collection trench. The swale will be lined with a geocomposite clay liner and resurfaced with crushed stone and rip rap.

### **3.2 CONSTRUCTION QUALITY ASSURANCE RECORDS**

#### **3.2.1 Documentation**

The level of quality demonstrated on the project will be demonstrated through a complete documentation procedure. The procedures, as outlined below, will be established and monitored by the CQAO. The CQAO will be assisted by the RPE, whose duties will include reminding the Contractor of the specified items to be inspected. The RPE will also be responsible for keeping a record of descriptive remarks describing the daily construction activities, and for maintaining a system of data sheets, construction management testing services submittals, and standard forms.

Documentation and data collected during the course of construction activities will be available to the Burgess Brothers Settling Defendants, EPA and VTDEC at the site.

#### **3.2.2 Record Keeping Requirements**

Daily records will be prepared by the Construction Management Team that will be a compilation of the following:

- Daily Report Form
- Copied Field Book recordings
- QA/QC Forms
- Field testing results
- Figures of the Site showing where the work has taken place

#### Daily Report Form

The Daily Report Form is provided in Attachment B. The form will be completed by the RPE at the end of each day, and will include:

1. Client name
2. Project name
3. Contractor's name

4. RPE time on site
5. Hours/time worked by the contractor
6. Brief descriptions of the days activities
7. A listing of the visitors to the site
8. The Contractor's manpower and equipment
9. Special or unusual event
10. Health and safety protocol
11. Accidents

The RPE will attach copies of field book notes, completed QA/QC forms, and applicable figures to the report. The report will be signed and dated by the RPE and filed in the field trailer at the end of each day.

#### Field Books

Observations noted in the field pertaining to the site activities and the level of compliance with the plans or specifications will be recorded in a bound field book, solely dedicated to the Burgess Brothers RA. As a minimum, information cited in the field book will include:

1. Date;
2. Weather observations;
3. RPE initials;
4. Contractors manpower, equipment and major material deliveries;
5. Field observations, including time of observation;
6. Visitors log; and

Notes will be legible, concise and written in ink. The pages of the book will be clearly numbered.

## Photographs

The Construction Management Team will collect photographs during construction to document RA activities. The format and content of the photographs is described in the specifications.

## Construction Related Correspondence

The General Conditions of the construction contract will clearly define the provisions and procedures related to non-compliance with the project plans and specifications, changed conditions, and extra work.

Work that, in the Engineer's opinion, does not conform to the RA plans and specification will be documented and reported to the Burgess Brothers Settling Defendants. The non-conformance will be resolved and corrective action taken, in a manner that is approved by the Burgess Brothers Settling Defendants, Construction Management Team and regulatory agencies, prior to proceeding with the work. Because of the accelerated schedule for construction work at the site, conference calls will be conducted daily at a minimum, with the Construction Management Team, Contractor, and if appropriate, the Burgess Brothers Settling Defendants, EPA, and VtDEC, until non-conforming work is resolved. The RPE will document the correspondence with the Contractor, either through field memorandum or letters, until such time that the corrective action results in the work conforming to the plan and specifications, the action shall be documented.

The regulatory agencies will be notified promptly of deviations from the approved RA design. Communication with the EPA will be conducted by identifying the proposed change and indicating whether the proposed change is minor or major in nature; the Field Change Decision-Making Process is provided in the approved CQAP.

### **3.3 *ACTIVITY-SPECIFIC IMPLEMENTATION AND QA/QC***

The Construction Management Team will oversee the Remedial Action and Environmental Partners' RPE will be on-site full-time while all activities are performed at the site, including:

1. contractor mobilization/site preparation
2. collection trench system installation, including excavation and installation of the collector trenches, stockpiling, grading and capping of the trench spoils, and lining of the toe of slope swale.

3. construction, shake-down, and start-up of the treatment system system
4. site demobilization activities

XDD personnel will be onsite, as needed, during installation, shake-down and startup of the treatment system.

Details of the specific activities of for collection trench systems are summarized in detail in the Geo-Solutions Remedial Action Work Plan included in Appendix A. Details of the specific activities for treatment system, including equipment and specifications, are summarized in detail in the RES Work Plan included in Appendix B. The Construction Team RPE will oversee and document all remedial activities to ensure that they comply with the attached work plans. Any significant variations from the attached work plan will be documented and provided to the Burgess Brothers Settling Defendants, *de maximis*, EPA and VTDEC for approval.

### **3.4 FINAL CONSTRUCTION INSPECTION AND ACCEPTANCE**

#### **3.4.1 Final Inspection**

After the contractors have substantially completed the construction work shown on the Plans and described in the Specifications and this report, the Construction Management Team will perform an inspection and determine if the project is substantially complete. In the event that additional work is required, the Construction Management Team will develop a punch-list of items to be completed within a set timeframe and towards achieving completion.

When the Construction Management Team has determined that the project is complete, they will notify EPA and VTDEC to schedule and conduct the Final Construction Inspection. The inspection will be attended by the Burgess Brothers Settling Defendants' Project Coordinator, *de maximis*, the Construction Management Team, the Construction Contractor, EPA and VtDEC. In accordance with the SOW, the Final Construction Inspection will occur within sixty (30) days of the Construction Management Team's determination that construction is 100% complete.

#### **3.4.2 Remedial Action Construction Report**

Within 30 days after the final inspection, the Settling Defendants will submit a draft Remedial Construction Report to EPA and VTDEC for review. The Remedial Construction Report will include, at a minimum, the following documentation:

1. A summary, in chronological order, of all procedures actually used during construction activities, including trench excavation and construction, capping of stockpiled spoils from the trenches, lining of the toe of slope swale and installation, startup and testing of the air stripper and off-gas treatment systems.
2. Tabulation of all analytical data and field notes prepared during the course of the Remedial Design and Remedial Action activities including:
  - a. QA/QC documentation of these results; and
  - b. presentation of these results in appropriate figures.
  - c. a description, with appropriate photographs, maps and tables of the disposition of the Site including areas and volumes of groundwater treated, etc.);
  - d. final, detailed cost breakdowns for each of the treatment process components;
  - e. conclusions regarding conformance of treatment processes with the Performance Standards; and
  - f. description of actions taken and a schedule of any potential future actions to be taken.

Within 30 days of receipt of EPA comments, the Settling Defendants will submit the final Remedial Action Construction Report for EPA approval.

## **4.0 PROJECT OPERATIONS PLAN**

### **4.1 PURPOSE AND OBJECTIVE**

The purpose of the POP is to support the RA by addressing:

1. site management, including site security, construction contingencies, controlling spills and discharges, air quality, erosion and sediment control, and surface water impacts
2. environmental sampling and analysis to be conducted during construction
3. health and safety

This Chapter provides the POP information required by the SOW, with the exception of the Sampling and Analysis Plan provided in Chapter Five.

### **4.2 SITE MANAGEMENT PLAN**

The overall objective of the SMP is to provide EPA and VtDEC with a written understanding and commitment that describe how various aspects of the project will be managed during the RA activities. These include site access, site security, contingency procedures, management responsibilities, waste characterization and disposal, budgeting, and data handling. Specific objectives and provisions of the SMP are to:

1. Provide a map and a list of properties, the property owners, and addresses of owners for those properties where access may be required to perform the remedial actions. This includes any private or Town-owned property for which deed restrictions, institutional controls or Town ordinances are required (not applicable).
2. Identify the exclusion zone, contamination reduction zone (CRZ), and clean zone during the on-site investigation activities.
3. Establish procedures sample notification letters to land owners to arrange field activities and to ensure that EPA and VTDEC are informed of any access-related problems and issues (not applicable).
4. Provide for security of property on the Site.

5. Prevent unauthorized entry to the Site, which might result in exposure of persons to potentially hazardous conditions, prior to and including the investigative work to be performed as part of the RD/RA.
6. Secure access agreements for the Site (not applicable);
7. Establish the location of a field office for on-site activities and meetings.
8. Provide contingency and notification plans for potentially dangerous activities associated with the RD/RA.
9. Communicate to EPA, VTDEC, and the public the organization and management of the RD/RA, including key personnel and their responsibilities.
10. Provide for the proper disposal of materials used and wastes generated during the RD/RA field activities, such as trench spoils, extracted groundwater, protective clothing, disposable equipment, etc. These provisions shall be consistent with the off-site disposal aspects of CERCLA, RCRA, and applicable state laws.
11. Provide plans and procedures for organizing, managing, and presenting the data generated from the RD/RA field activities and for verifying its quality before and during the RD/RA. These procedures include a description of the database management, as a required element of the current EPA QAPP guidance. The database management procedures will define data flow, database structure, data input fields, appropriate quality assurance/quality control (QA/QC), and capabilities of data manipulations for data users.

Provisions for airborne contaminant monitoring that may occur due to the site activities are provided in the site specific HASP, dated August 2013.

Specific objectives and provisions of the SMP that have been addressed previously in this document are the organization and management of the RA and a listing of contractors and subcontractors that are performing the RA, with a description of their activities and roles.

#### ***4.2.1 Property Owner and Access Agreements***

##### ***4.2.1.1 Property Ownership and Access***

The Burgess Brothers Superfund Site property is entirely within property owned by Burgess Brothers as shown on Figure 4-1. No work is anticipated to be performed on any other properties. Access to the site is by the gravel access road

adjacent to the former Burgess Brothers construction offices located off Burgess Road. Portions of the Burgess Brothers property have been offered for sale and Burgess Brothers is currently considering an offer from a potential buyer, Earth Waste Systems. Should the property be sold the Settling Defendants, which includes Burgess Brothers, will ensure continued access to the site. Earth Waste Systems has been notified that should they purchase the property, access to the site will need to be maintained. As a result SMP objectives #1, #3, and #5 do not apply to the Site.

#### *4.2.1.2 Site Security Plan*

Access to the Site is controlled by a steel swing gate at the road entrance near the north end of the landfill. To prevent unauthorized entry, all visitors to the Site will be required to sign a daily visitors log at the Construction Trailer located in the staging area just beyond the swing gate. The Construction Trailer is where monitoring equipment and records will be stored and includes sufficient room for project meetings with the field team if necessary. During non-working hours, the swing gate will be closed.

The RA areas (shown on Figure 4-2) are located on Burgess Brothers property. Since access to these areas is needed to complete the RA activities, the Construction Management Team will provide all elements of work area security necessary to prevent unauthorized entry.

The Landfill area and portions of the Site downgradient of the Landfill are enclosed within a 6-foot high chain link fence. RA activities will be require that portions of the fence be opened up or removed to provide access and an adequate work area for trench construction.

The security of the Site property will be maintained by the access restrictions described above. Storage of equipment, if needed on Site by government or others, will be arranged by contacting the Construction Management Team prior to bringing the equipment to the Site. However, neither the Burgess Brothers Settling Defendants nor any of their representative and subcontractors, can ensure security for articles or equipment left at the Site during non-working hours, and cannot be held responsible for any damage or loss that may result.

Provisions of the HASP will be maintained by excluding all but essential personnel from those portions of the Site where operations pose a potential threat to human health. Only authorized persons will be allowed to enter the Site. In accordance with the HASP, the Remedial Design Team has designated work zones in which specific operations will occur and will institute specific site entry, decontamination and environmental air monitoring procedures at designated control points. The three work zones are shown on Figure 4-3 and consist of the following:

**Exclusion Zone** – The Exclusion Zone is the area where all trench excavation and construction will be performed and where trench spoils will be stockpiled at the top of the landfill. These are the areas in which the potential exists to come into contact with soils and groundwater that have potentially hazardous concentrations of organic and inorganic compounds. The Exclusion Zone is located inside the Landfill fenced area and in the vicinity of the Landfill Compliance Boundary and the Downgradient Barrier Systems and the areas surrounding these two systems.

**Contamination Reduction Zone (CRZ)** – The CRZ is the area between the Exclusion Zone and Clean Zone where equipment and personnel decontamination is performed. The CRZ is located at the southwest gate to the landfill (although this gate and portion of the chain link fence will be removed to enable construction of the Compliance Boundary Trench). All construction equipment and personnel must exit the Exclusion Zone through from this area and will be cleaned and decontaminated prior to entering the Clean Zone.

**Clean Zone** – The Clean Zone is located outside the landfill and downgradient area, and encompasses all other areas of the Site. The Clean Zone includes the treatment system building, equipment staging area, and construction trailer.

Property security at the Site will be maintained by the access restrictions described above. Storage of equipment, if needed on Site by government personnel or others, will be arranged by contacting the Field Project Manager prior to bringing the equipment to the Site. However, neither the Burgess Brothers Settling Defendants nor any of their representatives can ensure security for articles or equipment left at the Site during non-working hours, and cannot be held responsible for any damage or loss that may result.

#### **4.2.2 RA Contingency and Notification Plan**

##### *4.2.2.1 General*

While it is unlikely, potentially dangerous worker health and safety conditions could develop during the performance of the RA activities. As part of the HASP, Environmental Partners has developed an Emergency Response Plan (ERP) to address any on-site emergencies that can be reasonably anticipated. The ERP describes procedures for coordinating with local emergency response officials, including hazardous materials response teams, the police and fire departments, hospitals, ambulance services, poison control centers, EPA and VtDEC. The ERP will be periodically reviewed and, as necessary, amended to keep it current with new or changing site conditions or information. EPA and VtDEC will be notified

of the occurrence of any condition that creates an emergency situation or an immediate threat to the Site.

The Landfill Compliance Boundary trench excavation activities will be performed outside the limit of the landfill cap and beyond the limit of the landfill waste, in areas of the Site that were re-graded as part of the landfill closure activities. It is unlikely that drummed waste or other hazardous materials will be encountered based on what was experienced this area of the Site when the Landfill was re-graded prior to landfill capping.

The Trenching activities for the Downgradient Barrier System will also be performed outside the limit of the landfill cap and beyond the limit of the landfill waste, in areas where monitoring wells have already been installed. It is unlikely that drummed waste or other hazardous materials will be encountered, based on what was experienced during the drilling of these wells and the monitoring data.

#### *4.2.2.2 Spill and Discharge Control Plan*

This section provides for contingency measures and reporting requirements for potential uncontrolled spills and discharges of contaminated liquids. Measures for dealing with materials associated with trench excavation (trench spoils, purge water, personal protective equipment, etc.) and decontamination processes are addressed in Section 4.2. Environmental Partners will subcontract all spill response activities to a qualified hazardous waste disposal vendor. At the current time, this vendor is Clean Harbors, Inc. The disposal vendor will provide the equipment and personnel needed to perform decontamination measures that may be required to remove spillage from previously uncontaminated areas, equipment or material.

This Spill and Discharge Control Plan contains:

- Procedures for containing dry and liquid spills.
- Absorbent material available on Site.
- Storage of spilled materials.
- Reporting (i.e. notification) procedures.
- Decontamination procedures.

#### 4.2.2.3 Spill and Discharge Management

Environmental Partners Group will direct the emergency spill/discharge response activities being performed by the hazardous materials disposal vendor, and is responsible for field implementation and enforcement of this plan. Environmental Partners' Site Safety Officer will be responsible for implementing, communicating, and enforcing health and safety policies and procedures during the course of the project. Environmental Partners will also assist in evaluating health and safety concerns with respect to environmental releases and emergency response actions and determine if a reportable quantity of materials have been released.

Environmental Partners will provide support to emergency responders and dedicate appropriate project resources to the response effort. If required, additional personnel and equipment will be mobilized to the Site. Environmental Partners will also notify and provide the Burgess Brothers Settling Defendants with recommendations concerning any additional action(s) to be taken.

In the event that a spill incident occurs, Environmental Partners will immediately evaluate the situation and, if necessary, notify the local emergency support services. Telephone numbers for emergency contact personnel are summarized below and will be posted accordingly at the Site.

#### **Emergency Response Telephone Numbers**

	<b><u>In Bennington, VT</u></b>	<b><u>Outside Bennington, VT</u></b>
Police	911	(802) 422-1030
Fire	911	(802) 422-1030
VtDEC - Waste Management Division (Gerold Noyes)		(802) 522-5614
Project Manager (Mark White)		(617) 657-0200
Vermont Spills Hotline		(800) 641-5005
Southwestern Vermont Medical Center (Hospital), Dewey Avenue		(802) 442-6361

The list will be maintained with current contacts, and telephone numbers will be posted along with other emergency phone numbers at all telephone locations at the Site.

#### 4.2.2.4 Spill Control Equipment

The following equipment and materials will be maintained onsite for use during spill response activities:

- ABC-type fire extinguishers (16-pound)
- Fire blankets and towels
- First-aid kit
- Eyewash
- Mineral absorbent
- 55-gallon drums
- Small tools including shovels, rakes, brooms, dust pans, etc
- Diaphragm pumps

If applicable, each emergency response technician will be issued the following safety equipment:

- Eye protection, consisting of either vented goggles, splash glasses, or face shield
- Hand protection consisting of either vinyl disposable gloves, butyl gloves, or nitrile gloves
- Respiratory protection consisting of half-face respirator, or full-face respirator and HEPA/organic vapor gas cartridges
- Foot protection consisting of disposable booties
- Miscellaneous equipment consisting of an equipment bag, paint markers, pH paper, Hazardous Materials Substance and Waste Compliance Guide, and/or shop wipes

#### *4.2.2.5 Spill Leak Prevention*

The following procedures will be followed to reduce the possibility of spills from occurring during the RA field activities.

Environmental Partners RPE will compile and maintain a summary of the locations of potentially significant sources of spills and leaks where significant amounts of oil or hazardous substances are handled and stored. Areas that have a potential for spills to occur include fueling areas, outdoor storage areas, and parking areas.

No containers will be used for the storage of oil or hazardous material unless its material and construction are compatible with the material stored and the conditions of storage.

Environmental Partners RPE will conduct inspections on a routine basis to identify leaks or other conditions that could lead to spills. The inspections will include evidence of spilled materials in material storage and handling areas; effectiveness of housekeeping practices; and the condition of storage containers.

Vehicles will be maintained in proper condition to reduce the likelihood of spills. No other mechanical preventive maintenance programs are required.

Personnel will be trained and supervised to ensure adherence to the following general housekeeping procedures:

- Prompt cleanup of work areas when work is completed and prompt removal of spills and leaks;
- Regular refuse pickup and disposal;
- Routine inspection of oil and hazardous substance storage and handling areas; and
- Maintenance of unobstructed site access to allow emergency personnel and equipment access to any area in the event of an emergency.

Health and safety training will be performed with all of the field staff. As part of this training the RA activities and methods, and their related safety and health hazards, will be reviewed. Practices for preventing spills, and procedures for responding properly and rapidly to spills will also be reviewed.

#### *4.2.2.6 Countermeasures*

The following section discusses specific countermeasures to be taken in the event of a release of oil or hazardous material.

Operating personnel handling chemicals and designated emergency response personnel shall be the only individuals responsible for implementing spill contingency measures. The roles of individuals designated for implementing countermeasures associated with hazardous substances are summarized below:

Emergency Coordinator - Assumes control of incident scene. The Emergency Coordinator for this project is Environmental Partners' RPE.

Alternate Emergency Coordinators - Assume control of incident scene in the absence of the primary Emergency Coordinator. The Alternate Emergency Coordinator is the Site Superintendent.

#### *4.2.2.7 Spill Response*

All spills will be reported as soon as possible to the Emergency Coordinator (i.e., Environmental Partners' RPE). The Emergency Coordinator, in conjunction with the Site Safety Officer, will be responsible for determining the magnitude and potential impact of a release, as well as the need for personal protective equipment or outside assistance. If site personnel are unable to respond to an environmental release in safe and timely manner, evacuation of the area may be warranted. The decision to evacuate will depend upon the risk of exposure and severity of the release. General procedures to be followed in a spill situation are:

1. Evaluate potential health and safety concerns;
2. Stop the source/contain the spill;
3. Make appropriate notifications; and
4. Begin cleanup as directed.

More detailed procedures used to preclude releases to the environment are outlined below:

- Drips/Leaks of Oil/Automotive Fluid:

- Use rags or absorbent materials to clean up small drips and leaks of oil and automotive fluid. (Do not saturate rags with gasoline, solvents, or other hazardous wastes.)
  - Collect used rags in open-head 55-gallon drums or other appropriate containers for disposal.
  - Collect used absorbent material and store in 55-gallon drums or other appropriate containment (such as a 20-gallon poly lab-pack). Used absorbent from oil spills should be stored separately from used absorbent from hazardous material spills.
- Small Spills:
    - Stop release as appropriate (e.g., up-righting an overturned container, plugging a leak, using a means of secondary containment).
    - Use dry absorbent materials to soak up liquid spills. Personal protective equipment may be required for cleanup of hazardous materials.
    - Collect used absorbent material and store in 55-gallon drums or other appropriate containment (such as a 20-gallon poly lab-pack). Used absorbent from oil spills should be stored separately from used absorbent from hazardous materials spills.
- Large Spills:
    - Contain the release with absorbent socks, booms, or construction of temporary dikes or berms.
    - Stop the release as appropriate (e.g., upright an overturned drum or other container, plug a leak, place damaged drums or containers in overpacks or other secondary containment structure).
    - Collect the spilled material with pumps, shovels, or other equipment as necessary. Store the spilled material and contaminated absorbent for further treatment or disposal, depending on the amount and type of material.

#### *4.2.2.8 Decontamination Procedures*

In the event that a spill or discharge should occur, complete cleanup may require removal of contaminated soils. In this event, decontamination procedures will be required after cleanup to eliminate traces of the substance spilled. Personnel decontamination will include cleansing with soap and water prior to removing PPE and equipment. This is outlined in the site-specific HASP. Decontamination liquids and other liquids generated will be containerized for proper disposal.

#### *4.2.2.9 Disposal of Contaminated Material*

Contaminated groundwater collected during excavation of the trenches will be containerized in holding tanks onsite. The extracted groundwater and bio-slurry will be treated with the onsite groundwater treatment system for discharge to surface water. Prior to being introduced to the treatment system the construction water will be sampled and analyzed for VOC concentrations and pre-filtered. After pretreatment, the construction water is to be re-sampled to confirm that VOC concentrations have been reduced to appropriate levels prior to being discharged to surface water.

Contaminated soils from excavation of the trenches will be allowed to drain adjacent to the trench. After sufficient drainage, the soils will be transported and stockpiled at the soil disposal area within the capped landfill and covered with poly to prevent contact with rain water or snow. The area will be lined with an impervious geosynthetic clay liner. Groundwater draining from the stockpiled soils and surface water that comes in contact with these soils prior to capping will be collected and pretreated onsite prior to discharge. The soils will be final graded and capped with an impervious geomembrane clay liner, drainage system and vegetative support soils overlying and connected to the existing landfill capping system.

Should a release occur at the site, used absorbent materials will be disposed of in the same manner as waste oil and hazardous waste (as appropriate). All contaminated materials that cannot be decontaminated will be containerized and labeled for proper disposal.

#### *4.2.2.10 Internal and External Communications and Alarm System*

Spills notification will be communicated to all personnel via personal communication or telephone. If required, assistance will be summoned from external sources, such as the local fire department or local emergency management agency via telephone.

#### *4.2.2.11 Evacuation Plan*

If evacuation of personnel is concluded to be necessary, procedures detailed in the HASP will be followed under the direction of Environmental Partners and the Site Safety Officer.

#### *4.2.2.12 Emergency Spill Control Network*

Spills will be initially managed by Environmental Partners Group, as the Emergency Coordinator. The spill will be immediately reported to the Project Manager, regulatory agencies, *de maximis* and the Burgess Brothers Settling Defendants. The RPE will also report the spill or discharge to the appropriate regulatory agencies to comply with local, state and federal regulations. The Field Project Manager or Site Safety Officer will document the spill or discharge with the Spill Incident Report Form, which is provided in Figure 4-4.

#### *4.2.2.13 Arrangements with Local Emergency Response Agencies and Hospitals*

Formal arrangements will be made with local emergency response agencies and hospitals for providing services in the event of an emergency. In the event of an emergency, the local hospital and local emergency management agency will be notified as appropriate.

#### *4.2.2.14 Notification List*

All spills at the Site will be reported immediately to the Project Manager. Environmental Partners' RPE will notify the Project Manager immediately of an uncontrolled spill or discharge, resulting from work of one of their subcontractors. Based on the nature and magnitude of the spill, the Project Manager will determine which agencies, if any, must be notified and will provide the proper notification.

Spill response and reporting procedures will be performed in accordance with Vermont Hazardous Waste regulations §7-105 Emergency and Corrective Action, as follows:

*'All discharges and/or releases that meet any of the following criteria shall be immediately [within 2 hours] reported to the Secretary by the person or persons exercising control over such waste by calling the Waste Management Division at (802) 828-1138, Monday through Friday, 7:45 a.m. to 4:30 p.m. or the Department of Public Safety, Emergency Management Division at (800) 641-5005, 24hours/day:*

*(i) A discharge of hazardous waste, or release of hazardous material that exceeds 2 gallons;*

*(ii) A discharge of hazardous waste, or release of hazardous material that is less than or equal to 2 gallons and poses a potential or actual threat to human health or the environment;'*

This requirement may also be satisfied by calling VTDEC project manager (Gerold Noyes) at 802-522-5614. If he is not available, then the on-duty spill coordinator at one of the two numbers above shall be notified.

If human health or the environment is threatened the Project Manager or RPE will immediately contact the following agencies (in the order listed):

1. Local emergency response units (e.g. fire), if necessary.
2. VTDEC
3. EPA
4. Citizen Notification if required by the Burgess Brothers Settling Defendants, VtDEC or EPA.

If the Site had a spill, discharge, fire, or explosion that required a response action, the RPE will submit a draft Spill Incident Report Form to the Burgess Brothers Settling Defendants, VtDEC and EPA within 24 hours of the incident. Once all outcomes of the spill are known (e.g., testing results), the report will be finalized and re-circulated.

#### *4.2.2.15 Recordkeeping*

Environmental Partners' RPE will maintain all records for inspections and spill reports on file. Training records for employees will be kept on file until completion of the PDI.

Environmental Partners' RPE will document the location of the spill on site drawings and submit the drawings to the Project Manager at project completion. The report shall include at a minimum the cause and resolution of incident, outside agencies involved and date occurred. The report shall be submitted to *de maximis*, EPA and VtDEC in draft form within 48 hours of the incident, along with a timetable on completing the final form. The report will include the following:

- Name, address, and telephone number of the individual filing the report.

- Date, time, and location of the incident. Brief description of the circumstances causing the incident. Description and estimated quantity by weight or volume of materials or wastes involved.
- An assessment of any contamination of land, water, or air that has occurred due to the incident.
- Estimated quantity and disposition of recovered materials or wastes that resulted from the incident.
- Description of the resolution of the incident.
- Description of what actions the installation intends to take to prevent a similar occurrence in the future.
- Outside agencies involved in the incident.

### ***4.2.3 Waste Disposal***

During the RA activities, off-site waste disposal will be the responsibility of each contractor. In the event that hazardous waste is encountered Geo-Solutions will be responsible for handling and securing the material as specified, until such time as the Burgess Brothers Settling Defendants and Construction Management Team makes recommendations for off-site disposal. Management and off-site disposal of hazardous waste encountered will be discussed at the weekly project meeting until the issue is resolved.

### ***4.2.4 Dust, Vapor and Odor Control Plan***

#### ***4.2.4.1 Air Quality Monitoring***

Air monitoring will involve direct reading instruments capable of providing real-time indications of air contaminants and air sampling, to protect on-site personnel and the local population. Geo-Solutions' Site Superintendent, and Environmental Partners' RPE will be responsible for assuring that monitoring is conducted in an appropriate manner, that air monitoring/sampling are conducted at a frequency sufficient to ensure accurate assessments of site conditions, and that work practices, engineering controls and/or Personal Protective Equipment are proper for the conditions.

Air monitoring will be performed during all excavation activities trench spoils regrading. At a minimum, a photoionization detector (PID) will be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (i.e. excavations, regrading, etc.). The PID will be augmented

with Draeger tubes to detect the presence of vinyl chloride should PID readings from excavations exceed 1 part per million above background. The Draeger tubes will be used at various times as PID levels increase by 5 ppm, or as the reported vinyl chloride levels dictate. Action levels and Standard Operating Procedures for air monitoring are provided in the attached HASP.

Environmental Partners will maintain documentation of all air monitoring, which will be made available to *de maximis*, EPA or VtDEC for review at any time.

### **4.3 HEALTH AND SAFETY PLAN**

In accordance with the SOW, a site-specific Health and Safety Plan (HASP) for the RA activities is provided in Appendix C. The objective of the HASP is to establish the procedures, personnel responsibilities and training necessary to protect the health and safety of all on-site personnel during the RA. The plan provides for routine but hazardous field activities and for unexpected Site emergencies.

The site-specific health and safety requirements and procedures in the HASP may be updated based on an ongoing assessment of Site conditions, including the most current information on each medium. For each field task during the RA, the HASP identifies:

1. possible problems and hazards and their solutions;
2. environmental surveillance measures;
3. specifications for protective clothing;
4. the appropriate level of respiratory protection;
5. the rationale for selecting that level;
6. criteria, procedures, and mechanisms for upgrading the level of protection and for suspending activity, if necessary;
7. delineation of three work zones will be established to perform this work – an exclusion/contamination zone, a contamination reduction zone, and a support clean zone;
8. description of the on-site person responsible for implementing the HASP;

9. protective equipment personnel decontamination procedures; and
10. medical surveillance.

#### **4.4 COMMUNITY RELATIONS SUPPORT**

EPA is responsible for the Community Relations Support Plan (CRSP) to describe public information and public involvement activities anticipated during PDI activities. If necessary, the Burgess Brothers Settling Defendants may be required to assist in EPA's public relations effort. The support shall be at the request of EPA and may include:

1. participation in public informational or technical meetings, including the provision of presentations, logistical support, visual aids and equipment;
2. publication and copying of fact sheets or updates;
3. assistance in preparing a responsiveness summary after the public RD/RA comment period, and;
4. assistance in placing EPA public notices in print.

#### **4.5 ORGANIZATION OF PROJECT DATA**

The organization of project data will be the responsibility of the Construction Management Team. The RPE will keep an active filing system at the site, including:

1. all health and safety requirements, including an approved Health and Safety Plan;
2. all forms that are required under the RD Report and this RAWP/POP;
3. a summary of all submittals made to date and the status of the submittal review process;
4. materials to be stored for possible testing (e.g. destructive liner samples);
5. all material test results, including field and laboratory tests;
6. daily field logs;

7. visitor logs;
8. ongoing tally of measurement and payment quantities;
9. a photographic record as required by the project specifications; and
10. record drawings and details that document any approved revisions to the design and ongoing construction activity.

The Project Manager, or his representative, will make visits to the site every two weeks to verify that the RPE's record system is in accordance with the RD Report and this RAWP/POP. The Project Manager, or his representative, will also conduct an independent audit of the project data in accordance with this RAWP/POP. In addition to Environmental Partners' personnel, XDD will have a representative onsite, as appropriate, during the installation and startup of the treatment system.

The RPE will also ensure that any project data that is the responsibility of Geo-Solutions, RES or other subcontractors, be part of the project filing system and be made available upon request.

Upon completion of the project, all project data will be relocated to Environmental Partners' office in Quincy, Massachusetts. At a minimum, the project data will be stored electronically as a PDF file.

## **5.0 SAMPLING AND ANALYSIS PLAN**

A Long Term Monitoring Plan (LTMP) is currently being prepared by the Construction Management Team in accordance with Section V.F of the approved SOW. The LTMP will be submitted to EPA prior to startup of the collector trench system. LTMP sampling will include physical and chemical monitoring of groundwater and surface water. An O&M Plan will be prepared for the treatment system and collector trenches in accordance with Section VII of the SOW and will be submitted prior to startup of the treatment system. The treatment system O&M Plan will include sampling and analysis of influent and effluent groundwater samples and air effluent samples. Both the LTMP and O&M Plan will include the following:

1. a detailed Field Sampling Plan (FSP) that provides guidance for all fieldwork by defining in detail the sampling and data-gathering methods to be used on a project; and
2. a detailed Quality Assurance Project Plan (QAPP) that describes the policy, organization, functional activities, and the quality assurance and quality control protocols necessary to achieve the data quality objectives dictated by the intended use of the data.

This chapter presents only the SAP components that are relative to the sampling to be conducted for the RA construction activities. This includes screening for soil gas for health and safety purposes.

### **5.1 GENERAL SAP OBJECTIVES**

This SAP documents the following for each sample medium and for each sampling event:

1. sampling objectives;
2. data quality objectives, including data uses and the rationale for the selection of analytical levels and detection limits
3. site background update, including an evaluation of the validity, sufficiency, and sensitivity of existing data;
4. sampling locations and rationale;
5. sampling procedures and rationale and references;

6. numbers of samples and justification;
7. numbers of field blanks, trip blanks, and duplicates;
8. sample media (e.g., ground water, surface water, sediment, air, and soil gas);
9. sample equipment, containers, minimum sample quantities, sample preservation techniques, and maximum holding times;
10. instrumentation and procedures for the calibration and use of portable air, soil gas, or water-monitoring equipment to be used in the field;
11. chemical and physical parameters in the analysis of each sample;
12. chain-of-custody procedures must be clearly stated;
13. procedures to eliminate cross-contamination of samples (such as dedicated equipment);
14. sample types, including collection methods and if field and laboratory analyses will be conducted;
15. laboratory analytical procedures, equipment, and detection limits;
16. sampling equipment decontamination procedures;
17. consistency with the other parts of the Work Plan(s) by having identical objectives, procedures, and justification, or by cross-reference;
18. analysis from each medium for all Hazardous Substance List (HSL) inorganic and organic analytes; and
19. for any limited field investigation (field screening technique), provisions for the collection and laboratory analysis of parallel samples and for the quantitative correlation analysis in which screening results are compared with laboratory results.

The SAP is the framework of all anticipated field activities (e.g., sampling objectives, evaluation of existing data, standard operating procedures) and contain specific information on each round of field sampling and analysis work (e.g., sampling locations and rationale, sample numbers and rationale, analyses of samples). During the RA, the SAP may be revised as necessary to cover each

round of field or laboratory activities. Revisions or a statement regarding the need for revisions shall be included in each deliverable describing all new field work.

The SAP will allow split, replicate, or duplicate samples to be taken by EPA (or their contractor personnel), VTDEC, and by other parties approved by EPA. At the request of EPA or VTDEC, the Burgess Brothers Settling Defendants shall provide these samples in appropriately pre-cleaned containers to the government representatives. Identical procedures shall be used to collect the Burgess Brothers Settling Defendants and the parallel samples unless otherwise specified by EPA or VTDEC.

## **5.2 FIELD SAMPLING PLAN**

The objective of the FSP is to provide EPA and all parties involved with the collection and use of field data with a common written understanding of all environmental sampling work to be conducted during the RA. The FSP is written so that a field sampling team unfamiliar with the Site would be able to gather the samples and field information required. In accordance with the SOW, the FSP is site-specific and includes the following elements:

### **5.2.1 Site Background**

Based on the site history provided in this report and previous reports prepared for the site, the potential risks to the site include the following volatile organic compounds (VOCs):

- Trichloroethene (TCE), PEL=100 ppm
- Tetrachloroethene (PCE), PEL=100 ppm
- Dichloroethene (DCE) (Vinylidene Chloride), PEL=200 ppm
- Vinyl Chloride, PEL=1 ppm
- Carbon Disulfide, PEL=20 ppm

In addition, metals (Iron, Nickel, Zinc, Lead, and Mercury) have also been encountered at the site.

Soil gas headspace measurements made during a soil gas and soil sampling program in the winter and spring of 1989 found TCE and PCE concentrations ranging from 1.2 ppm to greater than 40 ppm. The Occupational Safety and

Health Administration (OSHA) Permissible Exposure Limit (PEL) for vinyl chloride and DCE is 1 ppm. Vinyl chloride, carbon disulfide and DCE were found in water samples collected from wells downgrading of the closed lagoons. PID field screening of soil samples during the PDI field program in Summer 2012 measured total VOC concentrations ranging from non-detect to 85 ppm and jar headspace readings ranged from non-detect to 454 ppm. Iron, nickel, zinc, lead and mercury were detected in the site soils at levels greater than the expected background levels.

### ***5.2.2 Sampling Objectives***

Based on the aforementioned history, it is proposed that environmental sampling during construction include field screening of excavations for the presence of volatile organics. The objectives of the proposed sampling are for health and safety reasons as discussed in the site-specific HASP (Appendix C).

### ***5.2.3 Sampling Location and Frequency***

The sampling location and frequency of air monitoring will vary based on the RA activity being conducted. In general, a PID will be used to screen air quality in the breathing zone of workers during all intrusive activity, or when workers are exposed to potentially harmful gas emissions from previously installed wells or newly installed gas vents. In the event that PID readings exceed 1 ppm above background levels, air monitoring will be augmented with vinyl chloride Draeger tubes. In accordance with the HASP, the location and frequency of air monitoring is ultimately the responsibility of the Site Safety Officer.

The PID will be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (i.e. excavations, regarding of trench spoils, etc.). The PID will be augmented with Draeger tubes to detect the presence of vinyl chloride should PID readings from excavations exceed 1 part per million above background. The Draeger tubes will be used at various times as PID levels increase by 5 ppm, or as the reported vinyl chloride levels dictate. Action levels and Standard Operating Procedures for air monitoring are provided in the attached HASP.

### ***5.2.4 Sample Designation***

Air screening results will be kept in the RPE's field book. Air monitoring will be designated by the type (AMB-Ambient or EXC-Excavation), number and date. The location of the air sample reading will also be logged in the field book.

### ***5.2.5 Sampling Equipment and Procedures***

Air samples will be obtained with a PID or Draeger tube. Sampling procedures, personnel protective equipment and decontamination procedures will be in accordance with the attached HASP, and will be coordinated with the Site Safety Officer. No laboratory analysis of air samples is proposed.

## ***5.3 QUALITY ASSURANCE PROJECT PLAN (QAPP)***

### ***5.3.1 General***

The QAPP shall document in writing specific quality assurance/quality control activities designed to achieve the data quality objectives (DQO's) of the RA. No laboratory analyses are anticipated under the RA.

### ***5.3.2 Internal Checks and Audits***

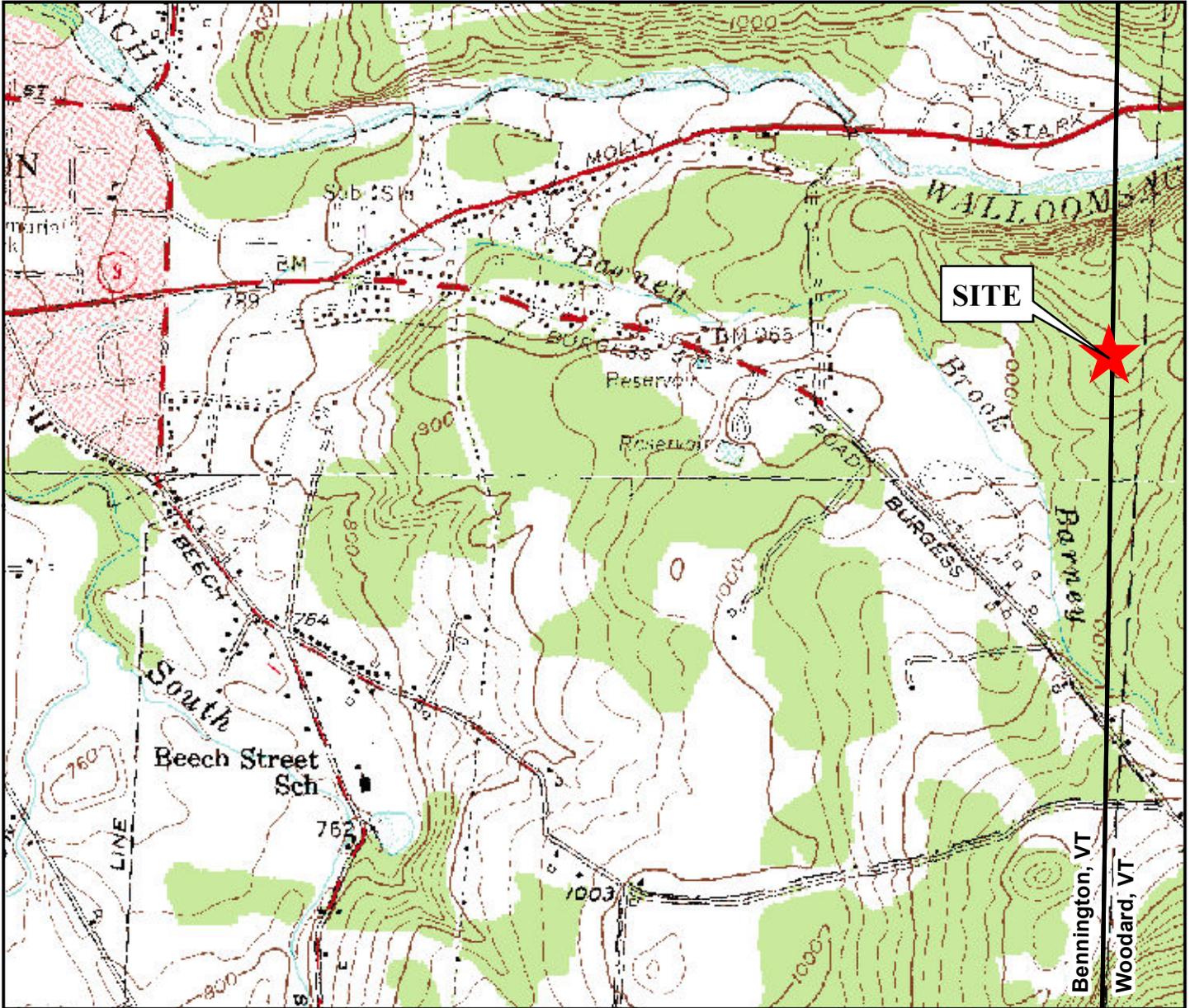
The Construction Management Team will conduct internal quality control checks for air monitoring, by performing independent PID and Draeger tube readings. The frequency of the internal checks will be determined by the Site Safety Officer.

Preventive maintenance procedures and schedules for performing maintenance on the PID and Draeger pump are discussed as part of the HASP. These procedures will be conducted on a regular basis by the RPE to ensure that the field screening equipment is in working order at all times.

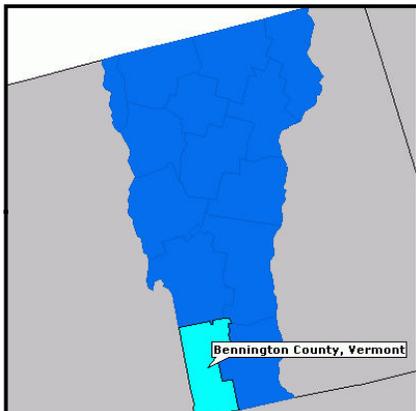
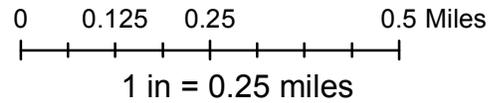
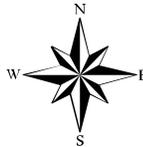
The PID will be calibrated to read to the nearest 1 ppm. In the event that the action levels discussed in the HASP are exceeded, Geo-Solutions and the Construction Management Team will undertake the corrective action prescribed in the HASP.

***FIGURES***

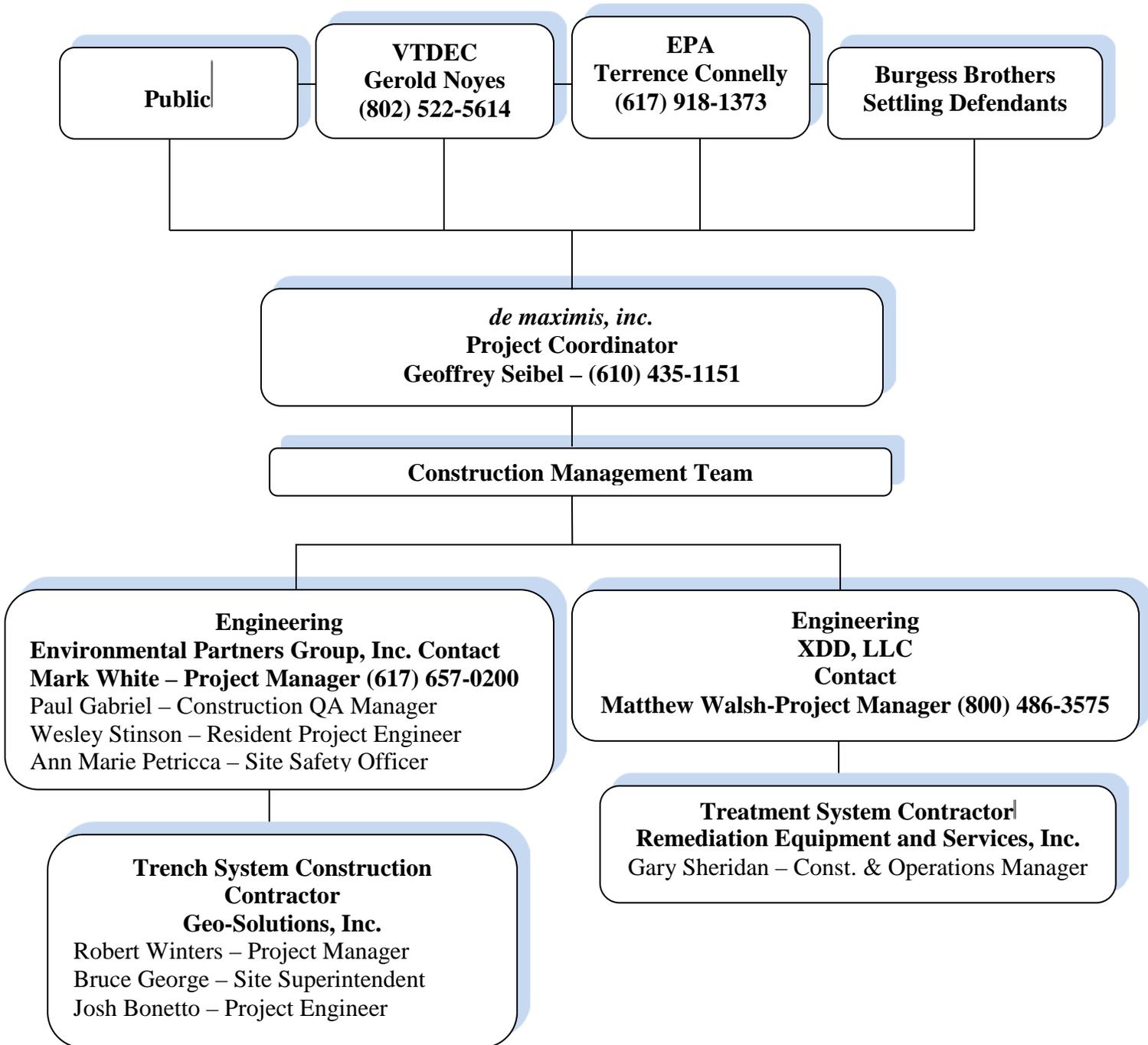
*Figure 1-1: Site Location Map*

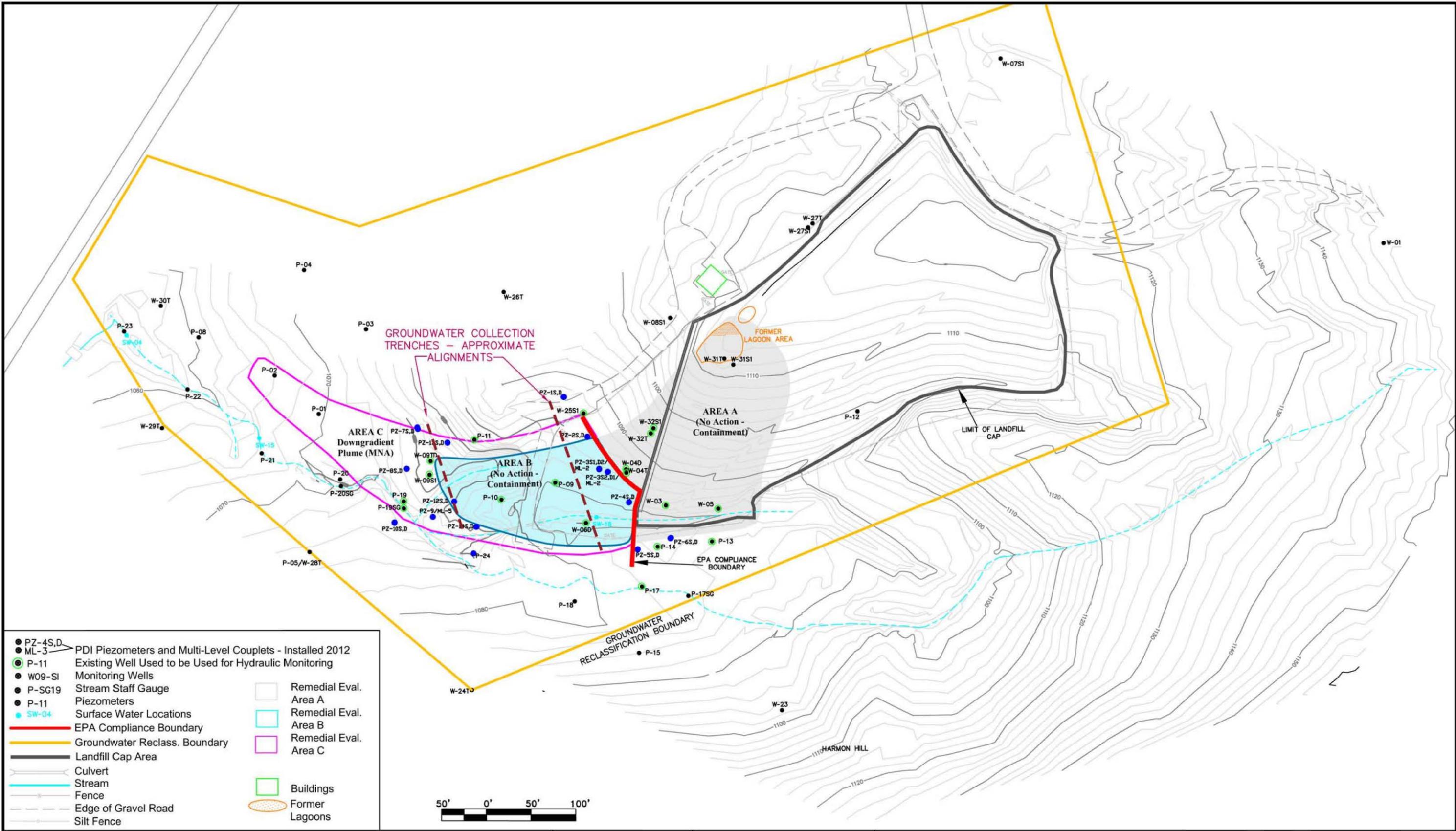


***Burgess Brothers Superfund Site  
Woodard and Bennington, VT***



**Figure 1-2**  
**Remedial Action Organizational Chart**  
**Burgess Brothers Superfund Site**

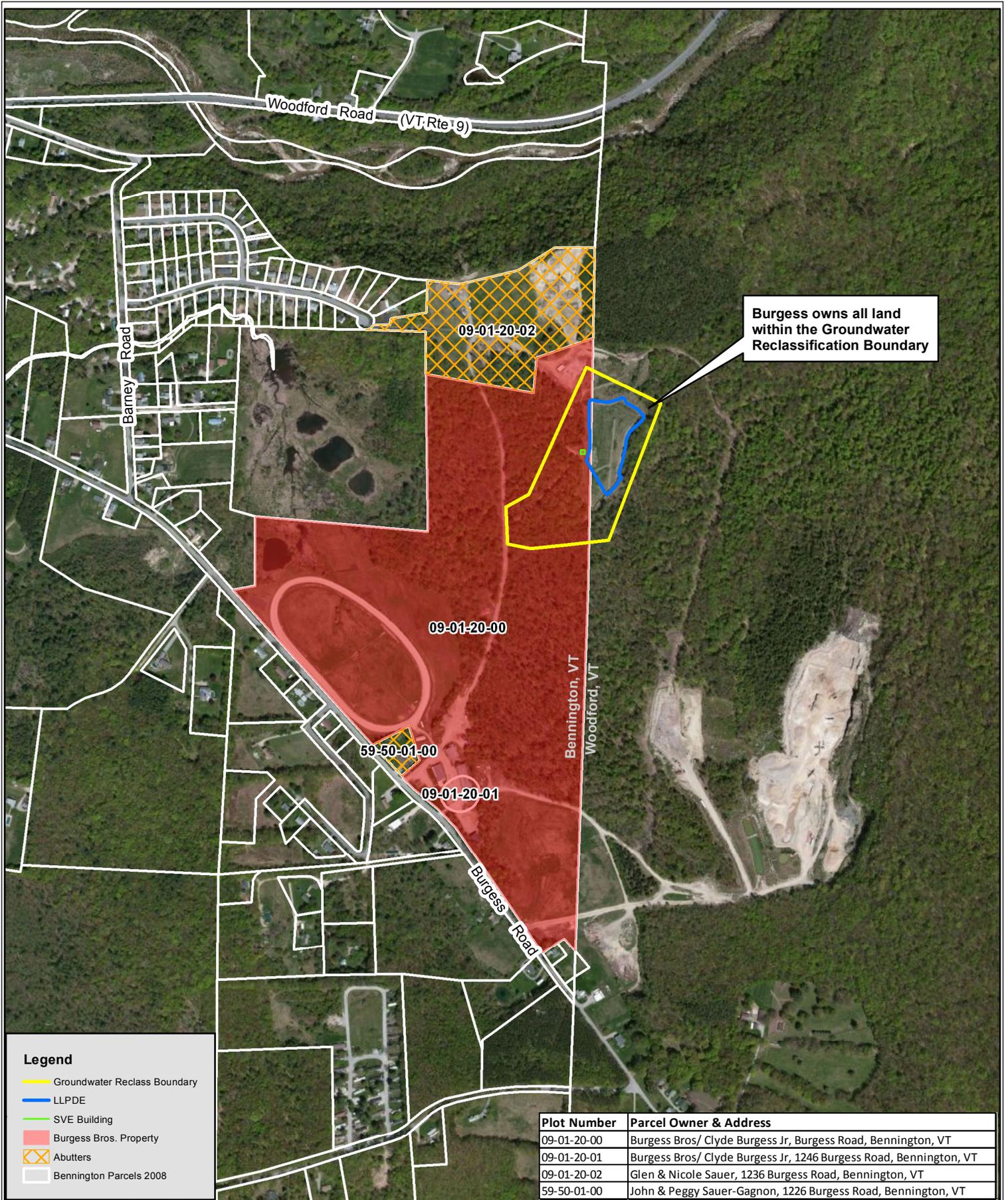




- PZ-4S,D  
● ML-3 PDI Piezometers and Multi-Level Couplets - Installed 2012
- P-11 Existing Well Used to be Used for Hydraulic Monitoring
- W09-SI Monitoring Wells
- P-SG19 Stream Staff Gauge
- P-11 Piezometers
- SW-04 Surface Water Locations
- EPA Compliance Boundary
- Groundwater Reclass. Boundary
- Landfill Cap Area
- Culvert
- Stream
- Fence
- Edge of Gravel Road
- Silt Fence
- Remedial Eval. Area A
- Remedial Eval. Area B
- Remedial Eval. Area C
- Buildings
- Former Lagoons







Burgess owns all land within the Groundwater Reclassification Boundary

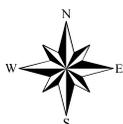
**Legend**

- Groundwater Reclass Boundary
- LLPDE
- SVE Building
- Burgess Bros. Property
- Abutters
- Bennington Parcels 2008

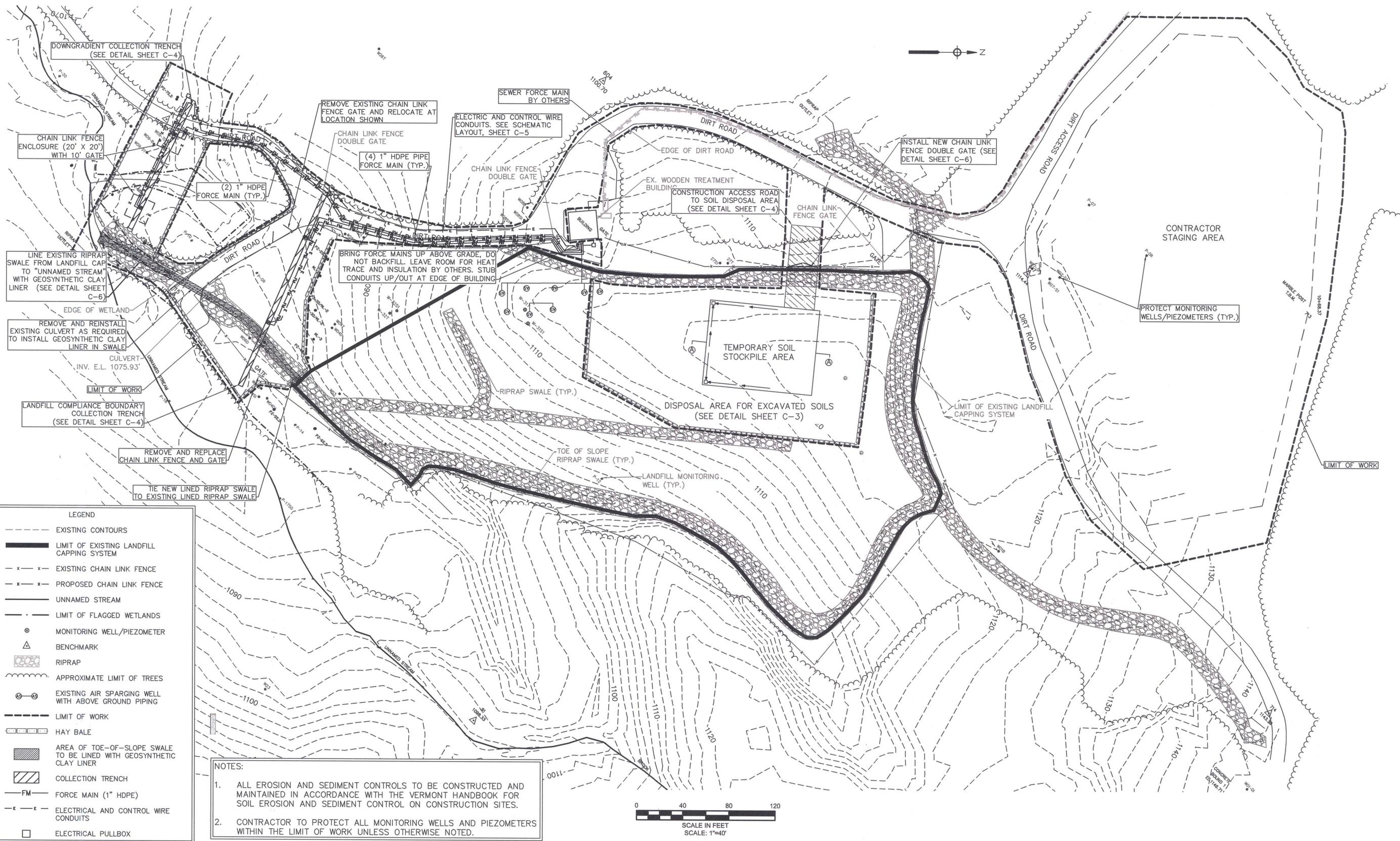
Plot Number	Parcel Owner & Address
09-01-20-00	Burgess Bros/ Clyde Burgess Jr, Burgess Road, Bennington, VT
09-01-20-01	Burgess Bros/ Clyde Burgess Jr, 1246 Burgess Road, Bennington, VT
09-01-20-02	Glen & Nicole Sauer, 1236 Burgess Road, Bennington, VT
59-50-01-00	John & Peggy Sauer-Gagnon, 1226 Burgess Road, Bennington, VT

0 500 1,000 2,000 Feet

1 inch = 1,000 feet



**Figure 4-1 Map showing Property Ownership Burgess Brothers Superfund Site Bennington & Woodford, Vermont**

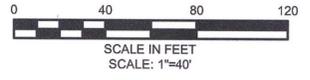


**LEGEND**

- EXISTING CONTOURS
- LIMIT OF EXISTING LANDFILL CAPPING SYSTEM
- x - x - EXISTING CHAIN LINK FENCE
- x - x - PROPOSED CHAIN LINK FENCE
- UNNAMED STREAM
- . - . - LIMIT OF FLAGGED WETLANDS
- ⊙ MONITORING WELL/PIEZOMETER
- △ BENCHMARK
- ▨ RIPRAP
- ~ APPROXIMATE LIMIT OF TREES
- ⊕ EXISTING AIR SPARGING WELL WITH ABOVE GROUND PIPING
- - - - - LIMIT OF WORK
- ▤ HAY BALE
- ▨ AREA OF TOE-OF-SLOPE SWALE TO BE LINED WITH GEOSYNTHETIC CLAY LINER
- ▨ COLLECTION TRENCH
- FM — FORCE MAIN (1" HDPE)
- e - e - ELECTRICAL AND CONTROL WIRE CONDUITS
- ELECTRICAL PULLBOX

**NOTES:**

1. ALL EROSION AND SEDIMENT CONTROLS TO BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH THE VERMONT HANDBOOK FOR SOIL EROSION AND SEDIMENT CONTROL ON CONSTRUCTION SITES.
2. CONTRACTOR TO PROTECT ALL MONITORING WELLS AND PIEZOMETERS WITHIN THE LIMIT OF WORK UNLESS OTHERWISE NOTED.



Drawing file: I:\Burgess Brothers\108136 Remedial Design Activities - May 2013\05 Design Drawings\Collection Trench RD-Plan Set Rev 6.25 13MAY.dwg Plot Date: Jun 28 2013 11:43am



MARK	DATE	DESCRIPTION

Scale	1" = 40'
Date	JUNE 28, 2013
Job No.	106-1305
Designed by	RJP
Drawn by	RJP
Checked by	PFG/ZFK
Approved by	PFG/MNW

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

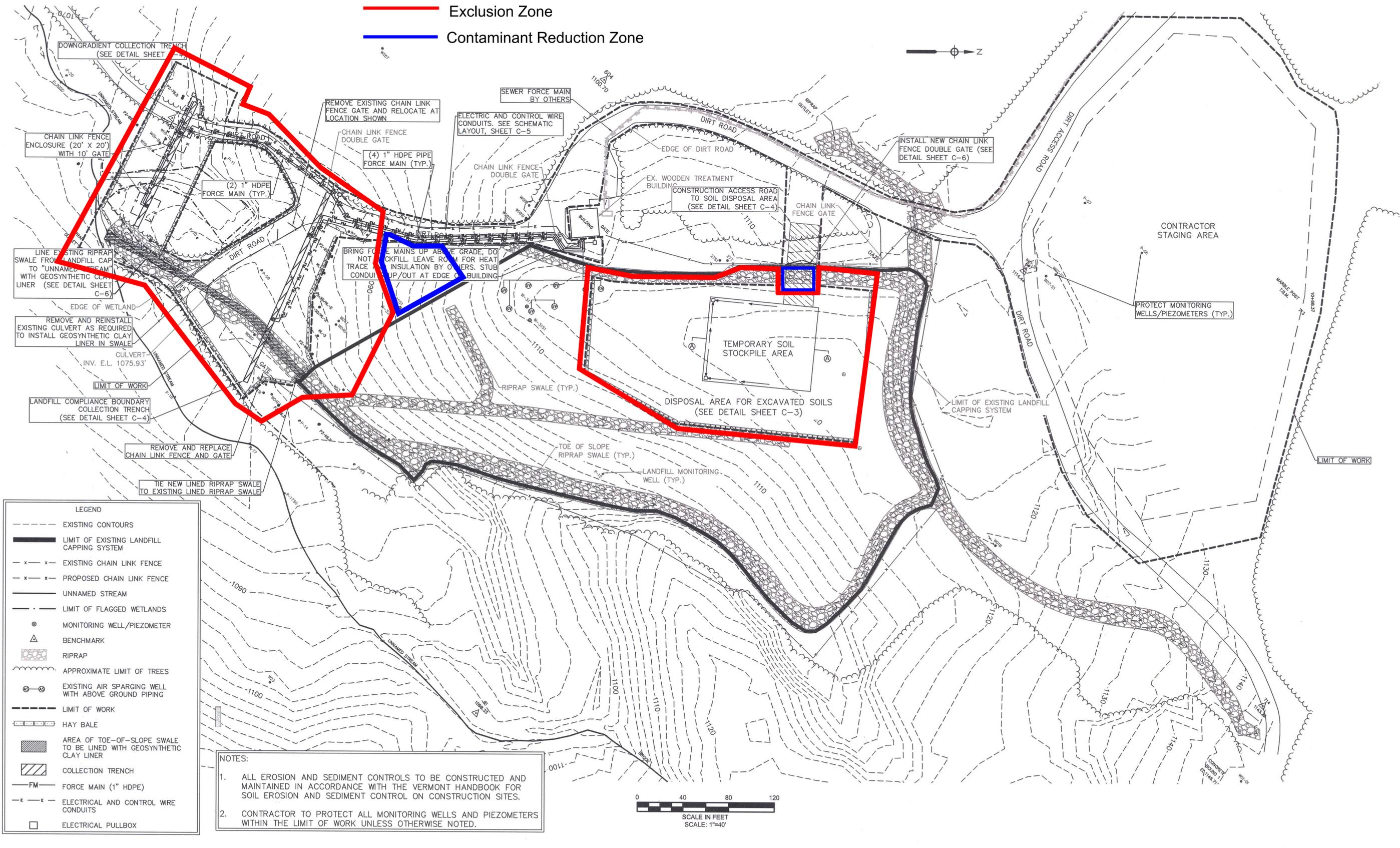
GROUNDWATER COLLECTION TRENCH CONSTRUCTION  
BURGESS BROTHERS SUPERFUND SITE  
BENNINGTON, VT

Remedial Action Site Plan

NOT FOR CONSTRUCTION  
Sheet No.

Fig. 4-2

**Exclusion Zone**  
**Contaminant Reduction Zone**



**LEGEND**

- - - - - EXISTING CONTOURS
- — — — — LIMIT OF EXISTING LANDFILL CAPPING SYSTEM
- x - x - EXISTING CHAIN LINK FENCE
- x - x - PROPOSED CHAIN LINK FENCE
- — — — — UNNAMED STREAM
- - - - - LIMIT OF FLAGGED WETLANDS
- ⊙ MONITORING WELL/PIEZOMETER
- △ BENCHMARK
- ▨ RIPRAP
- ~ ~ ~ ~ ~ APPROXIMATE LIMIT OF TREES
- ⊕ EXISTING AIR SPARGING WELL WITH ABOVE GROUND PIPING
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- ▨ HAY BALE
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Drawing file: I:\Burgess Brothers\108136 Remedial Design Activities - May 2013\05 Design Drawings\Collection Trench RD-Plan Set Rev 6.25 13\AMW.dwg Plot Date: Jun 28 2013 11:43am



MARK	DATE	DESCRIPTION

Scale	1" = 40'
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THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

**GROUNDWATER COLLECTION TRENCH CONSTRUCTION**  
**BURGESS BROTHERS SUPERFUND SITE**  
**BENNINGTON, VT**

**Site Work Zones Plan**

NOT FOR CONSTRUCTION  
 Sheet No.  
**Fig. 4-3**

**SPILL INCIDENT REPORT FORM**

**FACILITY / UNIT ORIGINATING REPORT**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

**INCIDENT DESCRIPTION**

Location Where Incident Occurred: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date Began: \_\_\_\_\_ Date Ended: \_\_\_\_\_

Time Began: \_\_\_\_\_ AM/PM Time Ended: \_\_\_\_\_ AM/PM

Spill Released onto or into:  Air  Ground  Water

Environmental Conditions at Time of Spill / Release:

Cloud Cover: \_\_\_\_\_ Precipitation Conditions: \_\_\_\_\_

Temperature: \_\_\_\_\_ Wind Direction and Speed: \_\_\_\_\_

Material / Product Information: \_\_\_\_\_

Material Spilled / Released: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Extremely Hazardous Substance (EHS) Involved?  Yes  No

Amount(s) Spilled / Released: \_\_\_\_\_

Amount(s) Recovered: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Incident Details: \_\_\_\_\_

What Occurred: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective Action(s) Taken: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**NOTIFICATIONS:**

Agency	Phone Number	Contact Name	Date and Time
--------	--------------	--------------	---------------

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

List others as appropriate: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



***APPENDIX A***  
***GEO-SOLUTIONS, INC. REMEDIAL ACTION PLAN***



1250 Fifth Avenue, New Kensington, PA 15068

T 724-335-7273 F 724-335-7271

[www.geo-solutions.com](http://www.geo-solutions.com)

# **REMEDIAL ACTION PLAN BURGESS BROTHERS SUPERFUND LANDFILL**

## **GROUNDWATER COLLECTION TRENCH CONSTRUCTION PROGRAM BENNINGTON, VERMONT**

August 2013

Reference No.: 12-064



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- Attachment B – Summary of Bio-Polymer QC Testing
- Attachment C – Product MSDS
- Attachment D – Daily QC Report
- Attachment E – Capping Materials

## **INTRODUCTION**

Geo-Solutions, Inc. (GSI) is submitting this Remedial Action Plan to provide details for the installation of the groundwater collection trench construction program at the Burgess Brothers Superfund Landfill located near Bennington, Vermont. The primary objective of the project is to construct two groundwater collection trenches down gradient of the existing landfill at the site. The “Landfill Compliance Boundary Trench” is located immediately south of the landfill on the slope. The “Down-gradient Collection Trench” is located at the toe of the slope closer to the southern property boundary. The collection trenches will be installed utilizing the Bio-Polymer (BP) trenching method. Ancillary work includes consolidation and capping of trench spoils and excess impacted materials on the landfill, installation of electrical conduits, installation of a lined storm water swale and miscellaneous earthwork.

BP slurry trenches are drains constructed for draining, diverting or collecting groundwater or leachate. BP drains are typically used when in-the-dry installation methods are not feasible or unnecessarily expensive. The BP method is a modified version of the slurry trench technique, which permits the construction of deep and narrow trenches supported by an engineered fluid, or slurry, to prevent sidewall collapse. A bio-degradable slurry, that does not affect the final permeability of the in-situ soil or backfill materials, will be used. The slurry will temporarily support the trench walls while the liner, collection sumps, and trench gravels are installed. After the trench is backfilled, the slurry is degraded chemically or naturally back to water and a small amount of carbohydrate. No dewatering, sheeting, or shoring is required during trench installation.

Persons experienced in slurry trenching techniques, equipment and testing will oversee the project. The Slurry Trench Specialist will have sufficient experience with successfully completing similar projects.

## **PROJECT DIRECTORY**

GSI individuals involved with this project include the following:

- Pete Maltese – Pete is the Vice President of Field Operations with GSI and will serve as the Technical Director. He is responsible for the overall project support to the Project Manager from a safety, technical and contractual basis. His contact information is as follows:

Office Phone: 724-335-7273  
Cell Phone: 412-952-0373  
Email: [pmaltese@geo-solutions.com](mailto:pmaltese@geo-solutions.com)

- Robert Winters, CSP – Rob will serve as the Project Manager. He has overall project responsibility from a safety, technical and contractual basis. His contact information is as follows:

Office Phone: 724-335-7273  
Cell Phone: 412-720-1407  
Email: [rwinters@geo-solutions.com](mailto:rwinters@geo-solutions.com)

- Bruce George – Bruce is GSI's Site Superintendent/Slurry Specialist for this project. He is responsible for daily field operations including site safety, field supervision and QA/QC. He reports directly to our corporate safety manager on all safety matters, and to the project manager for all other aspects. His contact information is as follows:

Cell Phone: 307-630-2006  
Email: [bgeorge@geo-solutions.com](mailto:bgeorge@geo-solutions.com)

- Josh Bonetto – Josh is GSI's Project Engineer responsible for Quality Control (QC) during the trench installation. He will perform the daily onsite QC testing and documentation. He will work closely with onsite personnel to assure compliance with the project specifications.

Cell Phone: 412-592-7809  
Email: [jbonetto@geo-solutions.com](mailto:jbonetto@geo-solutions.com)

## **BIO-POLYMER COLLECTION TRENCH INSTALLATION**

### **Project Mobilization**

Construction will begin with the mobilization of personnel, equipment and materials to the Site. Based on the current scope of work, GSI anticipates beginning mobilization on Monday, August 26, 2013. The contractor storage area will be used for field offices, material storage, and batch plant operations.

Prior to the collection trench construction, site preparations will be required. Site preparations will include:

- Setup mixing plant for production of BP slurry. The plant will consist of a 8000 gallon water tank, 20,000 gallon slurry storage tank, 5 cubic yard mixing tank

- where the bio-polymer slurry is created, along with associated pumps and hoses to transfer the slurry to the trench;
- Install silt fence and other erosion controls to prevent any potential runoff from leaving the work area prior to performing any intrusive site work;
  - Clearing and grubbing along with preparation of the access roads needed to perform construction activities;
  - Installation of a temporary working platform to construct each trench and provide the necessary head above the groundwater at the site. Each work platform will be approximately 25 to 30 feet wide and range from 0 to 4 feet thick to provide at least 3 feet above any groundwater. The work platform borrow soils will be obtained from the on-site source and will be placed and compacted in lifts to provide a stable base capable of safely supporting our excavator (Hitachi PC490);
  - Installation of containment berms for temporary storage of excavated material

### **Collection Trench Installation**

As previously stated, GSI will construct the drainage trenches by the BP trenching method. The drainage trenches will be installed in general conformance with the plans, profile and details shown on Sheets C-2 and C-3 of the project drawings.

As the trench is excavated, bio-polymer slurry is added to the trench to support the trench opening and maintain trench stability. GSI intends to use Rantec Guar Gume Gum bio-polymer for slurry generation. Bio-polymer slurry to support the trench will be produced in GSI's custom made High Speed/High Shear mixer. Bio-polymer will be introduced by the use of an eductor and mixed with water. Water will be obtained at the fire hydrant on Burgess Road and trucked to a storage tank located at the staging area. Slurry will be introduced into the trench from the plant through a 4-inch HDPE slurry line running from the plant along the length of the drainage trench alignment. The slurry plant is capable of providing a nearly uninterrupted supply of fresh hydrated bio-polymer slurry to the trench.

The trench excavation will commence once the BP slurry has been created. The collection trench will be excavated using a track-mounted hydraulic excavator (Hitachi PC490) equipped with a minimum bucket width of 3 feet. The excavation of the collection trench will be completed with a series of "cuts". The standard procedure for excavation is:

1. Begin a new excavation, or "cut", on the centerline by pre-trenching a trench that is ~3 to 4 feet deep and between 10 to 30 feet long. Pre-trenching is completed dry and without the addition of slurry. The dry soil from the excavation is used

- to create berms around the work area, as needed, and will be used to berm up an area for temporary storage of the trench spoils.
2. Introduce BP slurry into the excavation.
  3. Continue the excavation, so that the trench is continuous. Excavate to the required depth by removing horizontal layers of soil the entire length of the “cut” until the bottom of the excavation is achieved. The material excavated from the trench will be placed in a temporary stockpile area. The temporary stockpile will be constructed using soil excavated during the dry cut. The spoils will be stockpiled along the up-gradient side of the trench allowed to drain back into the trench to the extent practical.
  4. Clean the bottom of the excavation by repeated passes of the bucket along the bottom of the trench. When no more loose material is removed, place the bucket on the bottom of the trench in an half open position, so the bucket rest flat on the bottom of the trench, in the previous cut. Using the excavator tracks, move the excavator backward scraping the bucket along the bottom of the trench. Remove the bucket and if no loose material is in the bucket proceed to the next new “cut” or repeat as necessary until the bottom of the trench is cleaned.
  5. Sound the final depth of the trench every 10 lineal feet. Depths will be measured to the nearest 0.5 feet at 10 feet intervals along the wall alignment. Note any loose materials on the bottom and re-clean the bottom as necessary. The final depth of each “cut” will be based on the design depths as shown on the project drawings.

Slurry trenching will be performed with the trench full of slurry at all times. Once a sufficient distance of a trench is excavated, placement of the 4-inch HDPE collection pipe and extraction wells will occur. Concrete weights will be bolted onto the 4-inch pipe at 10 foot intervals to assist with sinking the pipes. The pipe will be suspended by pre-measured cables to set it at the required elevation near the bottom of the trench. Weights will be attached to the pipe to overcome buoyancy of the HDPE material. The 8-inch PVC wells will be attached to the collection pipe at specific locations prior to lowering the pipe into the trench. Wells will be secured at the surface with timbers to maintain verticality. Initial backfill around each well will be brought up simultaneously on both sides of the well to help secure the base of the pipe at the specified locations.

The trench will be backfilled displacing the slurry with the specified drainage media as the excavation advances. Initial backfill will be placed by the excavator bucket to form a 1 on 1 horizontal to vertical slope. Once the initial backfill “tops out” at the work platform surface, backfill will be placed from the advancing backfill slope. Backfill will not be allowed to free fall through slurry into the trench to preclude segregation of the drainage media. Backfill will be delivered and staged along the access road and work platform and placed into the trench with a wheeled loader.

GSI will install a series of temporary vertical wells to enhance circulation of slurry/water during development of the drainage media. Wells will be placed at an approximate spacing of 30 to 40 feet along the trench. Each well will extend from the surface to the bottom of the trench and consist of slotted 4 to 6 inch diameter schedule 40 PVC pipe with bottom end cap. The wells will be installed as the excavation advances ahead of the drainage media placement. The wells will be secured at the surface with timbers. Drainage media will be carefully placed around the wells to preclude damage.

Bio-polymer slurry will be broken down into water and a minute amount of carbohydrate material by a combination of enzyme and microbial action. GSI will add an initial enzyme breaker and/or bleach to start the breaking process. The remaining breakdown will be facilitated by circulation and aeration of the slurry. A frac tank set near the trench will be used to handle the surcharge of slurry left after backfill is complete. The stored slurry will be circulated with the in-trench slurry as one unit. Viscosity will be monitored and circulation will continue until 2 complete pore volumes have been circulated and the viscosity of the trench fluid is 30 seconds or less as measured by a Marsh Funnel. Fluid (frac tank and trench wells) will be transferred to the trench to rejoin the water table or to the on-site treatment system to the extent practicable. Trench fluid will be stored in a tank located near the collection trench work pad pending transfer to and treatment at the on-site treatment by others.

Upon completion of the trench, a well driller will be brought onsite to install Piezometers and detailed on the project drawings.

### **Preparation of Temporary Soil Stockpile**

GSI will prepare the temporary soil stockpile to grades and dimensions as shown on the project plans. A gravel road will be constructed and the area will be excavated to grade using a hydraulic excavator and some hand work around the perimeter. The area will be lined with a Geosynthetic clay liner (Bentomat ST – GCL) using a spreader bar and off road forklift and overlain with coarse aggregate as shown on C-4 of the construction drawings. The gravel will be spread using a small dozer.

### **Grading and Landfill Capping of Excavated Soils**

After the trench spoils have been transported to the temporary stockpile area, they will be graded to allow final capping. The area will be capped with a capping system as shown on C-4 of the construction drawings. The capping system will consist of:

1. Excavated spoils from the trench excavation;
2. Geosynthetic clay liner (Bentomat ST – GCL);
3. Triaxial drainage geocomposite ;

4. 26 inch vegetative support layer; and
5. 6 inch vegetative layer.

The system will be installed a minimum 20H:1V and a maximum 4H:1V slope.

### **Lining of Existing Riprap Toe-of-Slop**

GSI will install a Geosynthetic Liner (Bentomat) in the existing Riprap Toe of Slope Swale. The first step in this process will be installation erosion and sediment controls. Once the controls have been set in place, GSI will bypass the pump water in the up gradient portions of the swale to the unnamed stream. This will be done by building diversion berms with clean fill and pumping water as needed.

Once the runoff has been diverted, the existing rip-rap will be removed and stockpiled by using a hydraulic excavator. The swale will be graded and clean fill will be used to replace wet materials. Once the swale is dry the Geosynthetic Liner and gravel bedding will be installed. Riprap will be reinstalled and additional riprap will be added as needed.

### **Chain Link Fencing and Entry Gates**

GSI has subcontracted Becker Fence to install new fencing and gates as shown on the project drawings.

### **Underground Utilities**

Approximately 365 feet 6 inch schedule 80 PVC pipe will be installed as shown on C-7 of the project drawings. GSI will excavate the trench with a hydraulic excavator to design grades. Hathaway Electric will install self-regulating heat trace systems and all auxiliary electric that goes with it.

### **Project Demobilization**

Demobilization will involve the removal of all personnel, equipment and excess materials from the site. Work areas will be cleaned and the platform will be restored to a neat and orderly condition prior to demobilizing. After demobilization, GSI will be performing one year of landfill cap and maintenance. This will include repair of areas of erosion and gullies by filling with topsoil; mowing of the vegetative surface; re-seeding bare areas and re-fertilizing the vegetative layer as needed

**QUALITY CONTROL (QC)**

The successful completion of the slurry wall will involve a thorough quality control program. All test results, trench measurements, and abnormalities will be documented on daily quality control reports. All testing will be performed or reviewed by an experienced slurry trench specialist.

**QC Equipment**

The following equipment will be used to conduct all quality control tests:

No. Units	Equipment	Test	Standard Method
2	Marsh Funnel & Cup	Viscosity	API RP 13B-1
2	Mud Balance	Density	API RP 13B-1
1	pH paper	pH	Hach Kit

**Sequence of Quality Control Operations**

A typical day of QC activities is given below:

1. Each morning’s inspections include:
  - Test trench slurry.
  - Observe trench excavation and measurements.
  - Supervise cleaning of trench bottom in each “cut”.
  
2. Each afternoon’s inspections include:
  - Test trench slurry.
  - Observe trench excavation and measurements.
  - Supervise cleaning of trench bottom in each “cut”.
  
3. Additional activities performed throughout the day include:
  - Supervise panel and sump installation.
  - Observe trench backfilling.
  - Complete QC forms and submit to QC supervisor.
  - Continue daily inspections.

**Trench Depth Measurement**

Trench depths will be measured every 10' along the wall alignment, utilizing a weighted measuring device. Depth measurements will be recorded to the nearest 0.5'. Upon achieving the required trench depth, the trench bottom will be cleaned of excessive sediment by the excavator bucket prior to setting a liner panel and starting a new "cut".

### **Material Testing**

A table summarizing the Quality Control testing methods and frequencies can be seen in Attachment B. QC testing along with depth measurements will be recorded on QC reports and submitted the following workday for review.

#### **Water Source**

Water will be obtained at the fire hydrant on Burgess Road and trucked to a storage tank located at the staging area. Testing will be performed to determine the characteristics of the water.

#### **Bio-Polymer Slurry**

BP slurry will consist primarily of Rantec H3200 Cellulose Gum and water. H3200 Cellulose gum will be mixed with the water to produce slurry for maintaining trench stability throughout the excavation. Attachment C contains the product MSDS for the H3200 Cellulose gum.

The BP slurry will be tested at least four times per work shift in accordance with API RP 13-B for properties of viscosity, density and pH. Slurry samples for testing will be obtained from the batch plant and the slurry filled trench. All data will be recorded on the daily QC form.

#### **Additives**

Additives can be utilized to control the life and breakdown of the slurry. The following additives may be used during the collection trench installation to preserve the bio-polymer slurry life or accelerate its breakdown:

- Soda Ash – used as a water conditioning agent;
- Busan 1059 – used as a preservative to prevent early degradation, and;
- Polymer Breaker – an enzyme breaker for guar gum slurries.

Product MSDS for each additive listed above can also be found in Attachment C.

The life or duration of the polymer slurry is a function of temperature, biological activity, and pH. Although little can be done to control the effects of temperature, slurry life can be preserved or degraded through the control of pH and additives. The slurry will be degraded at the completion of the collection trench installation and the slurry properties will be monitored. Once the trench is complete, an enzyme breaker solution is added. The enzyme breaker is circulated with the slurry until complete degradation is observed. A decrease in the pH and viscosity indicates when the slurry is completely degraded.

### **Documentation**

A blank copy of the QC form can be seen in Attachment D. Results of all QC testing performed in the field during construction will be recorded on quality control forms. Sump and monitoring point locations will also be noted. These forms will be completed by the onsite QC representative and submitted the following day.

Once the project is complete, a profile of the trench alignment will be provided. The profile will indicate:

- Bottom elevation of the collection trench;
- Bottom elevation of the HDPE panels;
- Sump/monitoring point locations;
- Top of sand/gravel layer;

A surveyed, as-built drawing of the collection trench alignment, along with the location of the road crossing for the new air line, will be provided by Cummings-Riter.



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**ATTACHMENT A**  
**GRAVEL GRADATIONS**





Pea Stone Spec.

Location: Danby, VT  
 PLANT / CRUSHER: C613

DATE: 8/14/13

1/2" Washed Gravel			
WET MASS:		Dry Mass:	
Moisture Loss:		% Moisture	
SIZE	WEIGHT	%RET	%PASS
5/8"	0.0	0.0	100.0
1/2"	4.7	0.4	99.6
3/8"	689.2	57.9	41.7
#4	462.1	38.8	2.8
#8	10.0	0.8	2.0
	0.0	0.0	
	0.0	0.0	
#200	14.3	1.2	0.8
PAN	9.6	0.8	
TOTAL	1189.9		

1 FF =		2 FF =	
SIZE	WEIGHT	%RET	%PASS
3/4"		0.0	100.0
1/2"		0.0	100.0
3/8"		0.0	100.0
#4		0.0	100.0
#8		0.0	100.0
#16		0.0	100.0
#30		0.0	100.0
#50		0.0	100.0
#100		0.0	100.0
#200		0.0	100.0
PAN		0.0	
TOTAL	0.0	0.0	

704.04A 704.05A(F) 704.05A(C)  
 20-60 30-60 25-50  
 0-12 0-12 0-12  
 0-6 0-6 0-6

WET MASS:		Dry Mass:	
Moisture Loss:		% Moisture	
SIZE	WEIGHT	%RET	%PASS
1 1/2"		0.0	100.0
1"		0.0	100.0
3/4"		0.0	100.0
1/2"		0.0	100.0
3/8"		0.0	100.0
#4		0.0	100.0
#8		0.0	100.0
#200		0.0	100.0
PAN		0.0	
TOTAL	0.0		

1 FF =		2 FF =	
SIZE	WEIGHT	%RET	%PASS
3/4"		0.0	100.0
1/2"		0.0	100.0
3/8"		0.0	100.0
#4		0.0	100.0
#8		0.0	100.0
#16		0.0	100.0
#30		0.0	100.0
#50		0.0	100.0
#100		0.0	100.0
#200		0.0	100.0
PAN		0.0	
TOTAL	0.0		

704.04A 704.05A(F) 704.05A(C)  
 20-60 30-60 25-50  
 0-12 0-12 0-12  
 0-6 0-6 0-6

WET MASS:		Dry Mass:	
Moisture Loss:		% Moisture	
SIZE	WEIGHT	%RET	%PASS
3/4"		0.0	100.0
1/2"		0.0	100.0
3/8"		0.0	100.0
#4		0.0	100.0
#8		0.0	100.0
#16		0.0	100.0
#30		0.0	100.0
#50		0.0	100.0
#100		0.0	100.0
#200		0.0	100.0
PAN		0.0	
TOTAL	0.0		

WET MASS:		Dry Mass:	
Moisture Loss:		% Moisture	
SIZE	WEIGHT	%RET	%PASS
2"	0.0	0.0	100.0
1-1/2"	0.0	0.0	100.0
1"	0.0	0.0	100.0
3/4"	0.0	0.0	100.0
1/2"	0.0	0.0	100.0
3/8"	0.0	0.0	100.0
#4	0.0	0.0	100.0
#8	0.0	0.0	100.0
#16	0.0	0.0	100.0
#30	0.0	0.0	100.0
#50	0.0	0.0	100.0
#100	0.0	0.0	100.0
#200	0.0	0.0	100.0
PAN	0.0	0.0	
TOTAL	0.0		

Dry

Tested by: C. Coombs

Notes:



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**ATTACHMENT B**  
**SUMMARY OF BIO-POLYMER QC TESTING**



**Table 1: Bio-Polymer Slurry Trench QC Testing Summary**

PROPERTY	REQUIREMENT	MINIMUM TEST FREQUENCY	TEST METHOD	COMMENT
<b>WATER FOR MIXING</b>				May be modified for potable source or treated with additives
pH	6-8	1 per source	Test Strips	
Hardness	≤500 ppm	1 per source	Test Strips	
Total Dissolved Solids	≤500 ppm	1 per source	Test Strips	
<b>IN-TRENCH POLYMER SLURRY</b>				
Viscosity	≥80 seconds	4 per shift	API RP 13B-1	
Density	≥62.5 pcf	4 per shift	ASTM D-4380	
pH	≥8.5	4 per shift	API RP 13B-1	
<b>DEGRADED POLYMER SLURRY</b>				Testing will be performed as slurry is degraded. Requirements are "targets".
Viscosity	≤30 seconds	2 per shift	API RP 13B-1	
Density	62.4 pcf	2 per shift	ASTM D-4380	
pH	<8	2 per shift	API RP 13B-1	





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**ATTACHMENT C  
PRODUCT MSDS**





# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 1. Product and Company Information

**Product Name:** Rantec® /Procol® / Viscol® Guar Gum

**Manufacturer/Supplier:** Rantec Corporation  
**Address:** 17 Kukuchka Lane  
Ranchester, WY 82839

**Phone Number:** (307) 655-9565  
**Fax Number:** (307) 655-9528  
**e-mail:** [rantec@ranteccorp.com](mailto:rantec@ranteccorp.com)

## 2. Hazards Identification

**OSHA Hazardous Material:** Yes

**OSHA Hazard Categories:**

1. Carcinogen – NO
2. Corrosive – NO
3. Highly Toxic – NO
4. Irritant – Yes
5. Sensitizer – Yes
6. Toxic – NO
7. Target Organ Effect Lung and Cutaneous -- Yes

### Emergency Overview:

Concentrations of dust suspended in the air present a fire and explosion hazard.

Inhalation of dust may cause respiratory irritation and possible lung injury with symptoms of shortness of breath and reduced lung function.

Guar gum is very slippery when wet.

### Acute Health Effects:

**Eye Contact:** Contact may cause irritation based on studies with laboratory animals.

**Skin Contact:** Contact may cause dryness.

**Inhalation:** Inhalation of dust may cause irritation of the nose, throat and respiratory passages. Symptoms include coughing, sore throat, nasal congestion, sneezing wheezing and shortness of breath. Guar gum may cause life-threatening allergic reaction in susceptible individuals.

**Ingestion:** DO NOT INGEST. While this product is not toxic by ingestion, swallowing small amounts could cause complete blockage of the mouth, pharynx, trachea, esophagus and/or gastrointestinal system which may cause choking, suffocation and/or other life threatening medical conditions. Get medical attention immediately.

### Chronic (long-term exposure) Health Effects:

- **Inhalation:** Overexposure to any nuisance dust may cause lung injury. Symptoms include cough, shortness of breath, difficulty breathing and reduced pulmonary function. Repeated exposures may cause allergic sensitization.
- **Carcinogenicity:** None of the components of this product are listed as carcinogens or suspected carcinogens by OSHA, IARC or NTP.
- **Medical Conditions Aggravated by Exposure:** Persons with pre-existing skin and respiratory disorders may be at an increased risk from exposure.



# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 3. Hazards Identification (continued)

### Physical Hazards:

- **Dust:** It is well documented that a dust cloud will fuel an explosion in a confined area with sufficient oxygen and an ignition source. Surface (passive) and airborne (active) dust (fuel) is a potential hazard and the appropriate protective measures should be taken when handling guar outside of the bag in confined work spaces, dust collectors, dryers, mills, sifters, blender, pneumatic conveyance systems, storage tanks, etc. Utilize good housekeeping to remove surface dust from floors, walls, beams, around equipment, etc.
- **Slick Surfaces:** It is possible that an employee will be exposed to guar powder or dust in combination with water on work platform, floor or stair, which will result in a slippery surface.

## 3. Composition / Information on Ingredients

Ingredient	CAS Number	% Weight
Guar Gum	9000-30-0	100
Chemical Family:	Carbohydrate	
Formula:	Approximately $(C_6H_{10}O_5)_n$	

## 4. First Aid Measures

**Eye:** Flush immediately with large amounts of water. Eyelids should be held away from the eyeball to ensure thorough rinsing. If irritation persists get medical attention.

**Skin:** First aid is not normally needed. Wash exposed skin with soap and water after use. If irritation or rash develops get medical attention. Use skin lotion if dryness occurs.

**Inhalation:** If symptoms of irritation or allergy develop, remove person from source of exposure to fresh air. If symptoms persist get medical attention.

**Ingestion:** Swallowing even small amounts may have serious, life-threatening effects. Get immediate medical attention.

## 5. Firefighting Measures

**Flashpoint:** Not Applicable

**Auto-ignition Temperature:** Not Determined

**Lower Explosion Limit:** 0.040 oz/cf

**Upper Explosion Limit:** Not determined

**Extinguishing Media:** Use water fog, dry chemical, carbon dioxide or foam. Do not use streams of water as dust dispersed by water streams can explode.

**Special Fire Fighting Procedures:** Wear positive pressure, self-contained breathing apparatus and full protective clothing.

**Unusual Fire and Explosion Hazards:** Powder has the potential to form explosive mixtures with air. It is well documented that a dust cloud will fuel an explosion hazard. Surface (passive) and airborne (active) dust (fuel) are a potential hazard and the appropriate protective measures should be taken when handling guar gum outside of the original packaging. Avoid creating dust. Keep away from heat, sparks and open flames. As with all dusty materials, use preventative measures including spark proof motors and ventilation to control dust. Utilize good housekeeping to remove surface dust from floors, walls, beams, around equipment, etc.

**Combustion Products:** Oxides of carbon and nitrogen.



# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 6: Accidental Release Measures

Wear appropriate protective clothing and equipment. Caution: Guar gum is **very slippery when wet**. Suspended dust may present a serious dust explosion hazard. Sweep up or vacuum, avoiding the creation of airborne dust. Keep spilled product away from flammable and combustible materials. Use vacuum equipment specifically designed for combustible dusts. Collect into a suitable container for disposal. Wash residual traces with hot water after sweep-up is complete. Test area for residual slippery conditions.

## 7. Handling and Storage

**Handling:** Avoid generating and breathing dust. Avoid eye contact. Use with adequate local exhaust ventilation and dust collection to maintain the concentration of airborne dust below the exposure limits. If clothing becomes contaminated, remove and launder before re-use. Wash thoroughly after handling. Keep product away from oxidizers and all sources of ignition including flames, electrical sparks, hot surfaces, pilot lights, etc.

**Storage:** Keep product dry. Store in a cool, dry area. Keep containers closed to avoid moisture absorption.

## 8. Exposure Controls / Personal Protection

Ingredient	Exposure Limits
Guar Gum	15 mg/m <sup>3</sup> (Total Particulate) PEL-TWA 5 mg/m <sup>3</sup> (Respirable Particulate) TLV-TWA

**Engineering Controls:** Consult a qualified engineer for evaluation of materials handling and explosion protection system(s).

### Personal Protective Equipment (PPE):

- **Eye Protection:** Safety glasses or goggles recommended.
- **Skin Protection:** Rubber, plastic or leather gloves recommended.
- **Respiratory Protection:** If the concentrations exceed the Threshold Value Limit (TLV), a NIOSH approved dust respirator, supplied air respirator or self-contained breathing apparatus is recommended. Select appropriate respiratory protection for respirable particulates based on consideration of the airborne workplace concentrations and duration of exposure. Select and use respirators in accordance with 29 CFR 1910.134 <http://www.access.gpo.gov/nara/cfr/cfr-retrieve.html#page1> , ANSI Z88.2 <http://www.ansi.org/>, the NIOSH Respirator Decision Logic and good industrial hygiene practice <http://www.cdc.gov/niosh/homepage.html>. To simplify selection of the appropriate respirator, OSHA has developed the Advisor Genius. Available online, the advisor genius allows a safety professional to input the conditions under which the respirator will be used and receive a recommendation of the type of respirator to use. The advisor also contains information about types of respirators and factors that affect respirator use. The online advisor contains a set of options as to the use of the respirator (firefighting, welding, escape purposes, confined areas) and then generates a report with the relevant OSHA standard indicated. The advisor is available at [http://www.osha.gov/SLTC/etools/respiratory/respirator\\_selection.html](http://www.osha.gov/SLTC/etools/respiratory/respirator_selection.html).

## 9. Physical and Chemical Properties

**Boiling Point:** Not Applicable

**Melting Point:** Decomposes

**Vapor Pressure:** Not Applicable

**Vapor Density (Air=1):** Not Applicable

**% Solubility in Water:** Complete

**Odor/Appearance:** Creamy white powder with a bean-like odor.

**Specific Gravity:** Not applicable

**% Volatile:** Not applicable

**Evaporation Rate (Butyl Acetate=1):** Not Applicable

**pH:** 5-8

**Octanol/Water Partition Coefficient:** Not Applicable



# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 10. Stability and Reactivity

**Stability:** Material is stable.

**Incompatibility:** Avoid high temperatures, sparks, open flames and moisture. Avoid contact with strong oxidizing agents.

**Hazardous Reactions-Decomposition Products:** Combustion may produce carbon dioxide, carbon monoxide and oxides of nitrogen.

**Hazardous Polymerization:** Will not occur.

## 11. Toxicological Information

**Guar Gum:** Oral rat LD50: 9.4g/kg

Guar gum is a natural food additive, although direct use in powder or pill form is banned by the FDA due to the risk of respiratory or gastrointestinal blockage

## 12. Ecological Information

NOEC – 100%

No other ecotoxicity data is available at this time.

## 13. Disposal Considerations

Dispose in compliance with all applicable federal, state and local regulations. Do not dump down sewers or drains as this may cause blockage.

## 14. Transport Information

### U.S. Department of Transportation (DOT)

**Proper Shipping Name:** Not Regulated

**Hazard Class:** N/A

**UN/NA Code:** N/A

**Packing Group:** N/A

**Labels Required:** N/A

### IMDG CODE

**Proper Shipping Name:** NOT REGULATED

**Hazard Class:** N/A

**UN/NA Code:** N/A

**Packaging Group:** N/A

**Labels Required:** N/A

## 15. Regulatory Information

### Regulatory Information

The United States Food and Drug Administration, the European Economic Community and the World Health Organization accept guar gum as a food additive/ingredient providing it meets specified purity standards and dosage limitations. Maximum usage levels permitted may vary from country to country. Guar gum has been affirmed as GRAS by the United States Food & Drug Administration under title 21, CFR, part 184.1339; it is listed as item G.3 of Table IV, Division 16, of the Canadian Food and Drug Regulations and is referenced E-412 under the EEC Council Directives.

### Comprehensive Environmental Response and Liability Act of 1980 (CERCLA) Reportable Quantity:

This product is not subject to CERCLA reporting requirements as it is sold.



# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 15. Regulatory Information (continued)

**OSHA Hazard Categories:** Irritant, Sensitizer, Target Organ Effect.

**Superfund Amendments and Reauthorization Act (SARA) Title III Information:**

**SARA Section 311/312 Hazard Categories:** Fire Hazard, Acute Health

**This product contains the following toxic chemical(s) subject to reporting requirements of SARA Section 313:** None

**California Proposition 65:** Guar gum is not a chemical known to the State of California to cause cancer or reproductive toxicity under the "Safe Drinking Water and Toxic Enforcement Act of 1986".

**Toxic Substances Control Act (TSCA):** All components of this product are listed on the TSCA inventory or exempt from notification requirements.

**Canadian Environmental Protection Act:** All of the components of this product are listed on the Canadian Domestic Substances List or exempt from notification requirements.

**European Inventory of Existing Commercial Chemical Substances (EINECS):** All of the components of this product are listed on the EINECS Inventory or exempt from notification requirements.

**Japan MITI:** All of the components of this product are existing chemical substances as defined in the Chemical Substance Control Law.

**Australian Inventory of Chemical Substances:** All of the components of this product are listed on the AICS Inventory or exempt from notification requirements.

**Canadian WHMIS Classification:** Class B, Division 4 (Flammable Solid)

## 16. Other Information

**NFPA Hazard Ratings:**

NFPA® Flammable (combustible dust) with representative diameter less than 420 microns (40 mesh).

Health: 1                      Flammability: 2                      Reactivity: 0

**HMIS Hazard Ratings:**

Health: 1                      Flammability: 1                      Reactivity: 0

**Abbreviations:**

ACGIH	American Conference Of Governmental Industrial Hygienists
ANSI	American National Standards Institute
CAS	Chemical Abstracts Service
CDC	Centers for Disease Control and Prevention
CFR	The Code of Federal Regulations
EEC	European Economic Community
EINECS	European Inventory of Existing Commercial Chemical Substances
EPA	United States Environmental Protection Agency
FDA	United States Food and Drug Administration
HMIS	Hazardous Materials Identification System
IARC	International Agency for Research on Cancer
IMDG	International Maritime Dangerous Goods



# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 16. Other Information -- Abbreviations (continued)

LD50	Lethal Dose expected to cause death in 50% of the test animals
MITI	Ministry of International Trade and Industry
NFPA	National Fire Protection Association
NIOSH	CDC - National Institute for Occupational Safety
NTP	National Toxicological Program
OSHA	U.S. Department of Labor, Occupational safety and health administration
PEL	OSHA - permissible exposure limit
TLV	ACGIH - threshold limit value
TWA	Time weighted average
UN/NA	United Nations / North America
US	United States
WHMIS	Workplace Hazardous Materials Information System

### NOTICE:

Information contained in the company's technical literature is believed to be accurate. It is a condition to any sale that buyer conduct an examination of the products under its own operating conditions within a reasonable time after the products have been delivered to buyer and determined to its own satisfaction that the products delivered hereunder are of acceptable quality and are suitable for buyer's contemplated use. The company makes no representation or warranty of any kind, express or implied, with respect to its products or to the use of its products by the buyer in combination with other substances, whether as to merchantability, fitness for a particular purpose, or any other matter. Statements concerning the possible use of the company's products are not intended as recommendations to use the company's products in the infringement of any patent.

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Issue Date: 10 November 2009

# BUSAN 1058

Revision date: 12/4/2009

Buckman Laboratories, Inc.  
1256 North McLean Boulevard  
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**24 Hour Emergency Phone****(901) 767-2722****SECTION 1*****OSHA HAZARD CLASSIFICATIONS*****Corrosive to eyes and skin. Weak sensitizer Avoid breathing vapors or spray mists.****SECTION 2*****HAZARDOUS COMPONENTS***

<u>Chemical Name</u>	<u>CAS Number</u>	<u>% by Weight</u>	<u>TLV</u>
Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione	533-74-4	24	Not available.
Sodium hydroxide	1310-73-2	11.25	ACGIH (United States). CEIL: 2 mg/m <sup>3</sup> OSHA (United States). TWA: 2 mg/m <sup>3</sup>

*While some substances are claimed as trade secret in accordance with the provision of OSHA 29 CFR 1910.1200(i), all known hazards are clearly communicated within this document.*

**SECTION 3*****FIRST AID INFORMATION***

- Eye Exposure: Flush immediately with copious amounts of tap water or normal saline (minimum of 15 minutes). Take exposed individual to a health care professional, preferably an ophthalmologist, for further evaluation.
- Skin Exposure: Wash exposed area with plenty of water. Repeat washing. Remove contaminated clothing and wash thoroughly before reuse. If irritation persists consult a health care professional.
- Inhalation: If exposure by inhalation is suspected, immediately move exposed individual to fresh air. If individual experiences nausea, headache, dizziness, has difficulty in breathing or is cyanotic, seek a health care professional immediately.
- Ingestion: **DO NOT INDUCE VOMITING.** Rinse with copious amounts of water or milk, first. Irrigate the esophagus and dilute stomach contents by slowly giving one (1) to two (2) glasses of water or milk. Avoid giving alcohol or alcohol related products. In cases where the individual is semi-comatose, comatose or convulsing, **DO NOT GIVE FLUIDS BY MOUTH.** In case of intentional ingestion of the product seek medical assistance immediately; take individual to nearest medical facility.

## SECTION 4

**PRIMARY ROUTES OF EXPOSURE****1. Effects from Acute Exposure:**

**Eye Exposure:** Very hazardous in case of eye contact (irritant, corrosive). Inflammation of the eye is characterized by redness, watering and itching.

**Skin Exposure:** Hazardous in case of skin contact (corrosive, irritant, sensitizer). Skin contact may produce burns. Skin inflammation is characterized by itching, scaling, reddening or, occasionally, blistering.

**Inhalation:** May be harmful if inhaled. Do not breathe spray mists of the undiluted product. Effects will depend upon solution strength and length of time of exposure.

**Ingestion:** Ingestion is not expected to be a primary route of exposure.

**2. Effects from Chronic Exposure:**

The effects from chronic exposure to this product have not been fully evaluated.

## SECTION 5

**Toxicological Information****Acute Effects:**

Acute Oral (LD50) = 1180 mg/kg Rat  
Acute Dermal (LD50) = >2000 mg/kg Rabbit

**Irritant / Sensitization Effects:**

Very hazardous in case of eye contact (irritant, corrosive). Inflammation of the eye is characterized by redness, watering and itching.

Hazardous in case of skin contact (corrosive, irritant, sensitizer). Skin contact may produce burns. Skin inflammation is characterized by itching, scaling, reddening or, occasionally, blistering.

May be harmful if inhaled. Do not breathe spray mists of the undiluted product. Effects will depend upon solution strength and length of time of exposure.

**Target Organs Effects:**

May cause damage to the following organs: upper respiratory tract, skin, eyes.

**Other Health Effects:**

None known.

## SECTION 6

**Environmental Toxicological Information**

No information available.

## SECTION 7

**Physical and Chemical Properties**

**Appearance** ..... Clear, yellow to amber liquid  
**Odor** ..... Pungent.  
**Density** ..... 1.15 g/cm<sup>3</sup> at 25°C (77°F)  
**Flash Point** ..... Open cup: >100°C (212°F) (ASTM D 1310).  
**Melting/Freezing Point** .... -23.333°C (-10°F)  
**Boiling Point** ..... Not available.  
**Solubility** ..... Easily soluble in cold water. Easily soluble in hot water.

<i>pH (Neat)</i> .....	>12 [Basic.]
<i>pH (100 ppm in water)</i> .....	8 - 9
<i>Vapor Pressure</i> .....	Not available.
<i>o/w Partition Coefficient</i> .....	Not available.
<i>Oxidizing/Reducing Properties</i> .	Not available.
<i>Viscosity</i> .....	Not available.
<i>Additional pH Information</i> .....	Not available.

**NOTE:** *The physical data presented above are typical values and should not be construed as specifications.*

<b>SECTION 8</b>	<b><i>Fire and Explosion Information</i></b>
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<i>Flammable Limits</i> .....	Not available.
<i>Extinguishing Media</i> .....	Water fog, carbon dioxide, foam, dry chemical.
<i>Special Firefighting Procedures</i> .....	Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

<b>SECTION 9</b>	<b><i>Reactivity Information</i></b>
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<i>Stability</i> .....	Stable under normal conditions of use and storage.
<i>Incompatibility</i> .....	Strong acids, strong bases, strong oxidizers, and reducing agents
<i>Hazardous Decomposition Products</i> .....	Carbon oxides (CO, CO <sub>2</sub> ), carbon disulfide, nitrogen oxides (NO, NO <sub>2</sub> ...), sulfur oxides (SO <sub>2</sub> , SO <sub>3</sub> ...), and hydrogen sulfide.

<b>SECTION 10</b>	<b><i>Handling Precautions</i></b>
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Eye wash fountains and safety showers in the work place are **STRONGLY** recommended. Chemical resistant gloves, indirect ventilation goggles, body-protective clothing, and chemical resistant safety shoes are required. When splashing can occur, a neoprene apron or neoprene rain suit and a face shield are advisable. Local exhaust should be maintained to control vapor and mist levels. Provide dilution ventilation to control vapor and/or mist level. When misting may occur in the work area, a NIOSH/MSHA approved respirator may be required. Use a respirator approved for the material and level of exposure. A comprehensive respiratory protection program is needed when respirators must be used. The handling precautions for this product are based on the characteristics of the neat product unless otherwise specified.

<b>SECTION 11</b>	<b><i>Satisfactory Materials of Construction</i></b>
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Teflon.  
 Polypropylene  
 PVC - rigid  
 Polyethylene - low density  
 Polyethylene - high density  
 Van leer epoxy liner 136

**NOTE:** With respect to all other materials not listed above, user should be aware that use of such materials with this product may be hazardous and result in damages to such materials and other property and personal injuries. No data concerning such materials not listed above should be implied by the user.

**SECTION 12*****Spill, Leak, and Disposal Procedures*****SPILL AND LEAK RESPONSE GUIDELINES:**

**Important:** Before responding to a spill or leak of this product, review each section of this MSDS. Follow the recommendations given in the Handling Precautions sections. Check the Fire and Explosion Data section to determine if the use of non-sparking tools is merited. Insure that spilled or leaked product does not come into contact with materials listed as incompatible. If irritating fumes are present, consider evacuation of affected areas.

**Emergency Response Assistance:** Emergency technical assistance is available at any time from Buckman Laboratories, Inc., by calling (901) 767-2722. Collect calls are accepted.

Initially minimize area affected by the spill or leak. Block any potential routes to water systems (e.g., sewers, streams, lakes, etc.). Based on the product's toxicological and chemical properties, and on the size and location of the spill or leak, assess the impact on contaminated environments (e.g. water systems, ground, air equipment, etc.). There are no methods available to completely eliminate any toxicity this product may have on aquatic environments. Minimize adverse effects on these environments. Buckman Laboratories, Inc. can be contacted for technical assistance. Determine if federal, state, and/or local release notification is required (see Regulatory Information section of this MSDS). Recover as much of the pure product as possible into appropriate containers. Later, determine if this recovered product can be used for its intended purpose. Address clean-up of contaminated environments. Spill or leak residuals may have to be collected and disposed of. Clay, soil, or commercially available absorbents may be used to recover any material that can not readily be recovered as pure product. Flushing residual material to an industrial sewer, if present at the site of a spill or leak incident, may be acceptable if authorized approval is obtained. If product and/or spill/leak residuals are flushed to an industrial sewer, insure that they do not come into contact with incompatible materials.

**DISPOSAL GUIDELINES**

**Note:** Follow federal, state, and local regulations governing the disposal of waste materials.

**Neat Product:** Contact your Buckman representative.

**Contaminated Materials:** Determine if waste containing this product can be handled by available industrial effluent system or other on-site waste management unit. If off-site management is required, contact a company experienced in industrial waste management.

**Container Disposal:** If assistance is needed, contact your Buckman sales representative.

**SECTION 13*****Transportation and Shipping Information******DOT Shipping Information:***

**UN1824 , SODIUM HYDROXIDE SOLUTION , Class 8, P.G. III , ( ERG Guide 154 )**

***IMO/IMDG Shipping Information:***

**UN1824 , SODIUM HYDROXIDE SOLUTION , Class 8, P.G. III , ( EmS No. 8-06 , ERG Guide 154, HazMat Code 4935240 )**

***IATA Shipping Information:***

**UN1824 , SODIUM HYDROXIDE SOLUTION , Class 8, P.G. III , ( ERG Guide 154, ERG Code 8L )**  
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**When shipped in a single package containing MORE THAN 922 GAL (8,850 LBS), this product contains a reportable quantity of SODIUM HYDROXIDE and the shipping description should be preceded or followed by the letters "RQ".**

*Unless otherwise stated, the shipping information provided above applies only to non-bulk containers of this product. Proper shipping name and general shipping information may vary depending on packaging and mode of shipment. All products shipped from Buckman locations have been properly packaged and labeled according to appropriate hazardous materials shipping regulations. If any alteration of packaging, product, or mode of transportation is further intended, different shipping information, including but not limited to proper shipping name, RQ designation, and labeling may apply. For further information pertaining to the shipping requirements for this product, contact Buckman's Transportation Department or DOT Coordinator.*

## SECTION 14

*Regulatory Information*

The following Regulations are known to apply to the use and disposal of this product. Additional Federal, State and Local regulations may also be applicable.

SARA (Superfund Amendments and Reauthorization Act)

SARA 302 Extremely Hazardous Substances List ...

No components of this product are listed.

SARA 312 Hazard Category ...

Immediate (Acute) Health Hazard

SARA 313 Toxic Chemicals List ...

This product contains the following toxic chemical(s) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372 :

Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione

CERCLA (Comprehensive Environmental Response, Compensation and Liability Act)

Sodium hydroxide ..... RQ = 1000 lbs.

RCRA (Resource Conservation and Recovery Act) Listed Hazardous Waste

No components of this product are listed; however, this product may need to be disposed of as a Hazardous Waste due to its corrosivity characteristics (pH >12).

CWA (Clean Water Act) Listed Substances

No components of this product are listed.

FDA ( Food and Drug Administration)

This product is allowed under the following FDA (21 CFR) sections :175.105, 176.230, 176.300, 178.3120.

Bundesinstitut für Risikobewertung (BfR) (The Federal Institute for Risk Assessment)

XXXVI, XXXVI/2, XIV

TSCA (Toxic Substances Control Act) Applicability

All components are listed on the TSCA Inventory. Registered pesticides are exempt from the requirements of TSCA.

FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act)

This product is a registered pesticide. EPA Reg. No. 1448-103

HMIS/NPCA Rating ... Health 3 Flammability 1 Reactivity 1

NFPA Ratings ..... Health 3 Flammability 1 Reactivity 1

State Regulations

Various State Right To Know Acts ...

Non-proprietary hazardous chemicals are listed in Section 2 of this MSDS. Should you require further information on specific proprietary or inert ingredients please contact Buckman Laboratories' Regulatory Affairs Department.

The information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application which is not described in the Data Sheet is the responsibility of the user. This Material Data Safety Sheet was prepared to comply with the OSHA Hazard Communication regulations. While some components are claimed Trade Secret under OSHA Hazard Communication regulations, all known OSHA hazards associated with the Trade Secret component(s), if contained in this product, are fully disclosed.

Buckman Laboratories, Inc. warrants that this product conforms to its chemical description and is reasonably fit for the purpose referred to in the directions for use when used in accordance with the directions under normal conditions. Buyer

assumes the risk of any use contrary to such directions.

**Seller makes no other warranty or representation of any kind, express or implied, concerning the product, including NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS OF THE GOODS FOR ANY OTHER PARTICULAR PURPOSE. No such warranties shall be implied by law and no agent of seller is authorized to alter this warranty in any way except in writing with a specific reference to this warranty.**

**The exclusive remedy against seller shall be in a claim for damages not to exceed the purchase price of the product, without regard to whether such a claim is based upon breach of warranty or tort.**

**Any controversy or claim arising out or relating to this contract, or breach thereof, shall be settle by arbitration in accordance with the commercial arbitration rules of the American Arbitration Association, and judgement upon the rendered by the Arbitrator(s) may be entered in any court having jurisdiction thereof.**

MSDS # 7522



Arch Chemicals, Inc.

**MATERIAL  
SAFETY DATA**

FOR ANY EMERGENCY, CALL 24 HOURS/7 DAYS:	1-800-654-6911
FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC®:	1-800-424-9300
FOR ALL MSDS QUESTIONS & REQUESTS, CALL MSDS CONTROL:	1-800-511-MSDS

**PRODUCT NAME: CALCIUM HYPOCHLORITE****SECTION 1 PRODUCT AND COMPANY IDENTIFICATION**

REVISION DATE: 03-04-2004 SUPERCEDES: 10-01-2003  
MSDS NO: 00002-0211-30518

MANUFACTURER: Arch Chemicals, Inc. 501 Merritt 7 PO Box 5204 Norwalk, CT 06856-5204

SYNONYMS: None

CHEMICAL FAMILY: Hypochlorite

FORMULA: Not Applicable/Mixture

~~DESCRIPTION: Sanitizer and oxidizer~~

OSHA HAZARD CLASSIFICATION: Oxidizer, toxic by inhalation, corrosive, skin and eye hazard, lung toxin

**SECTION 2 COMPONENT DATA****PRODUCT COMPOSITION**

CAS or CHEMICAL NAME: Calcium hypochlorite

CAS NUMBER: 7778-54-3

PERCENTAGE RANGE: 60-80%

HAZARDOUS PER 29 CFR 1910.1200: Yes

EXPOSURE STANDARDS: 3 mg/cubic meter (ceiling) as Chlorine:Manufacturer's Internal Exposure Standard

CAS or CHEMICAL NAME: Sodium chloride

CAS NUMBER: 7647-14-5

PERCENTAGE RANGE: 10-20%

HAZARDOUS PER 29 CFR 1910.1200: No

EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium chlorate

CAS NUMBER: 10137-74-3

PERCENTAGE RANGE: 0-5%

HAZARDOUS PER 29 CFR 1910.1200: Yes

EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium chloride

CAS NUMBER: 10043-52-4

PERCENTAGE RANGE: 0-5%

HAZARDOUS PER 29 CFR 1910.1200: Yes

EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium hydroxide

CAS NUMBER: 1305-62-0

PERCENTAGE RANGE: 0-4%

00002-0211-30518

CALCIUM HYPOCHLORITE

Page 1 of 9

HAZARDOUS PER 29 CFR 1910.1200: Yes

## EXPOSURE STANDARDS:

	OSHA (PEL)		ACGIH (TLV)	
	ppm	mg/cubic-meter	ppm	mg/cubic-meter
TWA:	None			5
CEILING:	None		None	
STEL:	None		None	

CAS or CHEMICAL NAME: Calcium carbonate

CAS NUMBER: 471-34-1

PERCENTAGE RANGE: 0-5%

HAZARDOUS PER 29 CFR 1910.1200: Yes

## EXPOSURE STANDARDS:

	OSHA (PEL)		ACGIH (TLV)	
	ppm	mg/cubic-meter	ppm	mg/cubic-meter
TWA:		15 (Total Dust) 5 (Respirable fraction)		10
CEILING:	None		None	
STEL:	None		None	

CAS or CHEMICAL NAME: Water

CAS NUMBER: 7732-18-5

PERCENTAGE RANGE: 5.5-10%

HAZARDOUS PER 29 CFR 1910.1200: No

EXPOSURE STANDARDS: None Established

## SECTION 3 PRECAUTIONS FOR SAFE HANDLING AND STORAGE

DO NOT TAKE INTERNALLY. AVOID INHALATION OF DUST AND FUMES. AVOID CONTACT WITH EYES, SKIN OR CLOTHING. UPON CONTACT WITH SKIN OR EYES, WASH OFF WITH WATER. REMOVE AND WASH CONTAMINATED CLOTHING BEFORE REUSE.

STORAGE CONDITIONS: Keep product tightly sealed in original containers. Store product in a cool, dry, well-ventilated area. Store away from combustible or flammable products. Keep product packaging clean and free of all contamination, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

DO NOT STORE AT TEMPERATURES ABOVE: 52 Deg.C (125 Deg.F)  
Storage above this temperature may result in rapid decomposition, evolution of chlorine gas and heat sufficient to ignite combustible products.

## PRODUCT STABILITY AND COMPATIBILITY

SHELF LIFE LIMITATIONS: Shelf life (that is, the period of time before the product goes below stated label strength) is determined by storage time and temperatures. Do not store product at temperatures above 52 Deg.C (125 Deg.F). When stored under moderate temperature conditions, product will maintain stated label strength for approximately two years. Prolonged storage at 35 Deg.C (95 Deg.F) or above will significantly shorten the shelf life. Storage in a climate-controlled storage area or building is recommended in those areas where extremes of high temperature occur.

INCOMPATIBLE MATERIALS FOR PACKAGING: Product packaging must be clean and free of contamination by other materials, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT: Do not allow product to come in contact with other materials, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

#### SECTION 4 PHYSICAL DATA

APPEARANCE: White, free flowing powder  
FREEZING POINT: Not Applicable  
BOILING POINT: Not Applicable  
DECOMPOSITION TEMPERATURE: Onset - Approximately 170-180 Deg.C  
(338-356 Deg.F)  
SPECIFIC GRAVITY: Not Applicable  
BULK DENSITY: 0.8 g/cc, loose  
pH @ 25 DEG.C: 10.4-10.8 (1% solution)  
VAPOR PRESSURE @ 25 DEG.C: Not Applicable  
SOLUBILITY IN WATER: Approximately 18% @ 25 Deg.C (Product also contains calcium hydroxide and calcium carbonate which will leave a residue.)  
VOLATILES, PERCENT BY VOLUME: Not Applicable  
EVAPORATION RATE: Not Applicable  
VAPOR DENSITY: Not Applicable  
MOLECULAR WEIGHT: 143 (Active ingredient)  
ODOR: Chlorine-like  
COEFFICIENT OF OIL/WATER DISTRIBUTION: Not Applicable

#### SECTION 5 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

##### PERSONAL PROTECTION FOR ROUTINE USE OF PRODUCT:

RESPIRATORY PROTECTION: Wear NIOSH approved respirator if dusts are created.  
VENTILATION: Use local exhaust ventilation to minimize dust and chlorine levels where industrial use occurs. Otherwise, ensure good general ventilation.  
SKIN AND EYE PROTECTIVE EQUIPMENT: Wear gloves, and safety glasses to avoid skin and eye contact. Where industrial use occurs, chemical goggles or full impermeable suit may be required.

##### EQUIPMENT SPECIFICATIONS (WHEN APPLICABLE):

RESPIRATOR TYPE: NIOSH approved full face-piece respirator with chlorine cartridges and dust/mist prefilter.  
PROTECTIVE CLOTHING TYPE: Neoprene  
(This includes: gloves, boots, apron, protective suit)

#### SECTION 6 FIRE AND EXPLOSION HAZARD INFORMATION

This product is chemically reactive with many substances. Any contamination of the product with other substances by spill or otherwise may result in a chemical reaction and fire. This product is a strong oxidizer which is capable of intensifying a fire once started.

##### FLAMMABILITY DATA:

FLAMMABLE: No  
COMBUSTIBLE: No  
PYROPHORIC: No  
FLASH POINT: Not Applicable  
AUTOIGNITION TEMPERATURE: Not Applicable  
FLAMMABLE LIMITS AT NORMAL ATMOSPHERIC TEMPERATURE AND PRESSURE (PERCENT VOLUME IN AIR): UEL - Not Applicable LEL - Not Applicable

## NFPA RATINGS:

Health: 3  
Flammability: 0  
Reactivity: 1  
Special Hazard Warning: OX (OXIDIZER)

## HMIS RATINGS:

Health: 3  
Flammability: 0  
Reactivity: 1

## EXTINGUISHING MEDIA:

Water only

## FIRE FIGHTING TECHNIQUES AND COMMENTS:

Use water to cool containers exposed to fire. Also see Section 11.

OTHER: Do not use dry extinguishers containing ammonium compounds

## SECTION 7 REACTIVITY INFORMATION

## CONDITIONS UNDER WHICH THIS PRODUCT MAY BE UNSTABLE:

TEMPERATURES ABOVE: 170 Deg.C (338 Deg.F)

MECHANICAL SHOCK OR IMPACT: No

ELECTRICAL (STATIC) DISCHARGE: No

HAZARDOUS POLYMERIZATION: Will not occur

INCOMPATIBLE MATERIALS: This product is chemically reactive with many substances, including, e.g., other pool treatment products, acids, organics, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, corrosive, flammable or combustible materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Chlorine gas

OTHER CONDITIONS TO AVOID: Storage at temperatures >125 Deg.F (52 Deg.C)

Prevent ingress of humidity and moisture into container or package.  
Always close the lid.

## SUMMARY OF REACTIVITY: (See also Section 6)

OXIDIZER: Yes  
PYROPHORIC: No  
ORGANIC PEROXIDE: No  
WATER REACTIVE: No

OTHER: Arch calcium hypochlorite products meet the specifications of ASTM method E-487-74 as set forth in 49 C. F. R. Sec. 173.21, Title 49-Code of Federal Regs. (DOT Regs.)

## SECTION 8 FIRST AID

EYES: Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Call a physician at once.

SKIN: Immediately flush with water for at least 15 minutes. Call a physician. If clothing comes in contact with the product, it should be removed immediately and laundered before reuse.

INGESTION: Immediately drink large quantities of water. DO NOT induce vomiting. Call a physician at once. DO NOT give anything by mouth if the person is unconscious or if having convulsions.

INHALATION: Remove victim to fresh air. Support respiration if needed. Call a physician.

## SECTION 9 TOXICOLOGY AND HEALTH INFORMATION

## ROUTES OF ABSORPTION

Inhalation, skin and eye contact, ingestion

## WARNING STATEMENT AND WARNING PROPERTIES

MAY BE FATAL IF SWALLOWED. AVOID BREATHING DUST OR FUMES. HARMFUL IF PRODUCT IS INHALED IN HIGH CONCENTRATIONS. CAUSES SKIN, EYE, DIGESTIVE TRACT AND RESPIRATORY TRACT BURNS.

## HUMAN RESPONSE DATA

ODOR THRESHOLD: Approximately 1.4 mg/cubic-meter, based on odor threshold of chlorine.

IRRITATION THRESHOLD: Approximately 13-22 mg/cubic meter, based on the irritation threshold of chlorine.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH: Approximately 45 mg/cubic-meter, based on IDLH concentration of chlorine.

## SIGNS, SYMPTOMS, AND EFFECTS OF EXPOSURE

## INHALATION

## ACUTE:

Inhalation of dust or vapor from this product can be irritating to the nose, mouth, throat and lungs. In confined areas, mechanical agitation can result in high levels of dust, and reaction with incompatible materials (as listed in Section VII) can result in high concentrations of chlorine vapor, either of which may result in burns to the respiratory tract, producing lung edema, shortness of breath, wheezing, choking, chest pains, impairment of lung function and possible permanent lung damage.

## CHRONIC:

Chronic (repeated) inhalation exposure may cause impairment of lung function and permanent lung damage.

## EYE

Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage.

## SKIN

## ACUTE:

Dermal exposure can cause severe irritation and/or burns characterized by redness, swelling and scab formation. Prolonged skin exposure may cause permanent damage.

## CHRONIC:

Effects from chronic skin exposure would be similar to those from single exposure except for effects secondary to tissue destruction.

## INGESTION

## ACUTE:

Irritation and/or burns can occur to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding and/or tissue ulceration. Due to the corrosive nature of this product, ingestion may be fatal.

## CHRONIC:

There are no known or reported effects from chronic exposure except for effects similar to those experienced from single exposure.

## MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Asthma, respiratory and cardiovascular disease

## INTERACTIONS WITH OTHER CHEMICALS WHICH ENHANCE TOXICITY

None known or reported

**ANIMAL TOXICOLOGY****ACUTE TOXICITY:**

Inhalation LC 50: Approximately 1300 mg/cubic-meter (1 hr., rat) -  
based on acute inhalation toxicity for chlorine  
Oral LD 50: 850 mg/kg. (rat)  
Dermal LD 50: > 2 g/kg. (rabbit)  
Causes burns to eyes and skin

**CHRONIC TOXICITY:**

There are no known or reported effects from repeated exposure.

**REPRODUCTIVE TOXICITY:**

Calcium hypochlorite has been tested for teratogenicity in laboratory animals. Results of this study have shown that calcium hypochlorite is not a teratogen.

**CARCINOGENICITY:**

This product is not known or reported to be carcinogenic by any reference source, including: IARC, OSHA, NTP or EPA. One hundred mice were exposed dermally 3 times a week for 18 months to a solution of calcium hypochlorite. Histopathological examination failed to show an increased incidence of tumors.

IARC (International Agency for Research on Cancer) reviewed studies conducted with several hypochlorite salts. IARC has classified hypochlorite salts as having inadequate evidence for carcinogenicity to humans and animals. IARC therefore considers hypochlorite salts to be not classifiable as to their carcinogenicity to humans.

**MUTAGENICITY:**

Calcium hypochlorite has been tested in the Dominant lethal assay in male mice, and it did not induce a dominant lethal response. Calcium hypochlorite has been reported to produce mutagenic activity in two in vitro assays. It has, however, been shown to lack the capability to produce mutations in animals based on results from the micronucleus assay. In vitro assays frequently are inappropriate to judge the mutagenic potential of bactericidal chemicals due to a high degree of cellular toxicity. The concentration which produces mutations in these in vitro assays is significantly greater than the concentrations used for disinfection. Based on high cellular toxicity in in vitro assays and the lack of mutagenicity in animals, the risk of genetic damage to humans is judged not significant.

**AQUATIC TOXICITY:**

Bluegill, 96 hr. LC50: 0.088 mg/l (nominal, static)  
Rainbow trout, 96 hr. LC50: 0.16 mg/l (nominal, static)  
Daphnia magna, 48 hr. LC50: 0.11 mg/l (nominal, static)

**TOXICITY TO WILDLIFE:**

Bobwhite quail, dietary LC50: > 5,000 ppm  
Mallard ducklings, dietary LC50: > 5,000 ppm  
Bobwhite quail, oral LD50: 3474 mg/kg.

**SECTION 10 TRANSPORTATION INFORMATION**

THIS MATERIAL IS REGULATED AS A DOT HAZARDOUS MATERIAL.

DOT DESCRIPTION FROM THE HAZARDOUS MATERIALS TABLE 49 CFR 172.101:  
LAND (U.S. DOT): CALCIUM HYPOCHLORITE, HYDRATED MIXTURES, 5.1,  
UN 2880, PG II

WATER (IMO): SAME AS ABOVE

AIR (IATA/ICAO): SAME AS ABOVE

HAZARD LABEL/PLACARD: OXIDIZER

REPORTABLE QUANTITY: 10 lbs. (Per 49 CFR 172.101, Appendix)

EMERGENCY GUIDE NO: 140

SPECIAL COMMENT: Under specific circumstances, this product can ship under two transport exceptions, Limited Quantity or Consumer Commodity. See Bill of Lading for proper shipping description.

#### SECTION 11 SPILL AND LEAKAGE PROCEDURES

FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC AT 800-424-9300.

REPORTABLE QUANTITY: 10 lbs. (as Calcium hypochlorite) Per 40 CFR 302.4

#### SPILL MITIGATION PROCEDURES:

Hazardous concentrations in air may be found in local spill area and immediately downwind. Remove all sources of ignition. Stop source of spill as soon as possible and notify appropriate personnel.

AIR RELEASE: Vapors may be suppressed by the use of a water fog. All water utilized to assist in fume suppression, decontamination or fire suppression may be contaminated and must be contained before disposal and/or treatment.

WATER RELEASE: This material is heavier than water. This material is soluble in water. Monitor all exit water for available chlorine and pH. Advise local authorities of any contaminated water release.

LAND SPILL: Contact at 1-800-654-6911 immediately.

DANGER: All spills of this product should be treated as contaminated. Contaminated product may initiate a chemical reaction which may spontaneously ignite any combustible material present, resulting in a fire of great intensity. In case of a spill, separate all spilled product from packaging, debris and other material. Using a clean broom or shovel, place all spilled product into plastic bags, and place those bags into a clean, dry disposal container, properly marked and labelled. Disposal containers made of plastic or metal are recommended. Do not seal disposal containers tightly. Immediately remove all product in disposal containers to an isolated area outdoors. Place all damaged packaging material in a disposal container of water to assure decontamination (i.e. removal of all product) before disposal. Place all undamaged packaging in a clean, dry container properly marked and labelled. Call for disposal procedures.

#### SPILL RESIDUES:

Dispose of per guidelines under Section 12, WASTE DISPOSAL.

This material may be neutralized for disposal; you are requested to contact at 800-654-6911 before beginning any such operation.

#### PERSONAL PROTECTION FOR EMERGENCY SPILL AND FIRE-FIGHTING SITUATIONS:

Response to a large quantity spill (100 pounds or greater) or when dusting or decomposition gas exposure could occur requires the use of a positive pressure full face supplied air respirator or self contained breathing

apparatus (SCBA), chemical resistant gloves, coveralls and boots. In case of fire, this personal protective equipment should be used in addition to normal fire fighter equipment.

#### SECTION 12 WASTE DISPOSAL

If this product becomes a waste, it meets the criteria of a hazardous waste as defined under 40 CFR 261 and would have the following EPA hazardous waste number: D001.

If this product becomes a waste, it will be a hazardous waste which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly.

As a hazardous solid waste, it must be disposed of in accordance with local, state, and federal regulations in a permitted hazardous waste treatment, storage and disposal facility by treatment.

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL. THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

#### SECTION 13 ADDITIONAL REGULATORY STATUS INFORMATION

##### TOXIC SUBSTANCES CONTROL ACT:

~~This substance is listed on the Toxic Substances Control Act inventory.~~

NSF LIMITS: NSF Maximum Drinking Water Use Concentration - 15 mg/l  
as calcium hypochlorite product

##### SUPERFUND AMENDMENT AND REAUTHORIZATION ACT TITLE 3:

HAZARD CATEGORIES, PER 40 CFR 370.2:

###### HEALTH:

Immediate (Acute)

###### PHYSICAL:

Fire and Reactivity

##### EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW, PER 40 CFR 355, APP.A:

EXTREME HAZARDOUS SUBSTANCE - THRESHOLD PLANNING QUANTITY:

None Established

SUPPLIER NOTIFICATION REQUIREMENTS, PER 40 CFR 372.45:

None Established

#### SECTION 14 ADDITIONAL INFORMATION

REGULATED UNDER FIFRA, USDA & FDA

MSDS REVISION STATUS: Revision to Section 11

#### SECTION 15 MAJOR REFERENCES

1. Ishidate, M. et al. (1984). Primary mutagenicity screening of food additives currently used in Japan. *Fd. Chem. Toxicol.* 22:623-636.
2. Hayashi, M. et al. (1988). Micronucleus tests in mice on 39 food additives and eight miscellaneous chemicals. *Fd. Chem. Toxicol.* 26:487-500.
3. Report on the Acute Inhalation in Rats, Acute Oral LD50 in Rats, Eye Irritation in Rabbits, Dermal Irritation in Rabbits, and Acute Dermal Toxicity in Rabbits of HTH. Biometric Testing Laboratories, Inc., Whippany, NJ. Experiment Reference #A-1490 (RC-30406), February 9, 1975.

4. Report on the Teratogenic Study with Calcium Hypochlorite in Albino Rats. Industrial Bio-Test Laboratories, Inc., Northbrook, IL. IBT #B758b, April 18, 1972.
  5. Report on the Mutagenic Study with Monosodium Cyanurate and Calcium Hypochlorite (HTH) in Albino Mice. Industrial Bio-Test Laboratories, Inc., Northbrook, IL. IBT #E756. April 18, 1972.
  6. Chemical Hazard Summary No. 20: Calcium Hypochlorite. Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada L8N 1H6. December 1986.
  7. Report on 18-Month Dermal Carcinogenicity Study with Monosodium Cyanuric Acid and HTH in Swiss White Mice. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-00751, April 9, 1974.
  8. Report to PPG Industries, Inc. on the Acute Toxicity Studies with PITCHLOR (Granular Calcium Hypochlorite). Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #601-06659, May 7, 1975.
  9. Report on the Acute Toxicity of HTH to Bluegill, Rainbow Trout and the Water Flea. E G & G, Bionomics Aquatic Toxicology Laboratory, Wareham, MA, July 1977.
  10. Report on the 8-Day Dietary LD50 Study with HTH in Mallard Ducklings. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-06184, May 15, 1975.
  11. Report on the 8-Day Dietary LC50 with HTH in Bobwhite Quail. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-06183.
  12. Final Report on the Acute Oral LD50 of Calcium Hypochlorite in Bobwhite Quail. Wildlife International, LTD., Easton, MD, Project #133-107, July 15, 1977.
  13. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Vol. 52: Chlorinated Drinking Water; Chlorination By-Products; Some Other Halogenated Compounds; Cobalt and Cobalt Compounds. World Health Organization, International Agency for Research on Cancer (IARC), Lyon, France, 1991.
  14. Sittig, Marshall, Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd Ed., Noyes Publications, Park Ridge, NJ, 1985.
  15. Chemical Hazard Response Information System (CHRIS), Vol. II, U.S. Coast Guard, Washington, D.C., 1984.
  16. Chlorine and Your Health. The Chlorine Institute, Inc., Washington, D.C., August 1988.
  17. ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth Edition, 1991. American Conference of Governmental Industrial Hygienists, Inc., Cincinnati, OH.
  18. Amore, John E. and Earl Hautala, Odor as an Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatiles for 214 Industrial Chemicals in Air and Water Dilution. Journal of Applied Toxicology, Vol. 3, No. 6, pp. 272-290, 1983.
  19. Forsberg, K., and S.Z. Mansdorf, Quick Selection Guide to Chemical Protective Clothing, Second Edition, Van Nostrand Reinhold, N.Y., 1993.
- (Additional references are available upon request)

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. ARCH CHEMICALS BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION BUT, MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS MSDS IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT ARCH CHEMICALS MSDS CONTROL AT THE PHONE NUMBER ON THE FRONT PAGE TO MAKE CERTAIN THAT THIS DOCUMENT IS CURRENT.

Arch Chemicals, Inc.  
MSDS Control  
501 Merritt 7  
PO Box 5204  
Norwalk, CT 06856-5204

Technical data

**Soda Ash**

CAS No 497-19-8

<b>Chemical name</b>	Sodium carbonate, anhydrous
<b>CAS name</b>	Disodium carbonate
<b>Formula</b>	Na <sub>2</sub> CO <sub>3</sub>
<b>Molecular weight (mol)</b>	105.99
<b>General physical properties</b>	
Description	white granular solid
Melting point, °C (°F)	851 (1564)
<b>General chemical properties</b>	
Solubility, max % @ 35.4°C	33.2
pH, 1% solution @ 25°C	11.4
Heat of fusion, MJ/kg (BTU/lb)	0.318 (136)
Heat of hydration, MJ/kg (BTU/lb)	
monohydrate	0.126 (54)
heptahydrate	0.653 (282)
decahydrate	0.874 (376)

# Dense Grades

## Chemical properties

	Grade 160		Grade 260	
	Typical	Specification	Typical	Specification
Na <sub>2</sub> O, % by weight	58.4	58.0 min	58.4	58.0 min
Na <sub>2</sub> CO <sub>3</sub> , %	99.8	99.2 min	99.8	99.2 min
Na <sub>2</sub> SO <sub>4</sub> , %	0.06	0.20 max	0.05	0.20 max
NaCl, %	0.03	0.20 max	0.02	0.20 max
Fe <sub>2</sub> O <sub>3</sub> , ppm	7	20 max	4	20 max
Water insolubles, %	0.00	0.05 max	0.01	0.05 max
Ignition loss, %	0.1		0.1	
Heavy metals (as Pb), ppm	<10		<10	
COD (as O <sub>2</sub> ), ppm	40		200	
Pb, ppm	1		1	
As <sub>2</sub> O <sub>3</sub> , ppm	0.1		0.1	
B, ppm	3		6	
CaO, ppm	140		80	
Cu, ppm	0.1		0.1	
MgO, ppm	50		20	
SiO <sub>2</sub> , ppm	30		150	

## Physical properties

	Grade 160		Grade 260	
	Typical	Specification	Typical	Specification
Bulk density, lb/ft <sup>3</sup>	59	54-62	65	60-70
g/cm <sup>3</sup>	0.95	0.86-0.99	1.06	0.96-1.12
Particle density, g/cm <sup>3</sup>	1.826		1.960	
Particle shape	Needle-like		Blocky	
Angle of repose, deg	52		40	
Screen analysis, cumulative %				
On U.S. 30 (600 μm)	0.4		1.5	
U.S. 40 (425 μm)	8	15 max	16	27 max
U.S. 100 (150 μm)	88		90	
Thru U.S. 200 (75 μm)	1	5 max	2	7 max

---

**Uses**

Glass manufacture, detergent manufacture, sodium chemicals and carbonate chemicals manufacture, pulp and paper, brine treatment, water hardness removal, pH adjustment in water or waste water, flue gas desulfurization.

---

**Standard containers**

Bulk hopper cars and trucks; 100 lb (45.4 kg) multi-wall paper bags.

The information contained herein is, to our knowledge, true and accurate. Because conditions of use are beyond our control, we make no warranty or representation, express or implied, except that the products discussed herein conform to the chemical descriptions shown on their labels. Nothing contained herein should be construed as permission or recommendation to infringe any patent. No agent, representative, or employee of this company is authorized to vary any of the terms of this Notice.



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**ATTACHMENT D**  
**DAILY QC REPORT**





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**ATTACHMENT E**  
**GEOSYNTHETIC CLAY LAYER & TRIAXIAL DRAINAGE GEOCOMPOSITE**



# TECHNICAL REFERENCE 401-BMST

## BENTOMAT® ST

### CERTIFIED PROPERTIES

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY	REQUIRED VALUES
Bentonite Swell Index <sup>1</sup>	ASTM D 5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss <sup>1</sup>	ASTM D 5891	1 per 50 tonnes	18 mL max
Bentonite Mass/Area <sup>2</sup>	ASTM D 5993	40,000 ft <sup>2</sup> (4,000 m <sup>2</sup> )	0.75 lb/ft <sup>2</sup> (3.6 kg/m <sup>2</sup> ) min.
GCL Tensile Strength <sup>3</sup>	ASTM D 6768	200,000 ft <sup>2</sup> (20,000 m <sup>2</sup> )	30 lb/in (53 N/cm) MARV
GCL Peel Strength <sup>3</sup>	ASTM D 6496	40,000 ft <sup>2</sup> (4,000 m <sup>2</sup> )	3.5 lbs/in (6.1 N/cm) min.
GCL Index Flux <sup>4</sup>	ASTM D 5887	Weekly	1 X 10 <sup>-8</sup> m <sup>3</sup> /m <sup>2</sup> /sec max.
GCL Hydraulic Conductivity <sup>4</sup>	ASTM D 5887	Weekly	5 X 10 <sup>-9</sup> cm/sec max.
GCL Hydrated Internal Shear Strength <sup>5</sup>	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) typical @200 psf

**Bentomat ST is a reinforced GCL consisting of a layer of sodium bentonite between a woven and a nonwoven geotextiles, which are needlepunched together.**

#### Notes

- Bentonite property tests performed at a bentonite processing facility before shipment to CETCO GCL production facilities.
- Bentonite mass/area reported at 0 percent moisture content.
- All tensile strength testing is performed in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496. Upon request, tensile and peel results can be reported per modified ASTM D 4632 using 4 inch grips.
- Index flux and permeability testing with deaired distilled/deionized water at 80 psi (551kPa) cell pressure, 77 psi (531 kPa) headwater pressure and 75 psi (517 kPa) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. Actual flux values vary with field condition pressures. The last 20 weekly values prior the end of the production date of the supplied GCL may be provided.
- Peak value measured at 200 psf (10 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

CETCO has developed an edge enhancement system that eliminates the need to use additional granular sodium bentonite within the overlap area of the seams. We call this edge enhancement, SUPERGROOVE™, and it comes standard on both longitudinal edges of BENTOMAT® ST. It should be noted that SUPERGROOVE™ does not appear on the end-of-roll overlaps and recommend the continued use of supplemental bentonite for all end-of-roll seams.

#### LAST UPDATED MAY 2007

*IMPORTANT: The information contained herein supersedes all previous printed versions, and is believed to be accurate and reliable. For the most up-to-date information, please visit [www.CETCO.com](http://www.CETCO.com). CETCO accepts no responsibility for the results obtained through application of this product. CETCO reserves the right to update information without notice.*



[www.CETCO.com](http://www.CETCO.com)

2870 Forbs Avenue Hoffman Estates, IL 60192  
847.851.1800 | 800.527.9948

# GSE FabriNet TRx Geocomposite

GSE HyperNet TRx geonet is produced with a unique one step process that coextrudes creep resistant columns to an intrusion resistant roof. The resulting triaxial geonet is then laminated to a nonwoven geotextile filtration media. This product achieves high in-situ transmissivity from optimally oriented flow channels that maintain porosity because of the intrusion and creep resistant nature of the triaxial structure. The geocomposite provides continuous performance over a broad range of conditions. It is well suited for use in surface water collection and removal systems, gas venting, and landfill drainage applications.

[\*]

**AT THE CORE:**  
A high flow geocomposite that achieves high in-situ transmissivity from optimally oriented flow channels that maintain porosity.

## Product Specifications

Tested Property	Test Method	Frequency	Minimum Average Roll Value		
			4 oz/yd <sup>2</sup>	6 oz/yd <sup>2</sup>	8 oz/yd <sup>2</sup>
<b>Geocomposite</b>					
Transmissivity <sup>(1)</sup> , gal/min/ft (m <sup>2</sup> /sec)	ASTM D 4716	1/540,000 ft <sup>2</sup>	12.1 (2.5 x 10 <sup>-3</sup> )	12.1 (2.5 x 10 <sup>-3</sup> )	10.1 (2.2 x 10 <sup>-3</sup> )
Double-Sided Composite			15.7 (3.2 x 10 <sup>-3</sup> )	15.7 (3.2 x 10 <sup>-3</sup> )	13.8 (2.9 x 10 <sup>-3</sup> )
Single-Sided Composite					
Ply Adhesion, lb/in	ASTM D 7005	1/50,000 ft <sup>2</sup>	1.0	1.0	1.0
<b>Geonet Core - GSE HyperNet TRx (prior to lamination)<sup>(2)</sup></b>					
Transmissivity <sup>(1)</sup> , gal/min/ft (m <sup>2</sup> /sec)	ASTM D 4716		43.5 (9 x 10 <sup>-3</sup> )	43.5 (9 x 10 <sup>-3</sup> )	43.5 (9 x 10 <sup>-3</sup> )
Density, g/cm <sup>3</sup>	ASTM D 1505	1/50,000 ft <sup>2</sup>	0.94	0.94	0.94
Tensile Strength <sup>(2)</sup> , lb/in	ASTM D 5035/7179	1/50,000 ft <sup>2</sup>	75	75	75
Carbon Black Content, %	ASTM D 1603 <sup>(3)</sup> /4218	1/50,000 ft <sup>2</sup>	2.0	2.0	2.0
<b>Geotextile (prior to lamination)<sup>(4)</sup></b>					
Mass per Unit Area, oz/yd <sup>2</sup>	ASTM D 5261	1/90,000 ft <sup>2</sup>	4	6	8
Grab Tensile, lb	ASTM D 4632	1/90,000 ft <sup>2</sup>	120	160	220
Puncture Strength, lb	ASTM D 4833	1/90,000 ft <sup>2</sup>	60	90	120
AOS, US sieve (mm)	ASTM D 4751	1/540,000 ft <sup>2</sup>	70 (0.212)	70 (0.212)	80 (0.180)
Permittivity, sec <sup>-1</sup>	ASTM D 4491	1/540,000 ft <sup>2</sup>	1.8	1.5	1.3
Flow Rate, gpm/ft <sup>2</sup>	ASTM D 4491	1/540,000 ft <sup>2</sup>	135	110	95
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	per formulation	70	70	70
<b>NOMINAL ROLL DIMENSIONS</b>					
Geonet Core Thickness, mil	ASTM D 5199	1/50,000 ft <sup>2</sup>	300	300	300
Roll Width <sup>(5)</sup> , ft			15	15	15
Roll Length <sup>(6)</sup> , ft	Double-Sided Composite		160	160	150
	Single-Sided Composite		180	170	170
Roll Area, ft <sup>2</sup>	Double-Sided Composite		2,400	2,400	2,250
	Single-Sided Composite		2,700	2,550	2,550

[Product specifications continued on back]

**DURABILITY RUNS DEEP**

**GSE**  
ENVIRONMENTAL

[\*]

**AT THE CORE:**

A high flow geocomposite that achieves high in-situ transmissivity from optimally oriented flow channels that maintain porosity.

**Product Specifications [continued]**

NOTES:

- <sup>1)</sup>This is an index transmissivity value measured at stress = 10,000 psf; gradient = 0.1; time = 15 minutes; boundary conditions = between plates. Contact GSE for performance transmissivity value for use in design.
- <sup>2)</sup>Tested in machine direction (MD).
- <sup>3)</sup>All properties are minimum average roll values except AOS (mm) which is a maximum average roll value and UV resistance which is a typical value.
- <sup>4)</sup>Roll widths and lengths have a tolerance of  $\pm 1\%$ .
- <sup>5)</sup>Modified.

GSE is a leading manufacturer and marketer of geosynthetic lining products and services. We've built a reputation of reliability through our dedication to providing consistency of product, price and protection to our global customers.

Our commitment to innovation, our focus on quality and our industry expertise allow us the flexibility to collaborate with our clients to develop a custom, purpose-fit solution.



**[ DURABILITY RUNS DEEP ]**

For more information on this product and others, please visit us at [GSE.com](http://GSE.com), call 800.433.2008 or contact your local GSE office.



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***APPENDIX B***  
***REMEDIATION EQUIPMENT AND SERVICES, INC. WORK PLAN***

## **RES July 24, 2013 Proposal**



July 24, 2013

Mr. Matthew T. Walsh  
XDD, LLC  
101 East Mill Street, Suite D  
Quakertown, PA 18951

RE: Groundwater Treatment System  
Bennington, VT  
RES Proposal # 13-00513-49PRO Rev 3

Dear Mr. Walsh:

Remediation Equipment and Services (RES) has prepared this revised proposal to supply and install a Groundwater Treatment System (GWTS) based your Draft Request For Proposal (RFP) dated June 28, 2013, updated figures and tables provided in your July 18, 2013 email, telephone discussion of July 19, 2013 and subsequent comments received on July 23, 2013. This revised proposal addresses the equipment and scope identified in your RFP and the updated information. RES would be happy to discuss any and all aspects of this work with you.

**Background:**

The project site is located in Bennington, VT. RES understands that there is an existing treatment building on site that will be cleared of all equipment except components to be reused in this revised proposal (4 vapor carbon vessels and building utilities). The site will have 4 new groundwater extraction wells installed at either end of two new capture trenches complete with piping and conduits run back to the existing treatment building. RES's scope of work is to provide and install the treatment system described in your RFP dated June 28, 2013 and our recent discussions.

**Scope of Work:**

The Scope of Work for this Proposal includes the following tasks:

**Task 1 Fabrication of Groundwater Treatment System (POTW Discharge)**

RES will order and procure the major system components and associated instrumentation in accordance with the contract terms and approved submittals. This includes the major System equipment as follows;

- A. 1 - QED Model EZ-2.4P Air Stripper System with 3 HP blower, feed and discharge pumps
- B. 2 - Grundfos Model 10 SQE05-100 NE well pumps
- C. 1 - 1300 gallon conical bottom tank on metal stand

- D. 4 – 10 micron Trade Size 2 bag filter units, skid mounted
- E. 1- Control Panel, NEMA 12 enclosure , by EOS Research, Inc. fully programmed with
  - a. 24 Analog Inputs capacity
  - b. 36 Digital Inputs capacity
  - c. 34 Digital Outputs capacity
  - d. 8 Analog Outputs capacity
  - e. Cellular modem & Verizon digital cellular service included for 1 year from Start-up
- F. Assorted instrumentation and controls as described in your RFP or as attached (if different from your specified device).

The air stripper, equalization tank, control panel, and carbon vessels (if requested), will be shipped directly to the site. Instrumentation, bag filters, piping, conduit, & electrical materials will be received at our Royersford, PA location and mobilized to the site with the installation crew.

RES is proposing limited shop fabrication and testing of the GWTS (ref Specification Section 4.3) in order to provide substantial cost savings. Assembly of the complete system in our shop would incur substantial unnecessary cost for shipping all the components to Royersford, assembly, disassembly to ship to the Site, then re-assembly at the Site. Shop testing for the control panel and air stripper will be performed by the vendors at their facilities. XDD may schedule on-site inspection visits with appropriate notice. Copies of the vendor's equipment documentation and factory testing certification will be provided upon completion by the vendor. RES will use our best efforts to provide a draft O&M manual within 1 week of completion of the factory testing. RES has included limited time for input and review of XDD's draft startup plan in conjunction with this information.

RES can assemble and test the well water inlet manifold and the bag filter skid in our shop however, all other components will be tested after assembly in the field under Task 4.

#### **Task 1A (Optional) Fabrication / Procurement of Additional Equipment for Surface Water Discharge**

RES will procure two 250 lb liquid phase carbon units, one 250 Lb Activated Alumina filter unit, and associated hoses, fittings, and gauges as described in your Figure 7 and Specification Section 2.2.3.

We are proposing to use TIGG Corporation's EI-200 fabricated vessels and TIGG's ARM, activated alumina product as an alternate to your requested products as RES has successfully relied on TIGG's experience in carbon systems in the past and this offers cost savings to the project. We have attached Tigg's Drawing EL-200-1001 and TIGG ARM material spec sheets for your review. RES believes these substitutions should be comparable to your requested materials. These components would be shipped to the site with the other system components mobilized by RES staff.

## **Task 2.0 Groundwater Treatment System Delivery and Installation at the site:**

RES will provide and unload all components at the project site in Bennington, VT on a pre-arranged date and place the major components in the existing building. We will install the control panel and perform all interconnecting piping and wiring between the components, installing the necessary sensors and control devices as the work proceeds. A temperature transmitter with 0<sup>o</sup> to 100<sup>o</sup> C range has been added to this proposal to allow alarming excessive temperatures inside the building.

Connections for the incoming water piping will be made to your new water lines via an HDPE to PVC transition coupling inside the building after the HDPE lines enter the building. Electrical conduits for the pumps, outlets, and other remote locations are anticipated to exit the building walls above grade to the junction boxes installed by the Civil contractor.

RES will install the well pumps and level transducers in your Primary extraction wells at one end of each trench. Wiring to the Secondary wells in each trench is not included in this proposal. Wiring will be pulled by us through your conduits from the building to the well pumps for pump Power, utility outlets, and instrumentation. Please note that for the CU 300 well pump controllers to function properly on multiple pump installations, parallel power conduits to each pump must be no closer in the trench than 24" or they must be steel or the power wiring must be shielded. Based upon our email correspondence of 7/8/2013, RES has priced the wiring to the nearer, "Compliance Boundary Trench" well as shielded 10 gauge wire so that the more distant, "Downgradient Collection Trench" well can be powered with unshielded wire.

All plumbing will be installed to connect the incoming water lines to the treatment system (equalization tank, bag filters, air stripper and carbon vessels) and discharge treated water outside the building into your discharge pipe or lift station located adjacent to the building.

Inlet air for the stripper will be piped from outside the building, through the air stripper and then exhaust through the Vapor Granulated Activated Carbon vessels (existing, on-site). Inlet and outlet air piping will penetrate the building through a side wall, and includes screening for protection against animal / insect intrusion. The exhaust pipe will be extended upward to vent 3 to 4 ft above the eave line.

Power and control wiring will be completed from your existing distribution panels, through our control panel(s), to the instrumentation, motors, and the Surface Discharge Line heat trace.

All plumbing and electrical work will be tested for leaks, terminations, and proper function prior to the system startup. RES will utilize compressed air to soap bubble test from the incoming well lines to the last valve before the equalization tank and from the equalization tank to the last valve before the air stripper. All other piping connections will be checked for leaks once water flow is established.

RES will complete all work within (8) eight weeks of approved submittals and receipt of the required equipment down payment (assuming 3 to 5 day review turnaround of RES submittals). On-site installation work is estimated at (10) days.

**Task 2A. (Optional) Installation of Additional Equipment for Surface Water Discharge Concurrent with System Installation**

RES will install the LGAC carbon vessels and activated alumina filter at the project site complete with interconnecting hoses, pipe fittings, gauges, and sample ports as shown on your Figure 7.

**Task 2B. (Optional) Installation of Additional Equipment for Surface Water Discharge Subsequent to System Installation**

We have modified your Bid Form to show the additional cost if RES must remobilize to install this equipment subsequent to our completion of the basic system installation.

**Task 3.0 Treatment System Building Modifications**

RES will install two WaterBug electronic water detection sensors on the floor of the building. These sensors will be tied into the EOS control panel with alarm outputs to signal water on the floor. The sump and sump float switch have been eliminated from this proposal.

Containment curbing will be installed after the equipment is set in place and assembly has been completed. RES has revised our proposal to utilize the New Pig Build-A-Berm containment system with 6 inch high barrier materials. The installation has been revised to cover the larger area shown in your Figure 5-6 and allows for two door “notches” in the layout.

RES has also included the use of a VacMaster 4000 SoftDig type truck in this portion of the project to perform the excavation of soil under the interior floor slab where the piping from the wells and the effluent Surface Drain Line will enter / exit the building. RES has added the cost to install two 6 inch underground conduit sleeves for these lines. The underground entry and sleeves will eliminate the need for heat tracing and insulation on these water lines.

Installation of the sleeves is anticipated to be coordinated with your Civil contractor so that RES can utilize their open trench from the well piping for exterior access under the building. Backfill of the trench around the piping sleeves outside the building would be performed by the Civil contractor as they complete their piping installation. The use of this equipment allows for minimal disturbance under the walls and floor, while allowing the pipe penetrations to remain below the frost line. Costs are included for one day of operation and fuel. This work may be completed any time prior to the installation of the system in order to facilitate the schedule and to coordinate with the Civil contractor.

**Task 4.0 Treatment System Start-up and Performance Testing**

Task 4.1 - RES will provide a gasoline powered water pump, hoses, and bag filter, as shown on Figure 6 to pump your estimated 80,000 gallons of collected trench water from construction activities to our 20,000 gallon frac tank (the Temporary Holding Tank or THT) located near the treatment building. We have included up to 500 ft of hose to reach the tanks (by others) in the designated Construction Staging Area. RES understands that the actual total volume of construction water to be treated is unknown. A temporary electric water pump will be installed

between our THT and the discharge of the transfer pump at the Equalization Tank. Appropriate valving will prevent the residual water from backing into the Equalization Tank and control the flow rate into the GWTS. The flow rate will be manually established at or near the maximum design flow rate of the air stripper.

Task 4.2 - RES will start up and operate the treatment system using filtered residual water from the groundwater collection trench construction activities to test the equipment, controls, and alarms, and demonstrate the system's performance capabilities.

Treated water will be temporarily discharged into another 20,000 gallon frac tank (the Effluent Holding Tank or EHT) provided by RES during the startup period. Sampling for attainment of discharge permit limits (by others) and testing of the system's alarms, controls, and component's performance will be accomplished at this time. RES will utilize another electric water pump as needed to discharge the treated water from the EHT through the GWTS effluent piping to the Owner's discharge point, once approved by XDD. Task 4.2 is estimated at 1 week of operation.

Task 4.3 - RES will operate the treatment system on a daily rate basis to treat any additional stored construction water not treated during Task 4.2. Operations will continue until the stored water is treated at which time the system will be switched over to groundwater from the extraction wells (Task 4.4). Spent bag filters will be containerized by RES for disposal by others.

Task 4.4 - Once the collected trench water has been treated and discharged, RES will start up the extraction well pumps and put the full system into operation. A trial period of two days as described in the RFP has been allotted for system startup. RES will remove the two frac tanks after the system startup is completed. Please note that RES has included the cost to clean these tanks on site before demobilization. Any residual sediment will be left on site for disposal by others; decon water will be processed through the GWTS.

The final Operation and Maintenance manual will be provided within 30 days of completion of the startup as one hard copy and one electronic copy. Documentation will include the component equipment manuals or specification sheets provided by vendors as well as RES's recommended startup, operation, and shutdown procedures.

### **Proposal Pricing:**

RES pricing is provided in your attached BID FORM

### **Notes and Exceptions:**

1. This proposal is valid for 60 days.
2. Only the process equipment, instrumentation, controls and services requested in your RFP and listed in this Proposal are included. Where you have provided product specific cut sheets, RES intends to supply that component EXCEPT for the attached alternates, (Specifications or cut sheets are attached).
3. Regarding RFP Section 4.1 RES has based the components, logic, and layout of this proposal on your specifications and drawings, and as such will not be providing your 1<sup>st</sup>,

- 2<sup>nd</sup>, 3<sup>rd</sup> or last bullet items. Electrical schematics and logic tables will be provided for the control panel.
4. RES will not warrant vendor supplied components for a longer period or differently than the manufacturer's warranty. RES will warrant our workmanship for 24 months from the date of startup at the site.
  5. RES has revised this proposal to include the GF Signet 2551 (P/N 3-2551-PO-41) Magnetic Flowmeter.
  6. One year of communication service is included in this Proposal. Subsequent years of service can be provided by subscription service directly through the panel manufacturer.
  7. Iron and Manganese fouling has not been addressed in this proposal other than by our use of the Signet magnetic flowmeter and we have estimated the project using 2" Sch 80 PVC as described on your Figure 5-4.
  8. If requested, RES will provide and install the inorganic carbon removal system but we cannot warrant that the system will meet your discharge parameters, should the optional equipment be requested.
  9. The pricing provided in our Bid Sheet for the cost of Item 2A, (Installation of Optional Additional Equipment) is based upon installation being performed at the same time as the basic system installation. We have added Line Item 2B to provide the cost if a second mobilization is required to install this equipment.
  10. The cost for all electrical wiring is based upon performance by RES staff. There is no licensed electrician included in this proposal.
  11. RES will make no modifications to, or install additional, heating, ventilation, lighting, or convenience outlets for this project.
  12. No Permits have been included in this proposal.

RES appreciates the opportunity to provide you with environmental equipment services and we look forward to working with you on this project. If you have any questions, comments or need additional information, please feel free to contact the undersigned at (484) 369-2015 or (484)-369-2021.

Sincerely,

**REMEDATION EQUIPMENT & SERVICES**

Gary J. Sheridan  
Remediation Systems Construction  
and Operations Manager

Mitchell L. Moss  
Director, RES

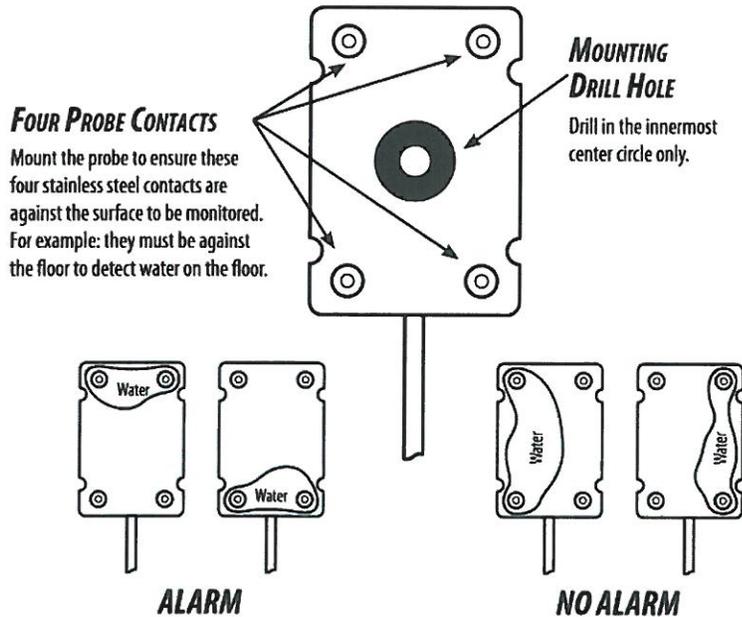
# WATERBUG®

**W-S-S**  
**WATERBUG SURFACE PROBE**  
**SUPERVISED**

**W-S-U**  
**WATERBUG SURFACE PROBE**  
**UNSUPERVISED**

If the unit is to be bolted down, as in a permanent installation, drill only through the innermost center recessed area. Drilling anywhere else may damage the internal wiring causing the unit to fail.

Extend probe wiring length using 22-18 AWG twisted pair.  
See product manuals for cable lengths.



To insure proper operation, test weekly.

  
**WINLAND**  
**ELECTRONICS, INC.**  
Tech Support 8:00am - 5:00pm Central Time  
(800) 635-4269 • +1-507-625-7231 P  
www.winland.com  


### Symbols on the Product or Manual Labeling



- For product disposal, ensure the following:
- Do not dispose of this product as unsorted municipal waste.
  - Collect this product separately.
  - Use collection and return systems available to you.



WEEE Waste Electrical and Electronic Equipment  
RoHS Restriction of Hazardous Substances

## PRODUCT AND ACCESSORY GUIDE

						
	W-S-S	W-S-S	W-S-S			W-S-S
	W-UC-S	W-UC-S	W-UC-S			W-UC-S
				W-S-U	W-S-U	W-S-U
				W-UC-U	W-UC-U	W-UC-U

### W-S-S (Water Probe, Surface, Supervised) and W-UC-S (Water Probe, Under Carpet, Supervised)

The supervised surface probe can be connected to the EnviroAlert products as well as the WB-800. The alarm will be activated if water is present as well as if the cable is cut.

### W-S-U (Water Probe, Surface, Unsupervised) and W-UC-U (Water Probe, Under Carpet, Unsupervised)

The standard surface probe is unsupervised and can be connected to the full line of WaterBug products. No alarm will sound if the cable is cut.

### WEEE Product Recovery/Recycling for EU Customers

In an effort to improve waste management in the European Union, the European Union has enacted directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE Directive). According to the WEEE Directive, Winland Electronics must take back waste electrical or electronic equipment covered under the WEEE Directive, at its cost, for all product it puts on the market after July 1, 2006. The Return Process: Contact Winland via our web site at [www.winland.com](http://www.winland.com).

### Applicable Directives

RoHS Directive 2002/95/EC; WEEE Directive 2002/96/EC

### Statement of Compliance:

Winland Electronics, Inc. hereby declares this device is in compliance with all the applicable Directives 2002/95/EC, 2002/96/EC. This device is considered a passive EM device and is thereby excluded from the scope of the EMC directive (89/336/EEC) and Low Voltage Directive 73/23/EEC.

## ONE YEAR LIMITED WARRANTY

Winland Electronics, Inc. ("Winland") warrants to the end user/purchaser that each product of its manufacture shall be free from defects in material and factory workmanship for a period of one year from the date of purchase, when properly installed and operated under normal conditions according to Winland's instruction. Winland's obligation under this warranty is limited to correcting, without charge, at its factory any part or parts thereof which shall be returned to the factory, by the original purchaser, transportation charges prepaid, within one year of the date of purchase and which upon examination, shall disclose to Winland's satisfaction to have been originally defective. Correction of such defects by repair to, or supplying replacements for, defective parts shall constitute fulfillment of all Winland's obligations to purchaser under this limited warranty. Repair service performed by Winland after one year from date of purchase will be for a reasonable service charge. This limited warranty shall not apply to any of Winland's products which have been subject to misuse, negligence or accident or which have been repaired or altered outside of Winland's factory. The warranty is void if the Product's housing or cover is removed. Winland shall not be liable for loss, damage or expense resulting, directly or indirectly, from the use of its products or any other cause. This warranty shall be null and void in its entirety if: (i) the product is altered or modified in any way that is not consistent with the manufacturer's instructions, or (ii) the product is used with or connected to a device: (a) that such product is not intended to be used with or connected to, (b) is not otherwise consistent with the manufacturer's instructions, or (c) is not otherwise approved by the manufacturer. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSES, NON-INFRINGEMENT AND TITLE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, USAGE OF TRADE OR OTHERWISE. ALL OTHER REPRESENTATIONS MADE TO THE END USER/PURCHASER BY ANY OTHER PARTY ARE ALSO EXCLUDED. WINLAND SHALL NOT BE LIABLE TO ANY PERSON FOR INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY DESCRIPTION, WHETHER ARISING OUT OF WARRANTY OR OTHER CONTRACT, NEGLIGENCE OR OTHER TORT, OR OTHERWISE. Under no circumstances shall Winland's liability under this limited warranty exceed the purchase price paid by the end user/purchaser for the product. No person, agent or dealer is authorized to give warranties on behalf of Winland nor to assume for Winland any other liability in connection with any of its products.



**WINLAND  
ELECTRONICS, INC.**

# WATERBUG®

Electronic Water Detection Device



**WB-200**

## CONTENTS

This package contains:

- 1 WB-200
- 1 Surface Probe - Unsupervised (W-S-U)
- 1 Installation/Operating Instructions Guide

## SPECIFICATIONS

Power Requirement	8-28 VDC @ 35mA 8-28 VAC @ 100mA
Sensitivity	Will not alarm due to high humidity or condensation.
Operating Temp	32° to 130° F (0° to 54° C); non-condensing environment (indoor use only)
Output	1 Form C Relay (N.O./N.C.) 1 Amp @ 30 VDC, resistive 1 Amp @ 24 VAC, resistive
Probe Options	Includes 1 Standard Unsupervised Surface Probe (W-S-U) Accepts up to 6 Unsupervised Surface Probes (W-S-U) wired in parallel or Accepts up to 6 Unsupervised Under Carpet Probes (W-UC-U) wired in parallel.
Max Cable Length	1-2 probes; max recommended distance of 200' (61 m) 3-6 probes; max recommended distance of 100' (30.5 m)
Probe Cable	Probes include 15' (4.6 m) cable. Extend using 22-18 AWG twisted pair.
Console Weight	2.4 oz (0.07 kg)
Console Dimensions	4.1 x 2.36 x 1.18" (10 x 6 x 3 cm) with flanges
Probe Dimensions	Surface: 2 x 3 x 0.88" (5.1 x 7.6 x 2.2 cm) Under Carpet: 2 x 3 x 0.18" (5.1 x 7.6 x 0.5 cm)
Mounting	Flanges
Case Material	ABS
Warranty	1 Year Limited

Tech Support 8:00am - 5:00pm Central Time  
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[www.winland.com](http://www.winland.com)



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D-011-0116 Rev C (08/2012)

## INTRODUCTION

Thank you for your purchase of the Winland WaterBug® model WB-200. The WB-200 is completely electronic and is designed to detect water only (distilled and deionized water cannot be detected). The WB-200 is not a self contained warning device. For proper operation, it must be used in conjunction with an alarm system, sounder, etc. It is designed so that the control console mounts on a wall or other flat vertical surface and the remote probes are placed in the locations where water leakage is most probable. Up to six remote probes may be connected to one control console. A film of moisture forming a bridge between the two metallic contacts on any remote probe is all that is needed for the unit to signal an alarm condition. The output on the WB-200 is non-latching, but will remain in alarm state until the moisture bridge is broken. As sensitive as the WB-200 is, it will not alarm due to high humidity or condensation. The WB-200 is ideal for use in homes, offices, computer rooms, warehouses, etc.

## INSTALLATION

Locate the area where the WB-200 console is to be mounted. Using the WB-200 as a guide, mark the two locations on the mounting surface where the holes will be drilled in order to use the case's mounting flanges. If mounting on drywall, use the two provided drywall anchors. Once the holes have been drilled, place the WB-200 against the surface and drive the screws into the holes or anchors.

Multiple probes must be hooked up in parallel to the two "sensor" terminals. The remote surface probes may be mounted securely to the floor or a wall. Mounting the probe(s) to a vertical surface like a wall enables you to monitor an area for rising water levels. This is useful in basement sump pumps and other types of water storage and drainage systems.

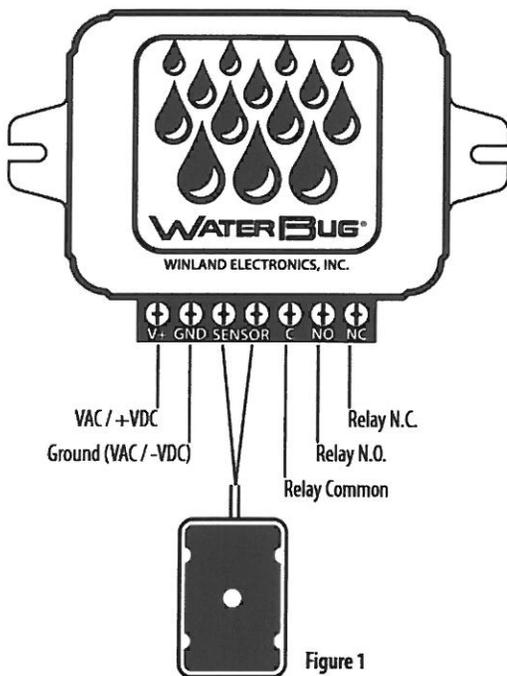


Figure 1

## TERMINAL BLOCK CONNECTIONS

Relay contacts are accessible on the terminal block (See Figure 1). The WB-200 is in normal condition when power is applied and no moisture is being detected. It's in alarm condition when water is detected by any one of the remote probes.

**Note:** When connecting DC power to the WB-200 be sure to observe polarity and test to see if the WB-200 is operating properly. This may be done by forming a water bridge between two of the metallic contacts located on the probe (See Figure 2) with a moistened finger or cloth. If the WB-200 is not operating properly, check the polarity of the power supply connections.

**AC** – Power input wires are interchangeable  
**DC** – Positive to V+ and negative to Ground

## TEST PROCEDURES

To test the WB-200 operational status, form a water bridge between the two metallic contact points (See Figure 2) with a moistened finger or cloth. If working properly, the WB-200 will activate the warning device to which it is connected within approximately three seconds. The WB-200 will reset automatically when the probe dries and there is no longer a water bridge between the two metallic contact points.

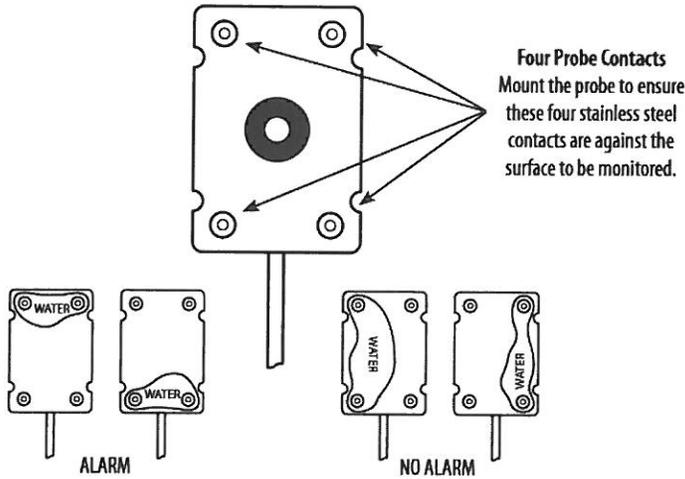


Figure 2

## STANDARD SURFACE PROBE UNSUPERVISED

If a remote probe is to be bolted down in a permanent installation, drill only in the innermost center recessed area (See Figure 3). Drilling anywhere other than the innermost circle may damage the internal wiring causing the WB-200 to fail.

Drill only in the innermost area.

## MONITORING FOR THE ABSENCE OF WATER

The WB-200 can be used to monitor for the absence of water (water level).

This is done by:

- 1 - mounting the probe at the desired minimum waterline and;
- 2 - using the opposite set of relay contacts that you would use if you were detecting the presence of water.

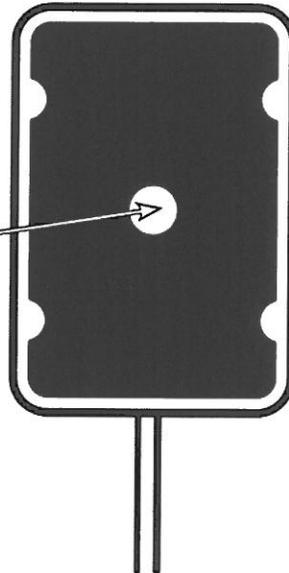


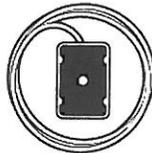
Figure 3

To insure proper operation, test weekly.

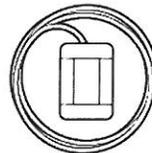
Concrete can be semi-conductive. If experiencing false alarms, insulate all probes mounted on concrete.

## ADDITIONAL PROBES

Multiple probes must be connected in parallel to the two "sensor" terminals. The WB-200 accepts up to 6 probes wired per console.



**W-S-U**  
Water Probe - Surface  
Unsupervised



**W-UC-U**  
Water Probe - Under Carpet  
Unsupervised

### WEEE Product Recovery/Recycling for EU Customers

In an effort to improve waste management in the European Union, the European Union has enacted directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE Directive). According to the WEEE Directive, Winland Electronics must take back waste electrical or electronic equipment covered under the WEEE Directive, at its cost, for all product it puts on the market after July 1, 2006. The Return Process: Contact Winland via our web site at [www.winland.com](http://www.winland.com).



Radio Frequency Interference Requirements: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



CE Marking and European Union Compliance: Products intended for sale within the European Union are marked with the CE Mark, which indicates compliance to applicable Directives and European Norms (EN). Amendments to these Directives or ENs are included: Electromagnetic Compatibility Directive 2004/108/EC; Low Voltage Directive 2006/95/EC; RoHS Directive 2002/95/EC; WEEE Directive 2002/96/EC.

Statement of Compliance: Winland Electronics, Inc. hereby declares that this device is in compliance with all the applicable Directives 2004/108/EC, 2006/95/EC, 2002/95/EC, 2002/96/EC.

### Symbols on the Product or Manual Labeling



For product disposal, ensure the following:

- Do not dispose of this product as unsorted municipal waste.
- Collect this product separately.
- Use collection and return systems available to you.



WEEE Waste Electrical and Electronic Equipment  
RoHS Restriction of Hazardous Substances

## ONE YEAR LIMITED WARRANTY

Winland Electronics, Inc. ("Winland") warrants to the end user/purchaser that each product of its manufacture shall be free from defects in material and factory workmanship for a period of one year from the date of purchase, when properly installed and operated under normal conditions according to Winland's instruction. Winland's obligation under this warranty is limited to correcting, without charge, at its factory any part or parts thereof which shall be returned to the factory, by the original purchaser, transportation charges prepaid, within one year of the date of purchase and which upon examination, shall disclose to Winland's satisfaction to have been originally defective. Correction of such defects by repair to, or supplying replacements for, defective parts shall constitute fulfillment of all Winland's obligations to purchaser under this limited warranty. Repair service performed by Winland after one year from date of purchase will be for a reasonable service charge. This limited warranty shall not apply to any of Winland's products which have been subject to misuse, negligence or accident or which have been repaired or altered outside of Winland's factory. The warranty is void if the Product's housing or cover is removed. Winland shall not be liable for loss, damage or expense resulting, directly or indirectly, from the use of its products or any other cause. This warranty shall be null and void in its entirety if: (i) the product is altered or modified in any way that is not consistent with the manufacturer's instructions, or (ii) the product is used with or connected to a device: (a) that such product is not intended to be used with or connected to, (b) is not otherwise consistent with the manufacturer's instructions, or (c) is not otherwise approved by the manufacturer. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSES, NON-INFRINGEMENT AND TITLE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, USAGE OF TRADE OR OTHERWISE. ALL OTHER REPRESENTATIONS MADE TO THE END USER/PURCHASER BY ANY OTHER PARTY ARE ALSO EXCLUDED. WINLAND SHALL NOT BE LIABLE TO ANY PERSON FOR INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY DESCRIPTION, WHETHER ARISING OUT OF WARRANTY OR OTHER CONTRACT, NEGLIGENCE OR OTHER TORT, OR OTHERWISE. Under no circumstances shall Winland's liability under this limited warranty exceed the purchase price paid by the end user/purchaser for the product. No person, agent or dealer is authorized to give warranties on behalf of Winland nor to assume for Winland any other liability in connection with any of its products.



**RES**

**REMEDIATION EQUIPMENT & SERVICES**

155 Railroad Plaza, Suite A

Royersford, PA 19468

E-Mail: [gary.sheridan@remediationequip.com](mailto:gary.sheridan@remediationequip.com)

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**VACMASTERS SYSTEM 4000**

*The World's Most Powerful Air-Vacuum Excavation System.*



**OPERATIONAL DATA**

**Vacuum:** 1000 cfm, 15" Hg, 4" hose

**Compressor:** 300 cfm @ 220 psi (Air Lance)

300 cfm @ 100 psi (Air Tools)

**High-Pressure Water:** 0-3000 psi @ 3 gpm

**Low-Pressure Water:** 0-1000 psi for clean-up

**DIMENSIONS and WEIGHTS**

**Length:** 27' 4"

**Width:** 8' 0"

**Height:** 10' 10"

**GVW:** 25,950

**Empty Wt. (lbs.):** 22,150 (standard configuration)

**TANK CAPACITIES**

450-Gallon Spoils Tank with Hydraulic Hoist

85-Gallon Water Tank

**OPERATOR CONTROL PANEL INSTRUMENTATION**

Fully Supervised, Automatic Shut-Down

Engine RPM, temperature, oil pressure

Compressor air pressure, temperature

**HOSES**

(2) 33' lengths of 4" Smooth-Bore Vacuum Hose

50' of 1" High-Pressure Air Hose for air lance

50' of 3/4" Air Hose for air tools

50' of 3/8" High-Pressure Water Hose

**Contact Us for Price and Availability**

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**610-792-3434**

Building Temperature Transmitter



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Series 650 Temperature Transmitter

4-20 mA Signal, Two Wire Operation, Temperatures from -55 to 180°C



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Product Introduction

The Series 650 Temperature Transmitter combines low cost with small size making it ideal for a wide variety of HVAC, industrial and commercial multi-point temperature monitoring applications. Non-polarized terminals simplify connection to any 12-35 VDC power supply. Capable of operation with long cable runs, Series 650 Transmitters are well suited for monitoring air or water temperatures at remote locations. Three models in popular ranges factory calibrated within 0.3% of span. All are linear within 0.25% of span and may be recalibrated within low range and span limits shown on Catalog page. Low range is temperature corresponding to 4 mA output. Span is temperature difference between Low and High ranges corresponding to 4-20 mA output signal.

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# PIG® Build-A-Berm® Barrier Straight Section

#PLR276 - 9" x 5' x 6" • 2 each



Build a permanent barrier around your machinery or storage areas with our crush-resistant spill berms.

- PIG Build-A-Berm Barriers can be constructed into a semi-permanent, high-visibility barrier that's exactly the size and shape you need - indoors or out
- Pliable open-cell foam barrier springs back into shape after you walk or roll over it with light, wheeled equipment
- Durable, 18-oz. all-vinyl covering resists oils, coolants and most chemicals
- Cut to length with utility knife and secure to floor with Sili-Thane sealant (PTY340), then seal seams with Industrial-Strength Vinyl Cement (PTY105)
- Contain leaks and spills around your machinery without building expensive cement curbs or cutting and installing angle iron
- High-visibility yellow color draws attention to barrier for increased safety
- Easy removal requires only a flat-bladed shovel
- Great for use around battery charging stations, machinery or any other leak-prone areas
- 6"-high barriers are ideal for surrounding high-capacity storage tanks



**New Pig**

By Phone:  
**1-800-HOT-HOGS**

Online:  
**newpig.com**

Email:  
**hothogs@newpig.com**

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ITEM: PLR276 - Pg 1 of 2

## PLR276 Specifications

<b>Style:</b>	Walk-on
<b>Color:</b>	Yellow
<b>Dimensions:</b>	9" W x 5' L x 6" H
<b>Intended For:</b>	Smooth Surface
<b>Temperature Limit:</b>	-22 °F to 160 °F
<b>Sold as:</b>	2 per box
<b>Weight:</b>	9 lbs.
<b>New Pig Patent:</b>	5,820,297
<b># per Pallet:</b>	28
<b>Composition:</b>	18 oz. Vinyl-Coated Fabric w/ a Closed Cell Polyethylene Foam Core
<b>UNSPSC:</b>	20122806

## PLR276 Metric Equivalent

<b>Dimensions:</b>	22.9cm W x 152.4cm L x 15.2cm H
<b>Weight:</b>	4.1 kg

## Technical Information

### Warnings & Restrictions:

There are no known warnings and restrictions for this product.

### Regulations and Compliance:

40 CFR 264.175 - Hazardous waste containment systems must be free of structural cracks or gaps, be designed to keep spilled liquids from remaining in contact with the container, prevent run-on and "have sufficient capacity to contain 10% of the volume of the containers, or the volume of the largest container, whichever is greater."

40 CFR 122.26 - When applying for a National Pollutant Discharge Elimination System (NPDES) permit, facilities must have a plan in place that describes actions, procedures, control techniques, management practices and equipment available to prevent illegal discharge of pollutants into waterways.

40 CFR 112.7 - SPCC planning requirements state that facilities subject to these regulations must have written plans in place discussing the products, countermeasures and procedures that are in place, or will be taken by the facility to prevent discharge of oil into waters of the United States.

### Technical Documents:

(Available at [newpig.com](http://newpig.com))

Product Data Sheet (PDS)

Chemical Compatibility (CCG)



## PLR276 Accessories

### You'll also need...



PIG® Build-A-Berm® Barrier Corner

### Item Number

PLR277



Industrial-Strength Vinyl Cement

PTY105



Sill-Thane(TM) 803 Sealant

PTY340



By Phone:  
**1-800-HOT-HOGS**

Online:  
[newpig.com](http://newpig.com)

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[hothogs@newpig.com](mailto:hothogs@newpig.com)

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AIR STRIPPERS/VOC REMOVAL

**E-Z Stacker® Low Profile Air Stripper**

Stackable high-efficiency air stripper for VOC removal.

Overview How it Works Specifications **Modeler**

Cylindrical Low Profile VOC Air Stripper Specifications

Model	Flow (gpm/Lpm)	Dry Weight (lb/Kg)	Operation Weight (lb/Kg)	Shell Dimensions (in/cm)	No. Trays and Weight (lb/Kg)	Active Area (sq. ft/m <sup>2</sup> )	Nominal airflow (cfm/m <sup>3</sup> /min)	Drawings
<b>EZ-2.4P</b>	1-25 gpm (4-94.6 Lpm)	103 lb (46.72 Kg)	483 lb (219 Kg)	27 x 83 in (68.6 x 210.8 cm)	4 x 16 lb (4 x 7.3 Kg)	2.6 sq. ft (0.24 m <sup>2</sup> )	140 cfm (3.96 m <sup>3</sup> /min)	
<b>EZ-2.6P</b>	1-25 gpm (4-94.6 Lpm)	135 lb (61.3 Kg)	531 lb (240.9 Kg)	27 x 103 in (68.6 x 261.6 cm)	6 x 16 lb (6 x 7.3 Kg)	2.6 sq. ft (0.24 m <sup>2</sup> )	140 cfm (3.96 m <sup>3</sup> /min)	
<b>EZ-4.4P</b>	1-40 gpm (4-151.4 Lpm)	155 lb (70.3 Kg)	1,004 lb (455.4 Kg)	37 x 83 in (94.0 x 210.8 cm)	4 x 24 lb (4 x 10.9 Kg)	5.8 sq. ft (0.54 m <sup>2</sup> )	280 cfm (7.93 m <sup>3</sup> /min)	
<b>EZ-4.6P</b>	1-40 gpm (4-151.4 Lpm)	203 lb (92.1 Kg)	1,134 lb (514.4 Kg)	37 x 102 in (94.0 x 259.1 cm)	6 x 24 lb (6 x 10.9 Kg)	5.8 sq. ft (0.54 m <sup>2</sup> )	280 cfm (7.93 m <sup>3</sup> /min)	

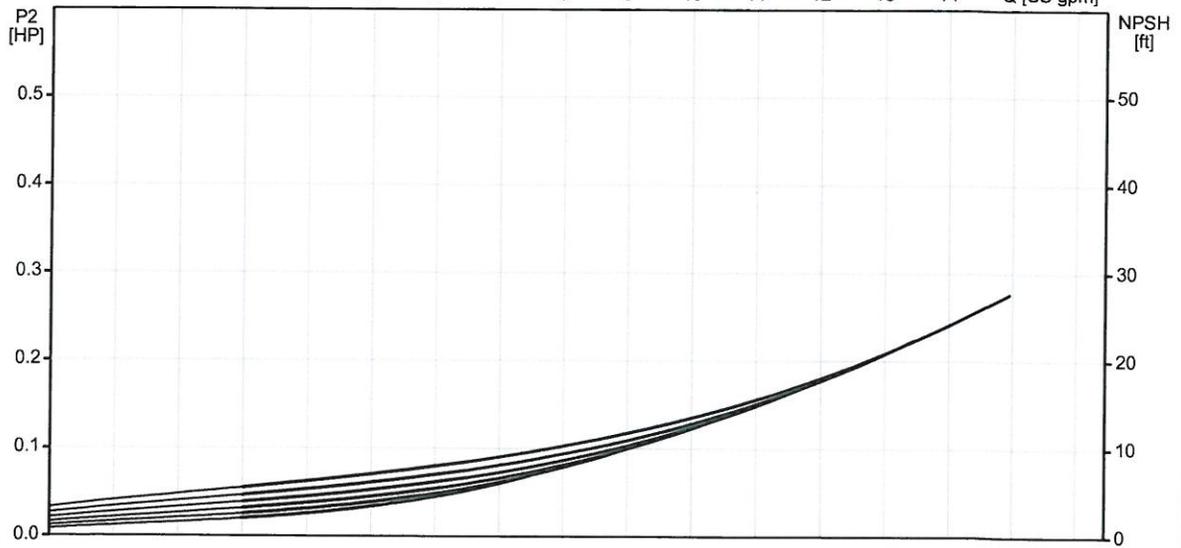
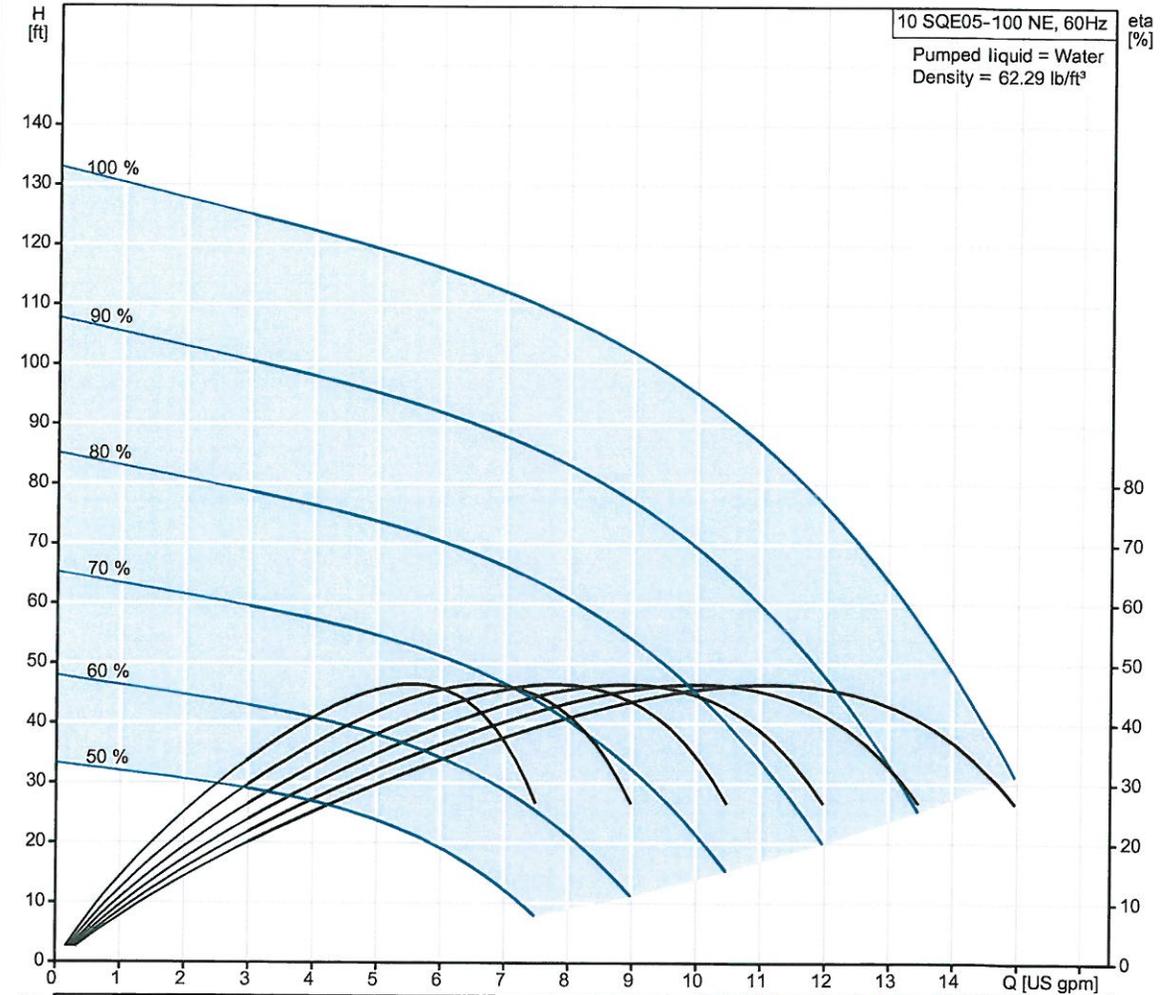
\* skid mounted

<b>Materials of construction:</b>	<b>Trays, sump, cover, internals</b>	<b>HDPE</b>
	Piping	CPVC
	Skid	Epoxy coated mild steel
	Demister	Polypropylene
<b>Blower Options:</b>	208-230/460 Volt,	3 Phase, TEFC, 3.5HP
	115/208-230 Volt,	1 Phase, TEFC, 2.5HP
	208-230/460 Volt,	3 Phase, EXP, 4HP
	230 Volt,	1 Phase, EXP 3HP
	All blowers supplied with blower piping and flow throttle	
<b>Sound Rating:</b>	70dB at 10', 74dB at 3' with 230V/1/TEFC blower and two 1/2HP transfer pumps operating	
<b>Stripper Options:</b>	Air flow meter	Sump low pressure switch
	Sump high level switch	Sump high pressure switch
	Stack support kit	Discharge pump level controls
(U.S. Patent Number 5,518,668)		

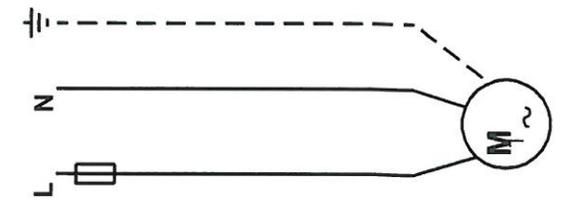
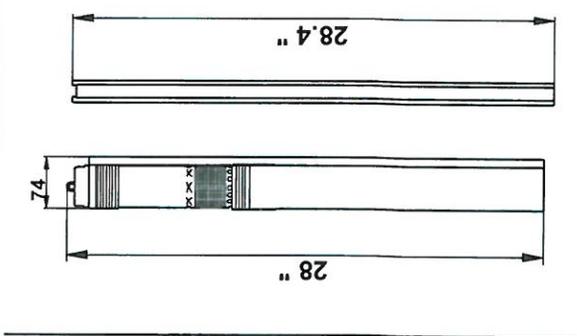
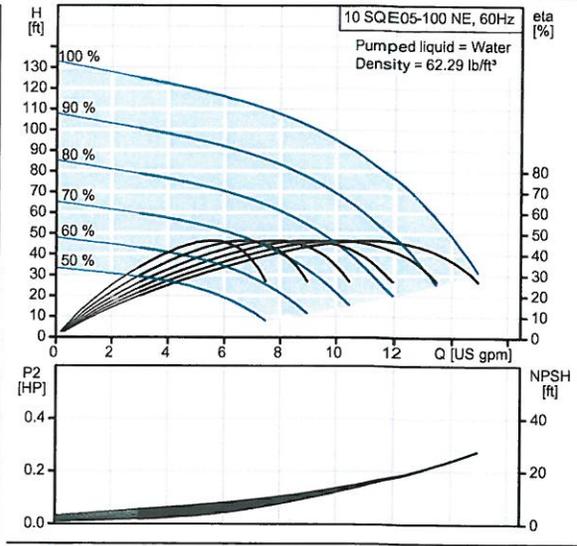
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A **TestAmerica** Company

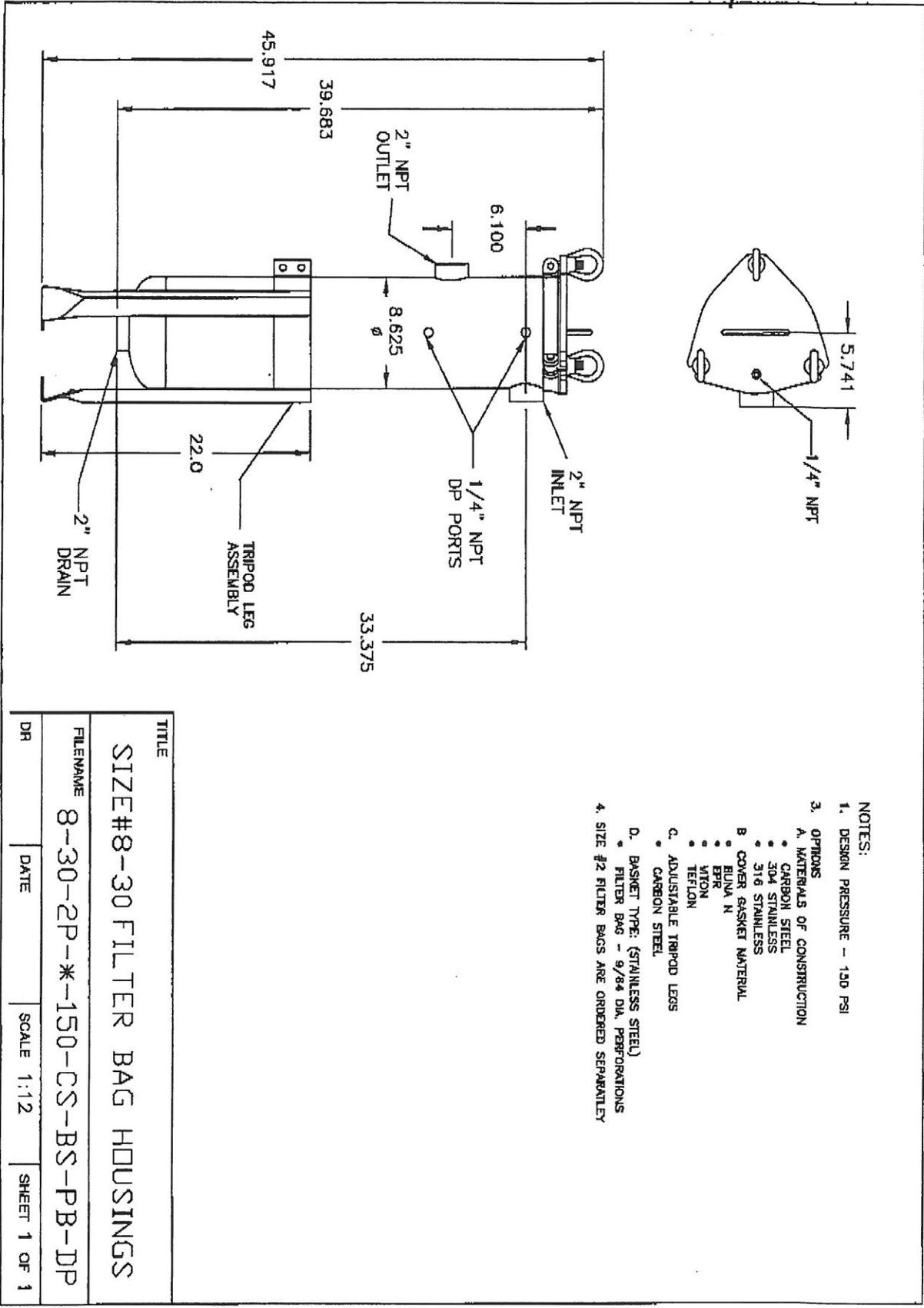
## 97778421 10 SQE05-100 NE 60 Hz



Description	Value
<b>Product name:</b>	10 SQE05-100 NE
<b>Product Number:</b>	97778421
<b>EAN number:</b>	5710624313657
<b>Technical:</b>	
Speed for pump data:	10700 rpm
Rated flow:	8.81 US gpm
Rated head:	102 ft
Approvals on motor nameplate:	CE,UL,CUL
Curve tolerance:	ISO 9906:1999 Annex A
Pump Number:	96397442
Stages:	2
Valve:	pump with built-in non-return valve
<b>Materials:</b>	
Pump:	PVDF / Stainless steel DIN W.-Nr. 1.4401
Impeller:	PVDF
Motor:	Stainless steel DIN W.-Nr. 1.4401 AISI 316
<b>Installation:</b>	
Pump outlet:	NPT 1 1/4
Minimum borehole diameter:	2.99 in
<b>Liquid:</b>	
Maximum liquid temperature:	95 °F
Max liquid temperature at 0.15 m/sec:	95 °F
Density:	62.29 lb/ft³
<b>Electrical data:</b>	
Motor type:	MSE3-NE
Power input - P1:	1.02 kW
Rated power - P2:	0.939 HP
Main frequency:	60 Hz
Rated voltage:	1 x 200-240 V
Start. method:	direct-on-line
Service factor:	1,85
Rated current:	5.2 A
Power factor:	1,00
Rated speed:	10700 rpm
Enclosure class (IEC 34-5):	IP58
Insulation class (IEC 85):	F
Motor protection:	Y
Thermal protec:	internal
Motor Number:	96160547
<b>Controls:</b>	
CU 300/CU 301:	communication with CU 300/CU 301 possible
<b>Others:</b>	
Gross weight:	11 lb
Sales region:	N-amreg



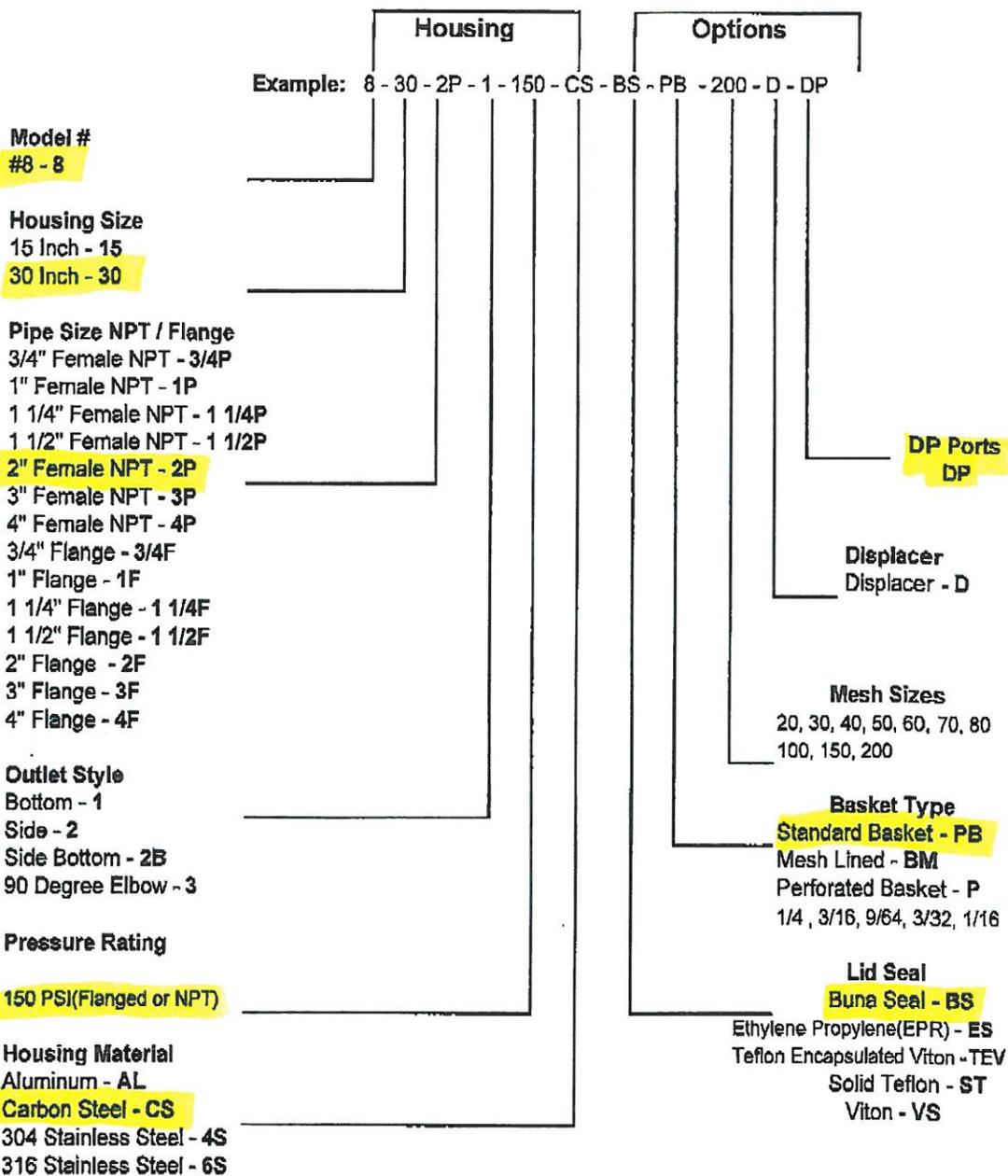
ATTN: GARY SHERRIDAN



- NOTES:
- DESIGN PRESSURE - 150 PSI
  - OPTIONS
    - A. MATERIALS OF CONSTRUCTION
      - CARBON STEEL
      - 304 STAINLESS
      - 316 STAINLESS
    - B. COVER GASKET MATERIAL
      - BUNA N
      - EPDM
      - NITON
      - TEFLON
    - C. ADJUSTABLE TRIPPOD LEGS
      - CARBON STEEL
    - D. GASKET TYPE: (STAINLESS STEEL)
      - FILTER BAG - 9/8" DIA. PERFORATIONS
  - SIZE #2 FILTER BAGS ARE ORDERED SEPARATELY

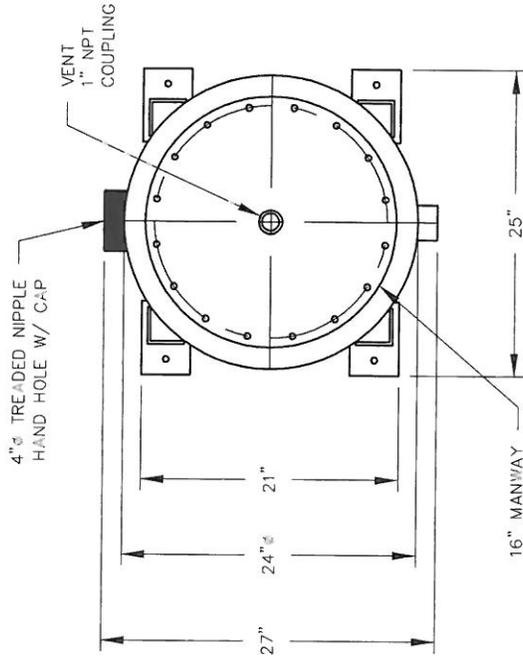
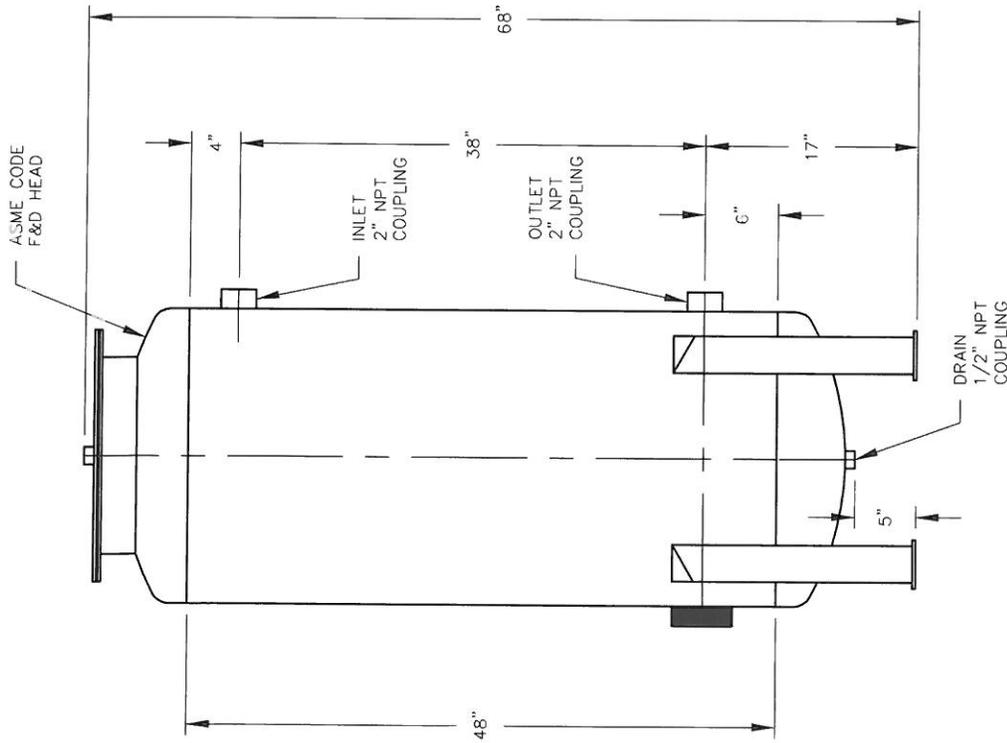
TITLE			
SIZE#8-30 FILTER BAG HOUSINGS			
FILENAME			
8-30-2P-*150-CS-BS-PB-DP			
DR	DATE	SCALE	SHEET 1 OF 1
		1:12	

## How to Order a Filter Bag Housing



- \* Carbon Steel & Stainless Housing only available with Eye Bolt Covers
- \* Aluminum Housings only available with Standard Covers
- \* All Filter Bag Housings come with Carbon Steel Legs & Standard 304 SS Basket
- \* 304 Stainless & 316 Stainless Legs are available & 316 SS Baskets are available

Revised 11/9/11

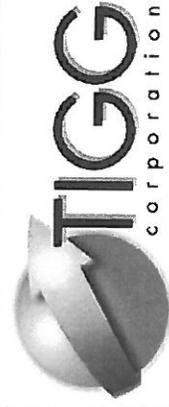


NOTES:  
 \* 5/8" THICK MATCH DRILL HOLES TO FRAME

## VESSEL STANDARDS

VESSEL MATERIALS :	516-70 CARBON STEEL
LINING :	HIGH SOLIDS EPOXY
EXTERIOR PAINT :	ACRYLIC ALKYD ENAMEL
HEAD THICKNESS :	3/16" ASME CODE F & D
SHELL THICKNESS :	3/16"
INTERNALS :	PVC PIPE
ADSORBENT OUTLET ASSEMBLY :	16" MANWAY
MAX. MEDIA FILL :	12.5 FT. <sup>3</sup>
EMPTY WT. :	355 LBS
MAX. OPERATING PRESSURE :	50 PSIG
MAX. OPERATING TEMP. :	130°F

NO.		REVISION		BY	DATE
PROJECT					
EL-200			STANDARD		
<small>THIS DRAWING AND DESIGN ARE THE PROPERTY OF TIGG CORPORATION. NO PART OF THIS DRAWING OR DESIGN IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF TIGG CORPORATION.</small>					
DRAWN BY		JB			
DESIGN BY		BB			
CHKD. BY		BB			
DATE		4/13/06			
SCALE		NTS			
DWG. NO.			EL-200-1001		
REV.			0		



PLAN & ELEVATION



## TIGG ARM

### DESCRIPTION

TIGG ARM is an activated alumina promoted with a proprietary additive. This combination has been engineered for enhanced arsenic removal from water. ARM has arsenic capacities of two to three times greater than unpromoted activated alumina. ARM's capacity for As(III) is about 40% its capacity for As(V). Oxidation is recommended to assist As(III) removal.

TYPICAL PROPERTIES	TIGG ARM
Al <sub>2</sub> O <sub>3</sub> + proprietary additive	75%
Loss on Ignition	25%
Bulk Density (g/cm <sup>3</sup> )	
BET Area (m <sup>2</sup> /g)	280
28 mesh	+5%
48 mesh	-5%

### TYPICAL APPLICATIONS

- Water treatment
- Waste water treatment
- Groundwater treatment

Standard packaging is in 2,000 lbs super bags.

## **RFP Addendum No. 1**

## ADDENDUM NO. 1

### BURGESS BROTHERS SUPERFUND LANDFILL BENNINGTON, VERMONT

#### GROUNDWATER EXTRACTION AND TREATMENT SYSTEM FABRICATION, INSTALLATION, AND START-UP JULY 24, 2013

Modifications to June 28, 2013 Request for Proposal:

Updated remedial design tables and figures are attached, provided to RES on July 18, 2013. The following additional modifications (beyond those provided in the updated tables and figures) were discussed and agreed upon by XDD and RES during a teleconference on July 19, 2013.

##### Extraction well conduits and wiring

1. Conduit layout is revised per the attached drawing.
2. Others will install all conduits from inside well vaults to disconnects at each well, running back to a pull box adjacent to the treatment system building. Others will install pull ropes in the underground conduits.
3. Contractor will pull pump power wiring and control wiring to the Primary extraction wells only.
4. Contractor will also pull electric power to the Primary wells, install outdoor GFCI outlets at each well head (at the pump disconnect) and provide a means for other to connect electric heat trace at the Compliance Boundary extraction well.

##### Piping connections at the treatment building, building modifications

1. Contractor will install PVC sleeves for 1-inch HDPE influent lines and 6-inch PVC effluent line through the treatment building floor to a point 5-feet below grade outside the building where the others can connect the discharge line, and feed the 1-inch HDPE lines inside the building. The trench leading up to the building will be backfilled by others. Backfilling and finishing inside the building will be the responsibility of the contractor.
2. Construct secondary containment berm using New Pig Build-a-Berm, delete PolyStar PolyDike
3. Install two Water-Bug electronic water detection sensors on the treatment building floor, tie into control panel with alarm outputs to signal water on the floor. Delete sump installation and sump float switch.

##### Treatment System

1. Add temperature transmitter to monitor building interior temperature, and initiate alarm at high and low temperature set points
2. Provide Signet magnetic flow meters, delete paddle-wheel flow meters

**Table 5-1**  
**Influent Concentrations and Effluent Requirements - POTW**

Burgess Brothers Superfund Site  
 Bennington, VT

Constituent	Estimated Treatment System Influent Concentration	Proposed Maximum Effluent Concentration	
<b>Volatile Organic Compounds</b>	<b>µg/L (parts per billion)</b>		
Tetrachloroethene (PCE)	3,700	<500	
Trichloroethene (TCE)	760	<2,000	
cis-1,2-Dichloroethene	820		
1,1-Dichloroethene	9.0		
Dichlorodifloromethane	8.0		
Vinyl chloride	190		
<b>Inorganic Constituents</b>	<b>mg/L</b>		
Iron	0.9	No Effluent Limits Required	
Manganese	1.5		
Solids, Total Dissolved (TDS)	243		
<b>Metals</b>	<b>ug/L</b>		
Arsenic	0.374		
Cadmium	0.024		
Chromium (total)	0.317		
Copper	0.596		
Nickel	33.4		
Silver	0.029		
Zinc	1.47		

**Notes:**

The estimated treatment system influent concentration from the collection trenches is based on an extensive database of groundwater analytical results for samples collected from monitoring wells in the area of groundwater extraction. Average concentrations are calculated for each VOC based on groundwater concentrations at multiple monitoring wells along the alignment of each collection trench. Anticipated Flow Range for Treatment Equipment Design = 2 to 10 gpm

Estimated Average Flow = 4.2 gpm (6,000 GPD)

Estimated Maximum Daily Flow = 6.3 gpm (9,000 GPD)

**Table 5-2**  
**Influent Concentrations and Effluent Requirements - Surface Water Discharge**

Burgess Brothers Superfund Site  
 Bennington, VT

Constituent	Estimated Treatment System Influent Concentration	Proposed Maximum Effluent Concentration <sup>(1)</sup>
<b>Volatile Organic Compounds<sup>(2)</sup></b>	<b>µg/L (parts per billion)</b>	
Tetrachloroethene (PCE)	3,700	0.8
Trichloroethene (TCE)	760	2.7
cis-1,2-Dichloroethene <sup>(3)</sup>	820	--
1,1-Dichloroethene	9.0	0.057
Dichlorodifloromethane <sup>(3)</sup>	8.0	--
Vinyl chloride	190	2.0
<b>Inorganic Constituents</b>	<b>mg/L</b>	<b>mg/L</b>
Iron	0.9	1.0
Manganese	1.5	4.1
<b>Metals</b>	<b>ug/L</b>	<b>ug/L</b>
Antimony	0.024	14
Arsenic	0.374	0.018
Copper	0.596	8.0
Lead	<1	1.5
Mercury	<1	0.012
Nickel	33.4	108
Selenium	<1	5.0
Silver	0.029	1.2
Thallium	<1	1.7
Zinc	1.47	58.9

**Notes:**

The estimated treatment system influent concentration from the collection trenches is based on an extensive database of groundwater analytical results for samples collected from monitoring wells in the area of groundwater extraction. Average concentrations are calculated for each VOC based on groundwater concentrations at multiple monitoring wells along the alignment of each collection trench.

(1) Effluent concentrations are based on Performance Levels (PLs) specified in the Record of Decision (ROD)

(2) Only constituents with PLs that were detected in site groundwater at the collection trenches are listed.

(3) PLs not specified in ROD.

Anticipated Flow Range for Treatment Equipment Design = 2 to 10 gpm

Estimated Average Flow = 4.2 gpm (6,000 GPD)

Estimated Maximum Daily Flow = 6.3 gpm (9,000 GPD)

## Table 5-3 Air Discharge Calculations

Burgess Brothers Superfund Site  
Bennington, VT

Constituent	Influent Concentration for Treatment <sup>(1)</sup> µg/L	Maximum Groundwater Flow Rate from Formation gpm	Air Discharge Calculations (assuming all VOCs are stripped)		VTDEC Action Level lbs./8-hr	Mass Reduction Required %
			µg/min	lbs./8-hr		
Tetrachloroethene (PCE)	3,700	6.3	88,228	<b>0.0933</b>	0.015	84%
Trichloroethene (TCE)	760	6.3	18,123	0.0192	0.04	
cis-1,2-Dichloroethene (cDCE)	820	6.3	19,553	0.0207	(2)	
Vinyl Chloride (VC)	190	6.3	4,531	0.0048	0.0091	
1,1-Dichloroethene	10	6.3	238	0.0003	1.7	
Dichlorodifluoromethane	10	6.3	238	0.0003	16.6	

### Acronyms and Abbreviations:

VOCs - Volatile Organic Compounds  
 VTDEC - Vermont Department of Environmental Conservation  
 µg/L - micrograms per Liter  
 gpm - gallons per minute  
 µg/min - micrograms per minute  
 lbs./8-hr - pounds per 8 hours  
 % - percent

**0.0933** - Exceeds VTDEC Action Level

### General Notes:

- (1) See Table 5-1 for explanation of calculated influent concentrations.  
 (2) No action level specified in VTDEC Air Pollution Control Regulations.

**Table 5-4**  
**Treatment System Equipment Specifications**  
 Burgess Brothers Superfund Site  
 Bennington, VT

Item/Part	Description	Specification
<b>Selected Items</b>		
AS	Air Stripper	EZ-Stacker 2.4P with 4-trays, 140 SCFM blower, GL NPE 1/2 HP Transfer (T201), Discharge Pump (D301), Air Pressure Switch (PS301), High Liquid Level Switch(WL301) and associated gauges.
PLC	Programmable Logic Control	ProControl Series Type A (or approved equivalent) with a minimum of - Digital inputs - 9; Digital outputs - 9; Analog inputs - 17; Analog outputs - 6
EQ	Equalization Tank	Den Hartog Industries, Inc. 1,300 gallon 15 degree bottom tank(CB1300-90) with stand (CB090-15ST)
VGAC	Vapor-Phase Carbon Vessels	Siemens VSC-1000 Granulated Activated Carbon Units (onsite)
E-001 and E-002	Extraction Pumps	Grundfos 10SQE05-100NE 60 Hz
<b>Adjustable Items</b>		
FTS101, 102	Flow Transmitter 1.0"	GF Signet Model 2537 or 2551or equivalent
FTS201	Flow Transmitter 1.5"	GF Signet Model 2537 or 2551or equivalent
FTS301	Flow Transmitter 1.5"	GF Signet Model 2537 or 2551or equivalent
PT101, 102, 201, 202, 301, 401, 402	Pressure Transmitter	Cole-Palmer Model S-68075-46 or equivalent
WL001, WL002	Pressure Transducer	KPSI model KPSI 700 or equivalent
WL003, WL004	Liquid Level Control	Gems Sensors Warrick Series 16M Submersible Pump Control
WL101	Pressure Transducer	KPSI model KPSI 700 or equivalent
WL102	Water Level Switch	Whitman Controls L60-020-R2-02-NO or equivalent
TT101 and TT301	Temperature Transmitter	Omega TX91A-J2 Temperature Transmitter or equivalent
S101 and S102	Particulate Separator/Strainer	Caleffi Model 54206A Separator or equivalent
F201 through F204	Particulate/Bag Filters	Siemens FBHFLT4201 or equivalent
CC	Carbon Canister	Cameron Model VC16-50 or equivalent
LGAC	Liquid-Phase Carbon Units	Siemens Aqua Scrub 200 or equivalent
AA	Liquid-Phase Arsenic Removal	Carbonair PC 3F Vessel with Activated Alumina or equivalent

SCFM = Standard cubic feet

psi = pounds per square inch

°F = degrees Fahrenheit

**General Notes:**

1. All equipment (i.e., process monitoring devices) to be configured with all manufacturer required specifications.
2. Refer to Figures 5-4 and 5-5 for the piping and instrumentation diagrams.
3. All wetted components will be rated for use with chlorinated solvents.

**Table 5-5**  
**General Specifications - Instrumentation, Valves and Sensors**

Burgess Brothers Superfund Site  
 Bennington, VT

Item/Part	Description	Specification
SV201	Solenoid Valve, 1.5"	Schedule 80 PVC. Solenoid Valve -Normally closed
SV301	Solenoid Valve, 1.5"	Schedule 80 PVC. Solenoid Valve -Normally closed
SV302	Solenoid Valve, 1.5"	Schedule 80 PVC. Solenoid Valve -Normally open
VI101	Vacuum Indicator	U-tube Manometer or other visual/flow indicator with flow control valve
FTS401	Flow Transmitter 4.0"	Air Flow Totalizer/Meter range 0.0 to 150 SCFM
Panel	Control Panel	With appropriate number of switches, control relays, electrical hook up, alarm strobe light, etc.
MS	Moisture Separator	Effluent Discharge Air Moisture Separator with Auto-Drain
VCC	Vapor Carbon Canister	Provide carbon absorption for vent vapors from equalization tank.
VV	Venturi Valve	Provide orifice to vent EQ tank vapor to discharge stack.
S	Sample Port	Sch. 80 Lab Cock Valve
BV	Ball Valves	Sch. 80 Double Union Ball Valve
CV	Check Valves	Sch. 80 Double Union Check Valve

SCFM = Standard cubic feet

psi = pounds per square inch

°F = degrees Fahrenheit

**General Notes:**

1. All equipment (i.e., process monitoring devices) to be configured with all manufacturer required specifications.
2. Refer to Figures 5-4 and 5-5 for the piping and instrumentation diagrams.
3. All wetted components will be rated for use with chlorinated solvents.

**Table 5-6**  
**General Specifications - Other**  
 Burgess Brothers Superfund Site  
 Bennington, VT

Item	Action	Notes
<b>General</b>		
Trip hazards	Mark pipes or other obstructions that are a potential trip hazard with high visibility paint or tape.	Most piping will be elevated 1-3 ft. above grade, or will be installed below grade, and will not present a tripping hazard
Shop drawings, schematics	Laminated copies (C or D size as needed) on-site.	Drawings will be posted inside the equipment enclosure for reference
Equipment/site security and access	All control panels and disconnects will have capability to be locked.	Extra keys Specify Copies of all keys will be provided to the engineer.
Fire Extinguishers	Fire Extinguishers will be located both indoors and outdoors and will be of appropriate type and capacity for minor fires	Equipment will be inspected regularly per OM&M manual.
Outdoor area lighting	Area lights provided outside equipment container/building.	
Equipment labels	All equipment, valves, gauges, ports, etc. will be labeled in accordance with the P&ID.	
<b>Treatment Building</b>		
Doors	Two routes in egress (minimum) will be provided.	
Emergency flash light	Mounted battery or rechargeable flash light.	
Emergency lights inside container/building	Emergency lights and glow-in-the-dark egress route outlined on floor.	
Eyewash stations	Eyewash stations will be provided.	
Fire Suppression (Optional)	A fire suppression system can be installed if desired.	if requested.
Building Sump	Located near equalization tank, installed with high level alarm switch.	Will be completed 2-3 ft. square and approximately 2-3 ft. deep with grated cover.
Containment Berm	Located around all wetted piping and equipment.	17.5' x 15' x 1.0' containment berm for liquid capture.
Safety shower (Optional)	Safety shower with reservoir.	if requested. Very low splash potential.
Site telephone	Cellular phones.	A wireless internet connection will be provided for the autodialer/telemetry connection. A full-time hard line for phone is optional.
<b>Equipment</b>		
Battery backup on PC/autodialer	Vendor specified.	Specified in the Construction and Equipment RFP stage.
Cam locks/quick disconnect fittings	Zip-tie fittings (or similar) on all flex hose connections to prevent accidental disconnection.	Zip-ties specified in the Construction and Equipment RFP stage.
External resets for control panels	All control panels must have a reset button accessible on the outside of the panel.	
Grounding	All equipment will be grounded to existing grounding rod.	
Pipe flow direction and labels	All piping will be labeled with contents (groundwater/air), flow direction (arrows); vendor to label.	

**General Notes:**  
 OM&M - Operations, maintenance, and monitoring  
 RFP - Request for proposals

**Table 5-7  
Summary of Input-Output Schedule**

Burgess Brothers Superfund Site  
Bennington, VT

Type	Data	Notes	Description	Function	Logging Schedule
Digital Inputs	Emergency Stop	[1]	Manual emergency stop power interruption (alarm condition)	Shut down entire system and provide alarm notification in the event of interior/exterior emergency stop activation and send alarm notification. Alarm will need to be manually reset, and emergency stop deactivated, before the entire system can restart. Switches located on panel and on outside of building	Event Log
	General Power Failure	[1]	Power failure/interruption (alarm condition)	Shut down entire system and provide alarm notification in the event of power failure/interruption, send alarm notification when power is restored.	Event Log
	WL102-LLHHA		High-high Level in Equalization Tank (alarm condition)	Turn off system if high liquid in equalization tank observed, indicating feed/transfer pump malfunction.	Event Log
	WL103-LLHHA	[1]	Water Level Sensor - Building Sump. Liquid level high alarm (alarm condition)	Measure groundwater level in building sump. Record alarm condition.	Event Log
	WL301-LLHHA		High-high Level in Air Stripper (alarm condition)	Turn off system if high liquid in air stripper sump observed, indicating discharge pump malfunction.	Event Log
	WL501-LLHHA		High-high level alarm in sewer sump (alarm condition)	Turn off system if high liquid in sewer pump station observed, indicating blockage in the force main.	Event Log
	LLH and LLL		Water Level Float Sensor - Air Stripper. Liquid level high, liquid level low.	Monitor water level in air stripper sump to operate discharge pump.	Event Log
	PS301 E-001 through E-002		Low Air Pressure - Air Stripper Blower Sump (alarm condition) Extraction pumps	Turn off system if low pressure reading observed in sump. Record alarm condition. Record flow rates and run time from each of the trenches. Record "on" and "off" events with time stamp.	Event Log Event Log
Digital Outputs	LLH and LLL		Water Level Float Sensor - Air Stripper. Liquid level high, liquid level low.	Monitor water level in air stripper sump to operate discharge pump. Record "on" and "off" events with time stamp.	Event Log
	LLHA - SUMP	[1]	Water Level Sensor - Building Sump. Liquid level high alarm (alarm condition)	Send alarm notification when "high level" is observed in the building sump.	Event Log
	SV201	[1] [2]	Analog solenoid valve	Normally closed solenoid valve. Opened when differential pressure reading at PT201 and PT202 is above set-point. Notification sent. Return to normal position when manually reset at control panel.	Event Log
	SV301	[3]	Analog solenoid valve	Normally closed solenoid valve. Opened when transfer pump T201 turns off/low level in equalization tank observed in order to prevent trying out of air stripper trays. Return to normal condition (closed) after two hours or when groundwater level in equalization tank returns to high level set point and transfer pump, T201, turns on. Record "open" and "close" events with time stamp	Event Log
	SV302	[3]	Analog solenoid valve	Normally open solenoid valve. Closes after five second delay when solenoid SV301 opens to allow for recirculation of groundwater. Return to normal condition (open) after 2 hours or when groundwater level in equalization tank returns to high level set-point and transfer pump, T201, turns on. Record "close" and "open" with time stamps.	Event Log
	E-001 and E-002		Extraction pumps	Turn "off" pump(s) in event of alarm condition. Turn "on" pump(s) with system restart. Record "on" and "off" events with time stamp.	Event Log
	System Alarm Notification		System alarm notification to auto dialer/security system/remote telemetry system	In the event of any system alarm condition, provide alarm notification to autodialer/security system/remote telemetry system. Record events with time stamp.	Event Log
	System Operational Status		System operational status to remote telemetry system	Under normal operating conditions, provide system operation status (on/off) to remote telemetry system.	Continuous Log
Analog Inputs	WL001 to WL002		Water Level Sensors - Sumps	Measure groundwater level in each of the extraction sumps.	Continuous Log
	TT101 and TT301		Analog temperature transmitter	Monitor and record the temperature of inlet and discharge groundwater.	
	WL101		Water Level Sensor - Equalization Tank. Liquid Low Level	Regulate drawdown in equalization tank. Three set-points: Pump on at high, off at low and continuous at mid-level set point. At low set-point, pump will remain off until high level set point is reached, and then pump will turn on.	Flow - Continuous Log Volume Total - Every Hour for a 24 hr. period/calendar day.
	FTS101 and FTS102		Analog flow transmitter	Monitor and record the groundwater instantaneous flow and volume totals from extraction pumps at manifold lines.	
	FTS201		Analog flow transmitter	Monitor and record the groundwater instantaneous flow and volume totals at transfer pump.	
	FTS301		Analog flow transmitter	Monitor and record the groundwater instantaneous flow and volume totals at POTW/surface water discharge line.	Continuous Log
	FTS401		Analog flow transmitter	Monitor and record instantaneous air flow and volume totals at the air discharge stack.	
	PT101 and PT102		Analog pressure transmitter	Monitor and record instantaneous pressure readings from the system inlet manifold.	
	PT201 and PT202		Analog pressure transmitter	Monitor and record instantaneous pressure readings from the system at the particulate filter.	
	PT301		Analog pressure transmitter	Monitoring and record instantaneous any back-pressure from discharge pipe.	
PT401 through PT403		Analog pressure transmitter	Monitor and record differential pressure across the vapor phase carbon vessels.		
Analog Outputs	E-001 and E-002 Control Boxes		Analog control box	Manual setting for each of the extraction pumps.	Event Log
	PT201 and PT202		Analog pressure transmitter	Provide alarm notification when particulate filter needs to be changed - based upon pressure differential calculated by the PLC from pressure reading inputs. Turn on solenoid SV201 to route groundwater through secondary particulate filter.	Event Log
	PT401 through PT403		Analog pressure transmitter	Provide alarm notification when carbon vessel needs to be changed - based upon pressure differential calculated by the PLC from pressure reading inputs.	Event Log

**Design Notes:**

- [1] Reset for all the alarm conditions will be located on the control panel.
- [2] Optional configuration for automatic particulate filter change.
- [3] Optional configuration for recirculation piping. See Figure 5-4.

**General Notes:**

- 1. Refer to Figures 5-4 and 5-5 for the piping and instrumentation diagrams.
- 2. All system controls are to be housed in one or two control panels.
- 3. Continuous logging will occur every minute unless otherwise specified.
- 4. Indicator lights on the control panel shall indicate all alarm conditions.
- 5. All digital/analog inputs/outputs (including alarms) will be recorded with in a personal computer (PC) in the Equipment Building. The logging frequency/interval for the analog inputs/outputs is to be determined.
- 6. The PC will be capable of dial-out and notify operator of all alarm conditions/system shutdown events. The PC will also have remote-log-in capability to monitor in real-time system operation and alarm events.

**Table 5-8  
Summary of Alarm Conditions**

Burgess Brothers Superfund Site  
Bennington, VT

No.	Data	Description	Action
1	Emergency Stop	Manual emergency stop power interruption	Shut down entire system and provide alarm notification in the event of interior/exterior emergency stop activation and send alarm notification. Alarm will need to be manually reset, and emergency stop deactivated, before the entire system can restart. Switches located on panel and on outside of building
2	General Power Failure	Power failure/interruption	Shut down entire system and provide alarm notification in the event of power failure/interruption, send alarm notification when power is restored.
3	WL001-LLHHA	High-high level in Landfill Compliance Boundary Trench	Send alarm notification.
4	WL002-LLHHA	High-high level in Downgradient Trench	Send alarm notification.
5	WL102-LLHHA	High-high Level in Equalization Tank	Turn off system if high liquid in equalization tank observed, indicating feed/transfer pump malfunction.
6	WL103-LLHHA	High-high Level in Building Sump	High water level in building sump. Record alarm condition, send notification, and shut down system.
7	WL301-LLHHA	High-high Level in Air Stripper	Shut down system if high liquid in air stripper sump observed, indicating discharge pump malfunction.
8	WL501-LLHHA	High-high Level in Sewer Pump Station	Shut down system if high liquid in sewer pump station observed, indicating blockage in the force main.
9	FTS-101 and FTS-102	High Flow at Influent Manifold	Send alarm notification when combined flow is greater than 6.25 gpm.
10	FTS-101 and FTS-102	Low Flow at Influent Manifold	Send alarm notification when combined flow is less than 0.6 gpm and individual flow is less than 0.3 gpm.
11	FTS-201	Low Flow at EQ Transfer Pump	If flow reaches 0.0 gpm while pump is on, send notification. If pump remains on with no flow for greater than 30 seconds, shut off pump.
12	FTS-301	Discharge Volume Total	If volume exceeds specified volume in a calendar day/24hr period, send notification.
13	PT101 and PT102	High Pressure at Manifold	Send notification if pressure exceeds 40 psi at manifold line. Shut down system if pressure exceeds alarm set point.
14	PT201 and PT202	Pressure Differential	Send notification if pressure differential exceeds 10.0 psi across the particulate filter. Shut down system if pressure differential exceeds alarm set point.
15	PT301	High Pressure - Discharge Line	Send alarm notification if pressure exceeds 25 psi. If pressure exceeds 30 psi, shut system down.
16	PS301	High/Low Pressure Switch - Air Stripper Sump	Send alarm notification and shut system down if high or low pressure observed in air stripper sump.
17	PT401 and PT402	Pressure Differential	Send notification if pressure differential exceeds a set point across the VGAC vessels.

**General Notes:**

1. Refer to Figures 5-4 and 5-5 for the piping and instrumentation diagrams.
2. All system controls are to be housed in one or two control panels.
3. Continuous logging will occur every minute unless otherwise specified.
4. Indicator lights on the control panel shall indicate all alarm conditions.
5. All digital/analog inputs/outputs (including alarms) will be recorded with in a personal computer (PC) in the Equipment Building. The logging frequency/interval for the analog inputs/outputs is to be determined.
6. The PC will be capable of dial-out and notify operator of all alarm conditions/system shutdown events. The PC will also have remote-log-in capability to monitor in real-time system operation and alarm events.

**Table 5-9**  
**Summary of Program Logic**

Burgess Brothers Superfund Site  
Bennington, VT

No.	Data	Description	Function	Control
1	WL001 and WL002	Water Level Sensors - Collection Trench Extraction Wells	Control extraction well pump flow rates (E-001, E-002).	Within sumps, at high set-point, adjust VFD to run pump at higher flow rate until groundwater level in sump reaches the preferred drawdown level. At the preferred drawdown level (mid/set point), adjust VFD to change the flow rate to maintain drawdown level in sump. If groundwater level goes below the preferred drawdown level to a point above the inlet of the extraction pump, or the "low set point" shut pump off. Pump will remain off until groundwater level reaches the "mid/set point" in the sump.
2	WL003 and WL004	Water Level Sensor Switch - Sumps	Control pump flow "on" and "off" cycle (E-001, E-002).	Within sumps, at high set-point, adjust VFD to run pump at higher flow rate until groundwater level in sump reaches the preferred drawdown level. At the preferred drawdown level (mid/set point), adjust VFD to change the flow rate to maintain drawdown level in sump. If groundwater level goes below the preferred drawdown level to a point above the inlet of the extraction pump, or the "low set point" shut pump off. Pump will remain off until groundwater level reaches the "mid/set point" in the sump.
3	WL101	Water Level Sensor-Equalization Tank	Control Transfer/Feed Pump T201 flow rate and "on" and "off" cycle using PID Loop.	Pump in normal operation until low set-point in equalization tank (as measured by WL101), which turns off transfer pump, T201. Pump T201 remains off until level in equalization tank fills to high set-point (as measured by WL101). Once high set-point is reached, pump T201 turns on and runs in normal operation. Set Points TBD.
4	T201	Groundwater Recirculation	Recirculate discharge water back to air stripper to prevent drying of air stripper trays.	When transfer pump, T201, turns off, open normally closed solenoid valve SV301, after a five second delay, close normally open solenoid valve SV302. Start countdown timer. Run time = 2 hours, after which turn off blower and discharge pump D301, open normally open solenoid valve, SV302, and close normally closed solenoid valve, SV301. System will restart when groundwater level in equalization tank reaches high level and transfer pump, T201, turns on. If during the 2 hour recirculation, the level in the EQ tank reaches the high point, system will return to normal condition (T201 on, blower on, SV302 open, SV301 closed)
5	PT201 and PT202	Particulate Bag Filter	Automatically switch to secondary set of particulate (bag) filters.	When pressure differential between PT201 and PT202 as measured by the PLC exceeds 10 psi, open normally closed solenoid valve SV201 and send notification.

**General Notes:**

1. Refer to Figures 5-4 and 5-5 for the piping and instrumentation diagrams.

**Table 5-10**  
**Electrical Load Summary**  
 Burgess Brothers Superfund Site  
 Bennington, VT

LOAD DESCRIPTION	WATTS	VOLTAGE <sup>[1]</sup>	TOTAL AMPS
<b>Treatment System</b>			
AS Blower	2286	220	10.4
AS Transfer Pump	762	220	3.5
AS Discharge Pump	762	220	3.5
Extraction Pump-Compliance Boundary Trench	254	230	1.1
Extraction Pump-Downgradient Trench	254	230	1.1
Sensors	160	32 VDC	5.0
Pump Station	1524	240V	6.4
Control Panel and Instrumentation	1200	120 VAC, 24 VDC	10.0
<b>Existing Equipment Load</b>			
Building Lights	2400	120 VAC	20
Electrical Outlets	2400	120 VAC	20
Ventilation Fans	2400	120 VAC	20
<b>TOTAL AMPERAGE - 120V</b>			<b>75</b>
<b>TOTAL AMPERAGE - 240V</b>			<b>26</b>
<b>TOTAL AMPERAGE</b>			<b>101</b>

**Acronyms and Abbreviations:**

VAC = voltage alternate current

VDC = voltage direct current

VA = voltage-amps

W = Watts

A = amps

AS = Air Stripper

**General Note:**

[1] Electrical utility service voltage available in the vicinity of the treatment area is suspected to be 240 Volt, single phase, power. Actual system design electrical specifications to be determined.

TREATED AIR TO ATMOSPHERE  
APPROX. 150 SCFM

TREATMENT SYSTEM BUILDING

VAPOR PHASE CARBON UNITS

STRIPPER AIR DISCHARGE

EZ-STACKER 2.4P SHALLOW TRAY AIR STRIPPER

PARTICULATE FILTER (10 MICRON)

EQUALIZATION TANK (1,300 GALLON)

FLOW FROM 6,000 GPD AVG. PUMPS AT 9,000 GPD MAX. GROUNDWATER COLLECTION TRENCHES

TREATED WATER DISCHARGE TO POTW

6,000 GPD AVG. 9,000 GPD MAX.

TEMPORARY HOLDING TANK (DURING START-UP ONLY)

CLEAN AIR INLET

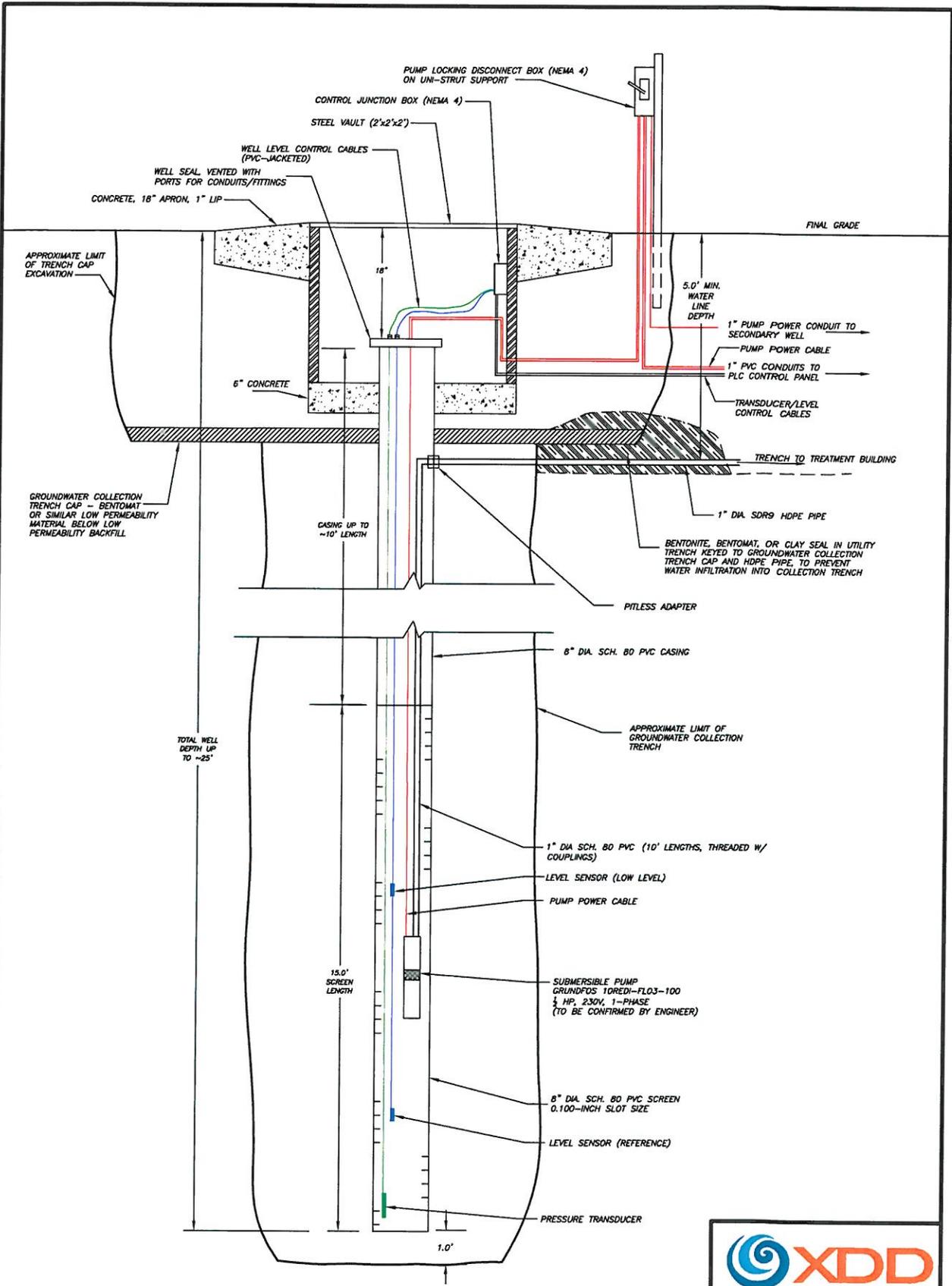
SETTLED SOLIDS/SPENT FILTER CONTAINER (FOR OFF-SITE DISPOSAL)

TEMPORARY HOLDING TANK (DURING START-UP ONLY)



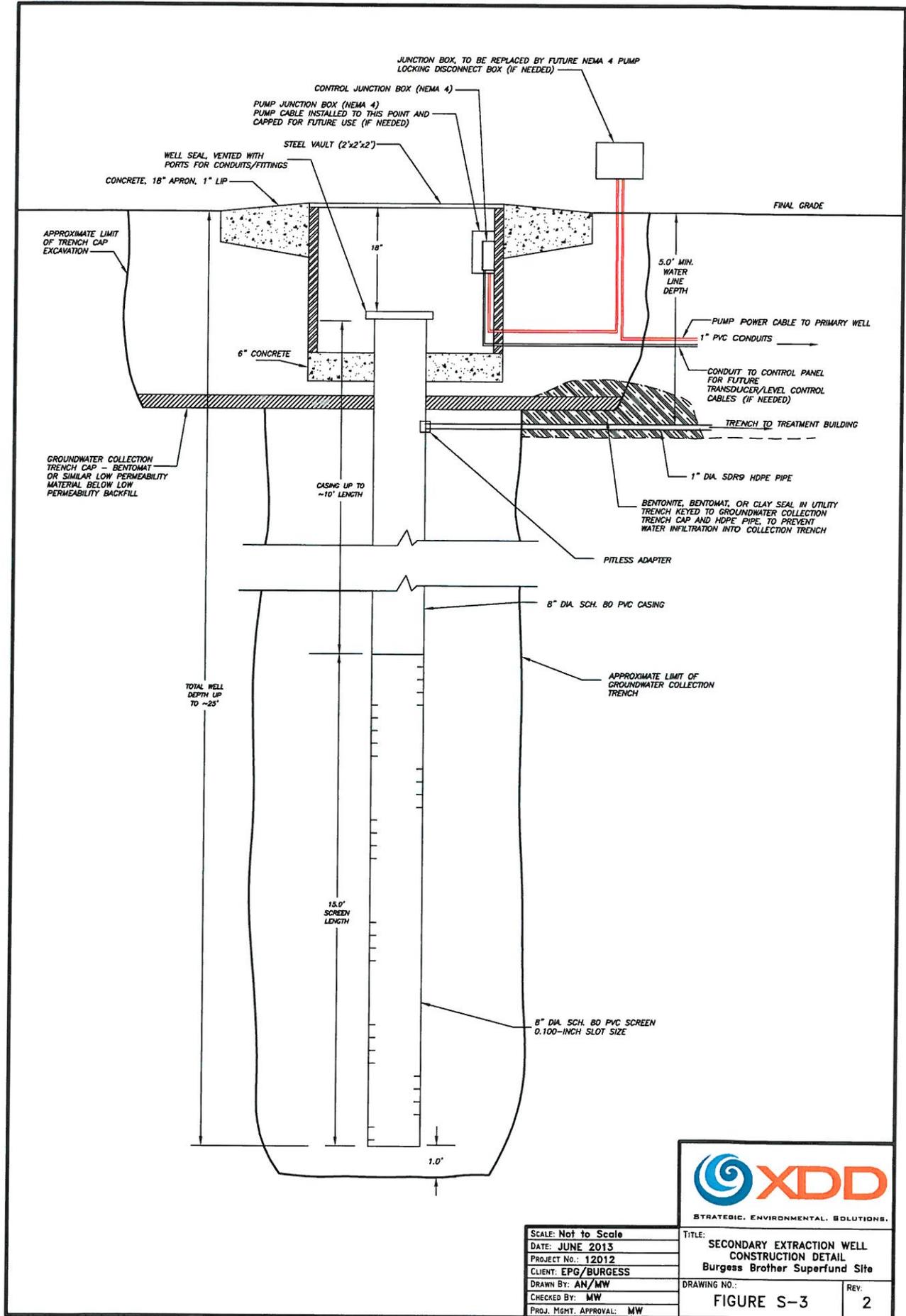
STRATEGIC ENVIRONMENTAL SOLUTIONS.

SCALE: NOT TO SCALE	TITLE: TREATMENT SYSTEM PROCESS DIAGRAM	DRAWING NO.: <b>FIGURE 5-1</b>	REV: <b>2</b>
DATE: JUNE 2013	PROJECT No.: 12012		
CLIENT: ENVIRONMENTAL PARTNERS	Burgess Brother Superfund Site		
DRAWN BY: KB			
CHECKED BY: MW			
PROJ. MGMT. APPROVAL: MW			

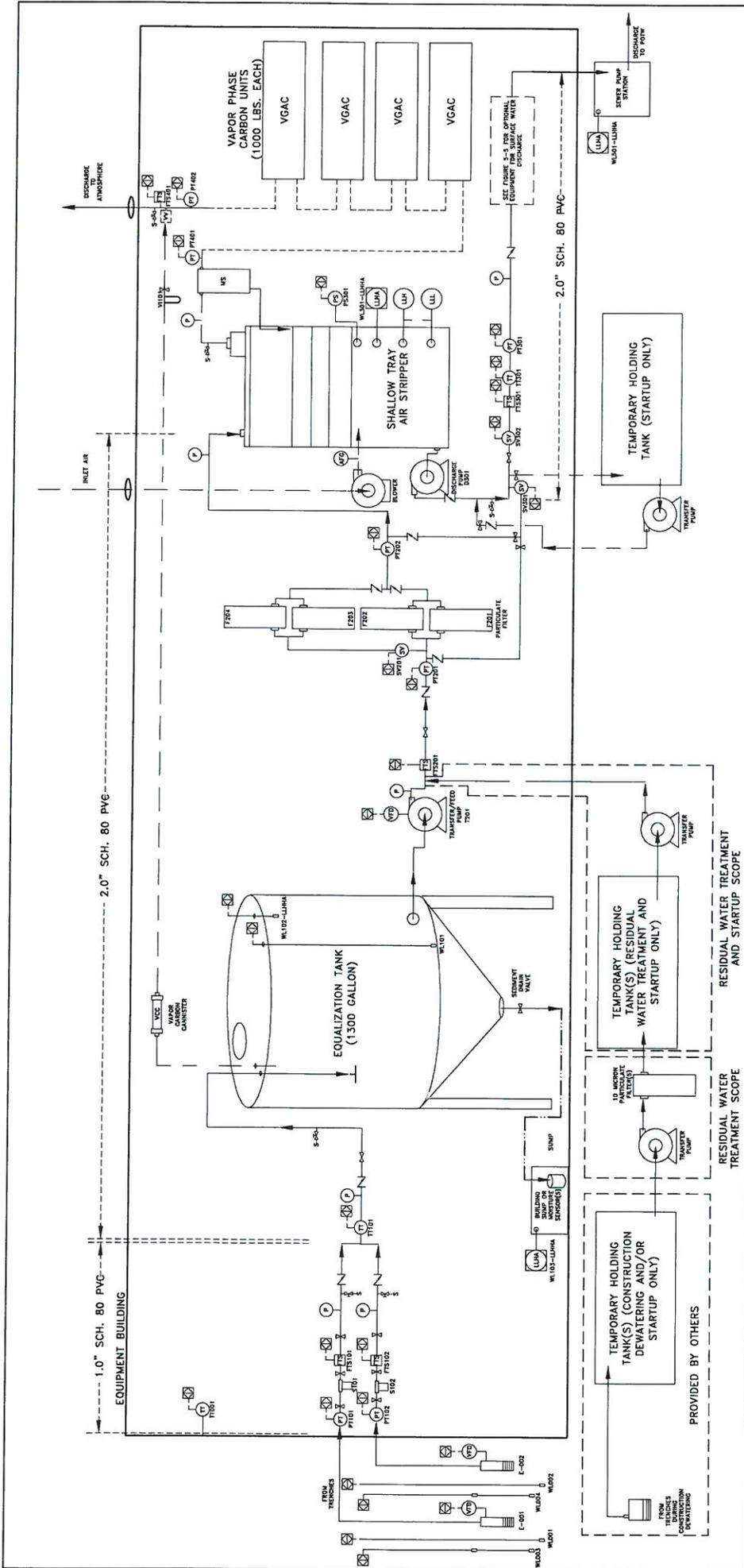


SCALE: Not to Scale
DATE: JUNE 2013
PROJECT No.: 12012
CLIENT: EPC/BURGESS
DRAWN BY: AN/MW
CHECKED BY: MW
PROJ. MGMT. APPROVAL: MW

TITLE: PRIMARY EXTRACTION WELL CONSTRUCTION DETAIL Burgess Brother Superfund Site
DRAWING NO.: FIGURE S-2
REV: 2



SCALE: Not to Scale	TITLE: SECONDARY EXTRACTION WELL CONSTRUCTION DETAIL
DATE: JUNE 2013	Burgess Brother Superfund Site
PROJECT No.: 12012	
CLIENT: EPG/BURGESS	
DRAWN BY: AN/MW	DRAWING NO.: FIGURE S-3
CHECKED BY: MW	REV: 2
PROJ. MGMT. APPROVAL: MW	



**LEGEND:**

- GROUNDWATER PIPING
- - - AIR PIPING
- ⊘ TRUE UNION BALL VALVE
- ⊘ FTS FLOW TRANSMITTER AND TOTALIZER
- ⊘ FM FLOW METER
- ⊘ TT TEMPERATURE TRANSMITTER
- S-P-G SAMPLING PORT
- ⊘ PRESSURE GAUGE
- ⊘ PT PRESSURE TRANSMITTER
- ⊘ AFG AIR FLOW GAUGE
- ⊘ PS PRESSURE SWITCH
- ⊘ SV SOLENOID VALVE
- ⊘ PLC CONNECTION
- ⊘ TRUE UNION CHECK VALVE
- ⊘ PIPE TEE FOR FLOW DISTRIBUTION
- ⊘ MS MOISTURE SEPARATOR
- ⊘ VFD VARIABLE FREQUENCY DRIVE
- ⊘ LLHA LIQUID LEVEL HIGH ALARM
- ⊘ LLL LIQUID LEVEL LOW INDICATOR
- ⊘ 4" FLEXIBLE AIR HOSE
- ⊘ 1.5" FLEXIBLE WATER HOSE
- ⊘ VENTURI VALVE
- ⊘ W1001 WATER LEVEL INDICATOR/PRESSURE TRANSDUCER
- ⊘ PARTICULATE SEPARATOR/STRAINER
- ⊘ EXTRACTION PUMP
- ⊘ VACUUM INDICATOR WITH FLOW CONTROL VALVE

**NOTES:**

Four, 1,000 lb. vapor-phase carbon (VGAC) vessels currently onsite.

**STRATEGIC ENVIRONMENTAL SOLUTIONS.**

**XDD**

**TITLE:** PIPING AND INSTRUMENTATION DIAGRAM  
Burgess Brother Superfund Site

**SCALE:** NOT TO SCALE

**DATE:** June 2012

**PROJECT NO.:** 12012

**CLIENT:** ENV. PARTNERS

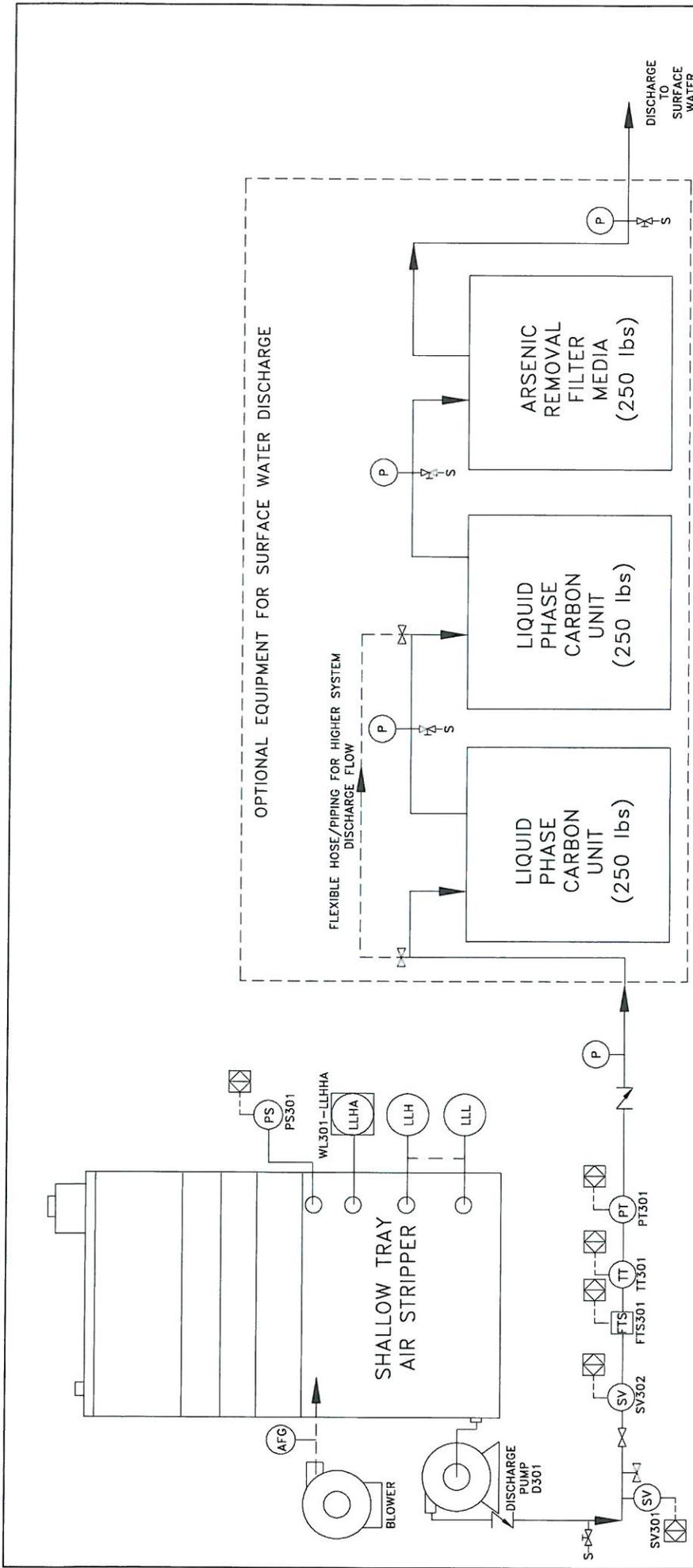
**DRAWN BY:** KB

**CHECKED BY:** MW

**PROJ. MGMT. APPROVAL:** MW

**FIGURE 5-4**

**REV. 2**



**LEGEND:**

- GROUNDWATER PIPING
- - - AIR PIPING
- ⊘ TRUE UNION BALL VALVE
- ⊞ FLOW TRANSMITTER AND TOTALIZER
- ⊞ FLOW METER
- ⊞ TEMPERATURE TRANSMITTER
- S-⊞ SAMPLING PORT
- ⊞ PRESSURE GAUGE
- ⊞ PRESSURE TRANSMITTER
- ⊞ AIR FLOW GAUGE
- ⊞ PRESSURE SWITCH
- ⊞ SOLENOID VALVE
- ⊞ PLC CONNECTION
- ⊞ TRUE UNION CHECK VALVE
- ⊞ PIPE TEE FOR FLOW DISTRIBUTION
- ⊞ MOISTURE SEPARATOR
- ⊞ VARIABLE FREQUENCY DRIVE
- ⊞ LIQUID LEVEL HIGH ALARM
- ⊞ LIQUID LEVEL LOW INDICATOR
- ⊞ 4" FLEXIBLE AIR HOSE
- ⊞ 1.5" FLEXIBLE WATER HOSE
- ⊞ VENTURI VALVE
- ⊞ WATER LEVEL INDICATOR/PRESSURE TRANSDUCER
- ⊞ PARTICULATE SEPARATOR/STRAINER
- ⊞ EXTRACTION PUMP
- ⊞ VACUUM INDICATOR WITH FLOW CONTROL VALVE

**NOTES:**

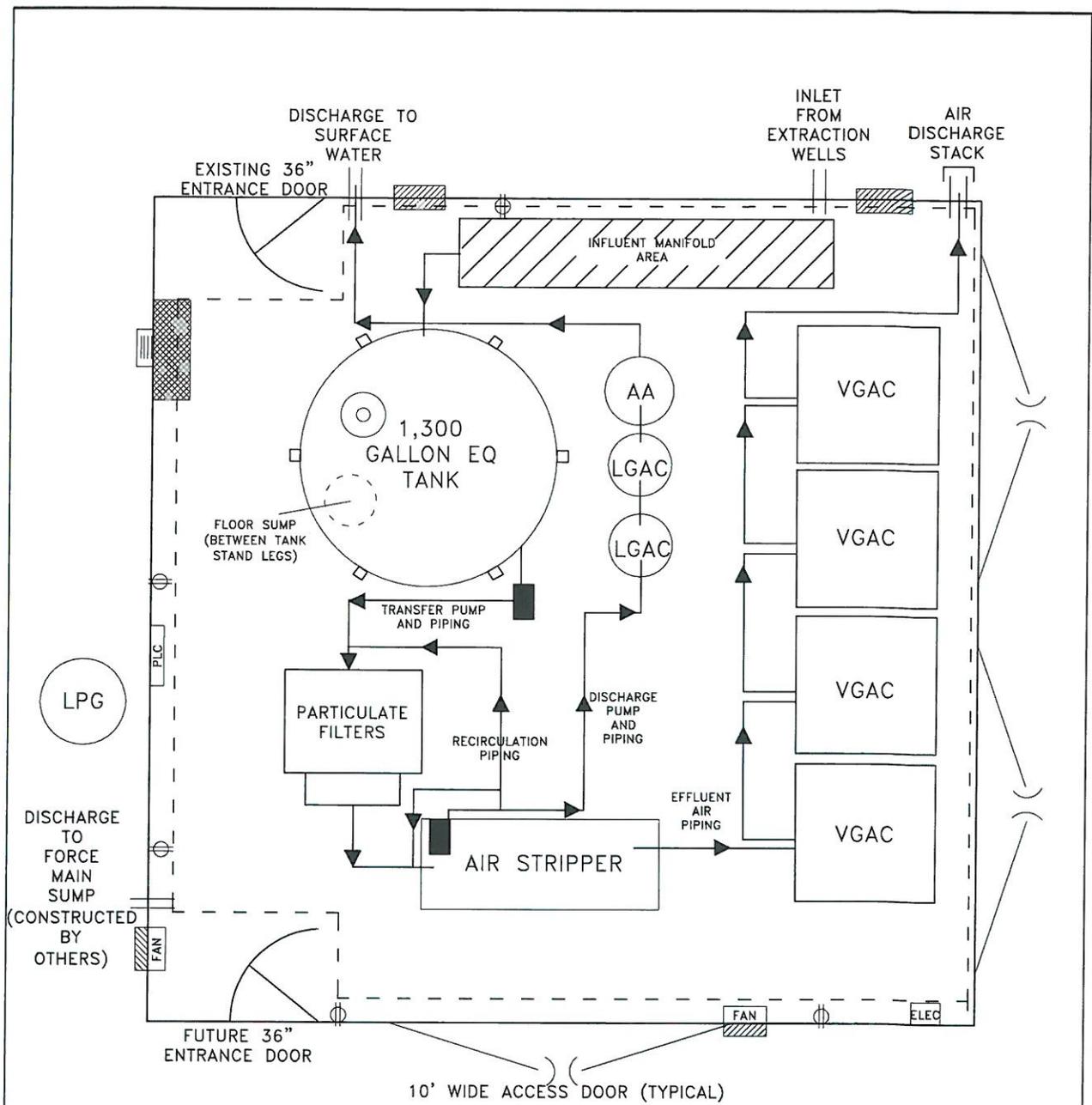
Four, 1,000 lb. vapor-phase carbon (VGAC) vessels currently onsite.

**STRATEGIC ENVIRONMENTAL SOLUTIONS.**

**TITLE:** SURFACE WATER DISCHARGE OPTION PIPING AND INSTRUMENTATION DIAGRAM  
**PROJECT NO.:** 12012  
**CLIENT:** ENV. PARTNERS  
**DRWN BY:** KB  
**CHECKED BY:** MW  
**PROJ. MGMT. APPROVAL:** MW

**SCALE:** NOT TO SCALE  
**DATE:** June 2012  
**DATE:** June 2012  
**PROJECT NO.:** 12012  
**CLIENT:** ENV. PARTNERS  
**DRWN BY:** KB  
**CHECKED BY:** MW  
**PROJ. MGMT. APPROVAL:** MW

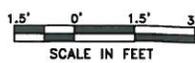
**DRAWING NO.:** **FIGURE 5-5**  
**REV.:** **2**



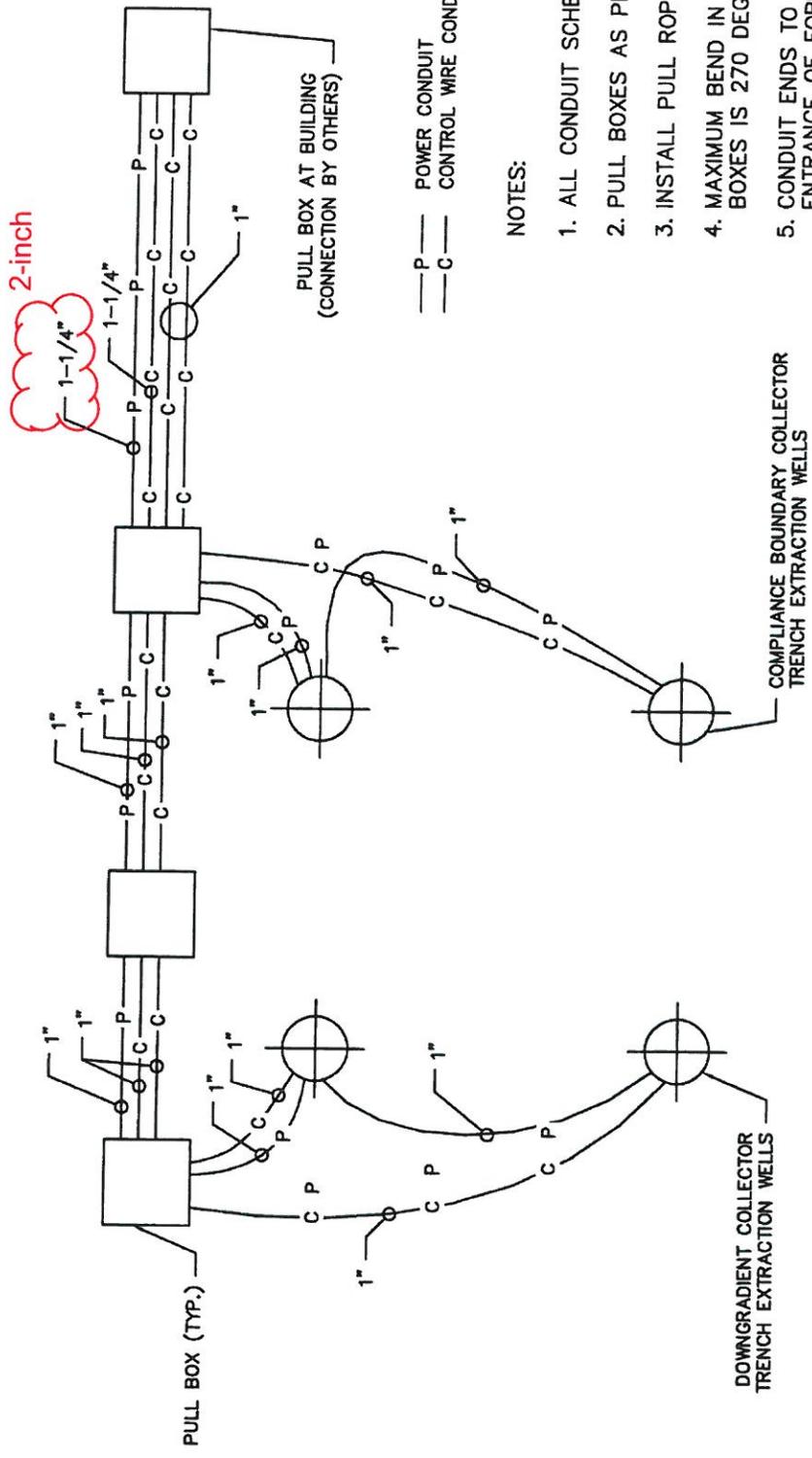
**LEGEND:**

	EZ-Stripper 24P AIR STRIPPER WITH PROGRAM LOGIC CONTROLLER (PLC)		BUILDING SUMP
	EQUIPMENT MANIFOLD SKID		BUILDING FOUNDATION EXTENT
	EXISTING 1,000 LB VAPOR-PHASE CARBON VESSEL		SECONDARY CONTAINMENT EXTENT
	LIQUID-PHASE GAC VESSEL		HEATER
	TRANSFER/DISCHARGE PUMP		GFCI
	GRANULAR ACTIVATED ALUMINA VESSEL		ELECTRICAL PANEL
	LOUVER VENT		EXISTING LIQUID PROPANE GAS TANK

**Notes:**  
 This is an approximate layout. The location and placement of treatment system components are subject to change based on field conditions.



SCALE: AS SHOWN	TITLE: TREATMENT SYSTEM EQUIPMENT LAYOUT
DATE: JULY 2013	CLIENT: ENVIRONMENTAL PARTNERS
PROJECT NO.: 12012	Burgess Brother Superfund Site
DRAWN BY: KAB	DRAWING NO.: FIGURE 5-6
CHECKED BY: MW	REV: 2
PROJ. MGMT. APPROVAL: MW	



NOTES:

1. ALL CONDUIT SCHEDULE 40 PVC, MINIMUM 36" DEPTH
2. PULL BOXES AS PER DETAIL, SHEET C-5
3. INSTALL PULL ROPE IN ALL CONDUITS.
4. MAXIMUM BEND IN THE CONDUITS BETWEEN PULL BOXES IS 270 DEGREES.
5. CONDUIT ENDS TO BE PLUGGED TO PREVENT ENTRANCE OF FOREIGN MATTER.

**ELECTRICAL AND CONTROL WIRE CONDUITS**  
**SCHEMATIC LAYOUT**  
 SCALE: N.T.S.

***APPENDIX C***  
***SITE SPECIFIC HEALTH AND SAFETY PLAN***

## Health and Safety Plan

*Burgess Brothers Superfund Site  
Woodford and Bennington, Vermont*

*Prepared for:  
Burgess Brothers Steering Committee*

*August 2013*

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Attachment A – Signature Page

Attachment B – Incident Report Form

Attachment C – Extreme Temperature Guidelines

Attachment D – Material Safety Data Sheets (MSDSs)

## **1.0 INTRODUCTION**

This section of the site-specific Health and Safety Plan (HASP) document defines general applicability and general responsibilities with respect to compliance with Health and Safety programs.

### **1.1 Scope and Purpose**

The purpose of this site-specific HASP is to define the requirements and designate protocols to be followed at the Burgess Brothers Superfund Site (Site) during Remedial Action (RA) activities. Applicability extends to the Environmental Partners field team, subcontractors, regulators, and authorized visitors during the RA activities at the Site.

All personnel on site, contractors and subcontractors included, shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This HASP summarizes those hazards and defines protective measures planned for the site.

This Plan must be reviewed, and an agreement to comply with the requirements must be signed by all personnel prior to entering the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ) described herein. A signature page is provided in Attachment A.

During development of this Plan consideration was given to current safety standards as defined by EPA/OSHA/NIOSH, health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources have been consulted:

- OSHA 29 CFR 1910.120/1926.65 (HAZWOPER) and EPA 40 CFR 311
- NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidance Manual Publication No.85-115
- NIOSH Guide to Chemical Hazards

### **1.2 Visitor Compliance**

All visitors entering the EZ or CRZ at the Site will be required to read and verify compliance with the provisions of this HASP. In addition, visitors will be expected to comply with relevant OSHA requirements such as medical monitoring, training, and respiratory protection. Visitors will also be expected to provide their own protective equipment.

In the event that a visitor does not adhere to the provisions of the HASP, he/she will be required to leave the work area. All nonconformance incidents will be recorded by the Site Safety Officer (SSO) in the site log.

## **2.0 PERSONNEL ROLES AND RESPONSIBILITIES**

### **2.1 Key Personnel**

The following personnel and organizations are critical to the planned activities at the Site. The organizational structure will be reviewed and updated periodically by the Remedial Design Team.

The SSO has total responsibility for ensuring that the provisions of this HASP are adequate and implemented in the field. Changing field conditions may require decisions to be made concerning adequate protection programs. The SSO is also responsible for conducting site inspections on a regular basis in order to ensure the effectiveness of this Plan.

Site Safety Officer:                      Ann Marie Petricca

The Remedial Project Engineer (RPE) has day to day responsibility for ensuring that the provisions of this HASP are implemented in the field. Changing field conditions may require decisions to be made concerning adequate protection programs.

Remedial Project Engineer:        Wesley Stinson

### **3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS**

#### **3.1 *Historical Overview of the Site***

This HASP defines the hazards and methods to protect personnel from hazards identified in previous site work and background information. The Site is located in southern Vermont in the Towns of Woodford and Bennington. The closed landfill is situated on the western slope of Harmon Hill and is part of a 60 acre plot. The Site consists of a Landfill Area, which includes two (2) former Lagoon Cells. The Landfill Area occupies approximately 60,000 square feet and the Lagoon Cells occupy approximately 4,130 square feet. In 1999, the Landfill was re-graded and capped in accordance with the 1998 Consent Decree and Statement of Work (SOW).

Volatile organic compounds (VOCs) including trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride are present in groundwater above MCLs within the Landfill area and downgradient of the landfill. The downgradient limit of the groundwater VOC plume is the Unnamed Stream to the east and south, which is a hydraulic barrier to groundwater contaminant migration. Towards the southwest, the downgradient limit of the groundwater VOC plume is between the P-02 and P-08 piezometer locations.

Soil samples may contain elevated concentrations of iron, nickel, and zinc when compared to background samples. Soil samples located in and around the lagoon area contain elevated concentrations. VOCs may also be present adsorbed onto soils in the vicinity of the groundwater VOC plume.

Therefore, materials that have been detected on site, along with their OSHA Permissible Exposure Limit (PEL), include the following:

- Trichloroethene (TCE), PEL=100 ppm
- Tetrachloroethene (PCE), PEL=100 ppm
- Dichloroethene (DCE), PEL=200 ppm
- Vinyl Chloride, PEL=1 ppm
- Carbon Disulfide, PEL=20 ppm
- Lead, PEL=50  $\mu\text{g}/\text{m}^3$
- Mercury vapor, PEL=0.1  $\text{mg}/\text{m}^3$

- Additional metals including: Iron, Nickel and Zinc

Although the Site is a landfill, most of the waste was industrial or construction material and not municipal solid waste. Monitoring with a combustible gas instrument (CGI) was performed during the landfill re-grading and capping, and installation of the SVE/Air Sparge system. Methane gas concentrations have never exceeded risk based action levels and all intrusive RA activities will be performed outside the limit of waste; therefore, monitoring for methane is not included in this HASP.

### **3.2 Risk Analysis**

The evaluation of hazards is based upon the knowledge of site background presented in Section 3.1, and anticipated risks posed by the anticipated operations. The following subsections describe each task/operation in terms of the specific hazards associated with it. In addition, the protective measures to be implemented during completion of those operations are also identified.

The RA activities are described in detail in the RD Report. The purpose of the RA is to remediate overburden groundwater contamination. The RA includes installation of one groundwater collection trench at the landfill compliance boundary and one downgradient of the compliance boundary, disposal and final capping of soils excavated from the trenches on top of the existing landfill cap, installation and testing of an on-site treatment system for the extracted groundwater, lining of the toe-of-slope swale between the landfill cap and Unnamed Stream, and discharge of the treated groundwater via onsite surface water discharge.

The collection trenches are to extend across the groundwater plume at the landfill compliance boundary and the area downgradient of the compliance boundary in the area of the W-09 well cluster. Both collection trenches will be located outside the limit of landfill waste. The collection trenches will be excavated to the surface of the lodgement till, estimated to be 25 to 30 feet below ground surface (bgs) and backfilled with a highly porous media (pea stone). Extraction wells within each trench will convey groundwater to a treatment system located in the existing treatment building on the Site.

Soils excavated from the collector trenches will be temporarily stockpiled at an area within the capped landfill. Groundwater draining from the stockpiled soils and surface water that comes in contact with these soils prior to capping will be collected and pretreated prior to discharge. The soils will be final graded and capped with an impervious geomembrane clay liner, drainage system and vegetative support soils overlying and connected to the existing landfill capping system.

The extracted groundwater is to be treated prior to discharge. The treatment system is designed to reduce VOC concentrations prior to discharge to onsite surface water. VOC treatment is to be provided by an air stripper with granular activated carbon for the off-gas treatment. Additional treatment to comply with surface water discharge requirements will include liquid-phase granular activated carbon (LGAC) polishing of effluent VOCs, and liquid-phase activated alumina (AA) to remove trace levels of arsenic.

The toe-of-slope swale will be lined between the existing landfill cap and the Unnamed Stream to prevent surface water being carried by the swale from discharging into the collection trench. The swale will be lined with a geocomposite clay liner and resurfaced with crushed stone and rip rap.

In addition to remedial activities, decontamination of equipment and machinery used during excavation and hauling of trench spoils will be performed.

Extensive drilling and environmental sampling has been performed at the site. The Landfill was re-graded and capped in 1999. All work to date, including landfill closure activities, has only required Level D Personal Protective Equipment (PPE). Therefore, for the field activities to be performed under this RA, the anticipated level of PPE required is Level D. Action levels and procedures for Level C and Level D are discussed in this HASP. Should site conditions exceed the protection limits for Level C, field activities will cease until the situation is evaluated further and appropriate measures implemented to address the site specific conditions.

In general, site activities will be conducted in Level D PPE. Site personnel will be required to upgrade to Level C Personal Protection if air monitoring with a Photoionization Detector (PID) exceeds specified threshold levels. If PID readings exceed 1 ppm above background, work in the area will be stopped (due to PID limitations for detecting vinyl chloride above the PEL), until the level of vinyl chloride is identified by Draeger tubes. Work will resume as directed by the SSO.

The following table summarizes the exposure thresholds for each of the contaminants of concern at the Site.

## EXPOSURE THRESHOLDS AND ACTION LEVELS

CONTAMINANT	CONCENTRATION DETECTED	REQUIRED LEVEL OF PROTECTION
Air Monitoring - PID	Background to 1 ppm	Level D
	>1 ppm and at every increase of 5 ppm	Add Draeger Tube Monitoring for Vinyl Chloride
	10 ppm to 50 ppm	Level C (Full-Face)
	>50 ppm	Level B

Notes:

Above action levels are based upon the PELs for tetrachloroethylene.

### 3.3 Task Hazard Descriptions

Hazards encountered during boring installation include both physical and chemical agents. Hazards encountered during groundwater sampling are primarily chemical agents. These hazards are summarized below.

#### 3.3.1 Physical Hazards

Physical hazards presented by activities covered under this Plan include:

- Working near heavy equipment;
- Noise;
- Vehicle traffic;
- Electrical hazards;
- Heavy lifting;
- Open trenches; and
- Weather related hazards

These hazards can be prevented through the following means:

- Wearing of hardhats, eye protection, hearing protection, skin protection, and foot protection in accordance with OSHA 29 CFR 1910 Subparts G and I;

- Maintaining proper distance from construction equipment and other mechanical equipment;
- Maintain visual contact with machine operators and coordinate with the operators a safe location to stand when not directly involved with site activities, such as air monitoring;
- Wearing light or bright colored clothing, including safety vests;
- Regularly inspecting work area for changing conditions;
- Providing an adequate barrier around open trenches;
- To prevent over exertion, limit manual lifting and emphasize mechanical means where practical;
- Maintaining ample workspace between workers;
- Ensuring personnel are aware of the signs of heat stress and cold; and
- Ensuring personnel routinely consume fluids.

### 3.3.2 Chemical Hazards

The Chemical hazards presented by Site contaminants are limited to toxicity through exposure via their inhalation, dermal exposure or accidental ingestion. This is particularly true of work with contaminated soil and groundwater during trench excavation activities.

These hazards can be prevented by

- wearing skin protection; and
- monitoring for airborne vapors as previously outlined.

If the concentrations exceed the action level, then personnel in the exclusion zone will upgrade to Level C personal protection (see Section 3.2).

### 3.3.3 Biological Hazards

The biological hazards presented by the Site include animals, poisonous plants and insects. Harmful effects (such as rabies or poisons) can be transmitted through bites, stings, or through dermal contact.

## **4.0 PERSONNEL TRAINING REQUIREMENTS**

This section describes the training required by personnel working in the different zones at the Site. All personnel shall receive Hazard Communication training, as outlined in Section 10. The RPE will request that all personnel are properly trained prior to entry onto the Site and will ask for training certification. Copies of Certificates of Training for Environmental Partners personnel will be kept onsite in the field office.

### **4.1 Exclusion Zone (EZ)**

The construction subcontractor and RPE conducting the oversight activities within the EZ will be required to have 40-Hour HAZWOPER General On-Site training as specified in 29 CFR 1910.120/1926.65.

### **4.2 Contaminant Reduction Zone (CRZ)**

Personnel reasonably expected to come in contact with site contaminants, specifically, support personnel present in the CRZ shall have a minimum of 24-Hour HAZWOPER Minimal Exposure training as specified in 29 CFR 1910.120/1926.65.

### **4.3 Level C Work**

All personnel required to wear respiratory protection will be properly trained in the use of the specific respirator. The personnel must meet all of the requirements set forth in 29 CFR 1910.134 (Respiratory Protection).

### **4.4 Personal Protective Equipment**

This section describes the general requirements of the OSHA designated Levels of Protection (A through D), and the specific levels of protection required for each task at the Site. The response procedures, upgrades, and controls required by this Plan are outlined in Sections 7 through 9. As stated in Section 3.2, if site conditions exceed the protection limits for Level C PPE, field activities will cease until the situation is evaluated further and appropriate measures implemented to address the specific conditions.

The minimum Level of Protection to be used during remedial activities at the Site is Level D. If air monitoring exceeds the Action Levels presented in Section 3.2, then exclusion zone personnel will upgrade to Level C. All support personnel working in the CRZ need not upgrade to Level C unless air concentrations within the CRZ exceed the required action level. Section 6.0 summarizes the Air Monitoring and Controls.

## **4.5 Levels of Protection**

Personnel wear protective equipment when remedial activities involve known or suspected atmospheric contamination vapors, gases, or particulates that may be generated by site activities, or when direct contact with skin-affecting substances may occur are as follow: full face-piece respirators protect lungs gastrointestinal tract, and eyes against airborne toxicants; chemical-resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals.

The specific levels of protection anticipated for the RA activities and necessary components for each have been divided into two categories according to the degrees of protection afforded:

- Level C: Should be worn when the criteria for using air-purifying respirators are met.
- Level D: Should be worn as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards. Modifications of these levels are permitted, and routinely employed during site work activities to maximize efficiency.

For example, Level C respiratory protection and Level D skin protection may be required for a given task. Likewise the type of chemical protective ensemble (i.e., material, format) will depend upon contaminants and degrees of contact. The Level of protection selected is based upon the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity;
- Potential for exposure to substances in air, liquids, or other direct contact with material due to work being done; and
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better identified.

### Level C Personnel Protective Equipment:

- Air-purifying respirator, full-face, organic vapor cartridge-equipped (MSHA/NIOSH approved) or high efficiency particulate absolute (HEPA) combination cartridges;
- Chemical-resistant clothing (coveralls; hooded, one-piece or two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls);

- Coveralls;
- Gloves (outer), chemical-resistant;
- Boots (outer), chemical-resistant, steel toe and shank;
- Boot covers (outer), chemical-resistant (disposable);
- Hard hat (face shield);
- Escape mask; and
- 2-way radio communications (intrinsically safe);

Level D Personnel Protective Equipment:

- Coveralls;
- Gloves;
- Boots/shoes, leather or chemical-resistant, steel/ceramic toe and shank;
- Safety Glasses; and
- Hard hat (if overhead hazards are present);

#### **4.6 Re-assessment of Protection Program**

The Level of Protection provided by PPE selection shall be upgraded or downgraded by the SSO based upon a change in site conditions or findings of investigations. When a significant change occurs, the hazards should be reassessed. Some indicators of the need for reassessment are:

- Commencement of a new work phase that begins on a different portion of the site;
- Change in job tasks during a work phase;
- Change of season/weather;
- When temperature extremes or individual medical considerations limit the effectiveness of PPE;
- Contaminants other than those identified are encountered;
- Change in ambient levels of contaminants (Action Level or PEL exceeded); and
- Change in work scope, which affects the degree of contact with contaminants.

As previously discussed, Exclusion Zone personnel shall upgrade to Level C protection if air concentrations exceed the OSHA PEL of 1.0 ppm for vinyl chloride.

## **4.7 Work Duration**

Before the workers actually begin work in their PPE ensembles, the anticipated duration of the work mission should be established. Several factors limit mission length, including:

- Suit/Ensemble permeation and penetration rates for chemicals;
- Ambient temperature and weather conditions (heat stress/cold stress); and
- Capacity of personnel to work in PPE.

In general, remedial activities at the work at the Site are expected to take place for 10 hours per day for approximately twelve (12) weeks. This HASP, and the Levels of Protection specified herein are designed specifically for these exposure scenarios. Should the work duration change, the SSO shall re-evaluate the work requirements.

## **4.8 Standard Operating Procedure for Personal Protective Equipment**

### **4.8.1 Inspection**

Proper inspection of PPE features several sequences of inspection depending upon specific articles of PPE and it's frequency of use. The different levels of inspection are as follows:

- Inspection and operational testing of equipment received from the factory or distributor;
- Inspection of equipment as it is issued to workers;
- Inspection after use or training or prior to maintenance;
- Periodic inspection of stored equipment; and
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

The primary inspection of PPE in use for activities at the Site will occur prior to immediate use and will be conducted by the user. This ensures that the specific devise or article has been checked-out by the user that is familiar with its use.

Prior to commencing work, the user shall:

- Determine that the clothing material is correct for the specific task at hand;
- Visually inspect for:

- imperfect seams
- non-uniform coatings
- tears
- malfunctioning closures
- Hold up to light and check for pinholes;
- Flex product and observe for cracks and for other signs of shelf deterioration; and
- If the product has been used previously, inspect inside and out for signs of chemical attack (discoloration, swelling, or stiffness).

During the work task, the user shall regularly look for:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening (keep in mind, however, that chemical permeation can occur without any visible effects);
- Closure failure;
- Tears;
- Punctures; and
- Seam Discontinuities.

Latex gloves should be inspected for imperfect seams, tears, and non-uniform coating; and should be pressurized with air to determine if pin-hole leaks are present.

#### **4.9 Decontamination**

It is expected that the highest level of protection used during the Burgess Brothers Landfill Site construction activities will be level C. The minimum Level C decontamination procedures will be followed when Level C PPE is used. Personnel wearing Level D PPE will be required to follow standard Level D decontamination procedures for clothing and equipment.

Refer to Section 8.0 for additional details regarding decontamination procedures.

## **5.0 MEDICAL SURVEILLANCE REQUIREMENTS**

Medical monitoring programs are designed to track the physical condition of employees on a regular basis as well as survey pre-employment or baseline conditions prior to potential exposures. The medical surveillance program is a part of each employers Health and Safety program.

The guidelines set forth in this section pertain only to the Remedial Design Team. Contractors and subcontractors shall make medical surveillance available to their employees, as described by OSHA.

### **5.1 *Baseline or Pre-Assignment Monitoring***

Prior to being assigned to a hazardous or a potentially hazardous activity involving exposure to toxic materials the Construction Management Team employees must receive a preassignment or baseline physical. The content of the physical is to be determined by their medical consultant. As suggested by NIOSH/OSHA/USCG/EPA's Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities, the minimum medical monitoring requirements for work at the Site are as follows:

- Complete medical and work histories;
- Physical examination;
- Pulmonary function tests (FVC and FEV1);
- Chest X-ray (every 2-years);
- EKG;
- Eye examination and visual acuity;
- Audiometry;
- Urinalysis; and
- Blood chemistry and heavy metals toxicology.

The pre-assignment physical should categorize employees as fit-for-duty and able to wear respiratory protection, in accordance with OSHA 29 CFR 1910.134.

### **5.2 *Periodic Monitoring***

In addition to a baseline physical, all field personnel require a periodic physical within the last 12 months unless the advising physician believes a shorter interval is appropriate. The employer's medical

consultant should prescribe an adequate physical which fulfills OSHA 29 CFR 1910.120 requirements. The pre-assignment physical outlined above may be applicable. All personnel working in contaminated or potentially contaminated areas at the Site will verify currency (within 12 months) with respect to medical monitoring. This is done by indicating date of last physical on the Safety Plan Agreement Form (Attachment B).

### **5.3 Exposure/Injury/Medical Support**

As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours. It will be up to the employers' medical consultant to advise the type of test required to accurately monitor for exposure effects.

### **5.4 Exit Physical**

At termination of employment or reassignment to an activity or location which does not represent a risk of exposure to hazardous substances, an employee shall require an exit physical. If his/her last physical was within the last 6 months, the advising medical consultant has the right to determine adequacy and necessity of exit exam.

## **6.0 AIR MONITORING CONTROLS**

This section explains the general concepts of the air monitoring program and specifies the surveillance activities that will take place during the remedial activities at the Burgess Brothers Superfund Site. The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection needed. Initial screening for identification is often qualitative, i.e., the contaminant, or the class to which it belongs, is demonstrated to be present but the determination of its concentration (quantification) must await subsequent testing. Two principal approaches are available for identifying airborne contaminants:

1. The on-site use of direct-reading instruments (PID and Draeger tubes, if necessary); or
2. Laboratory analysis of air samples obtained by gas sampling bag, collected media (i.e., filter, sorbent), and/or wet-contaminant collection methods.

The latter method will only be used if specifically requested by the SSO.

### **6.1 *Direct-Reading Monitoring Instruments***

Unlike air sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments provide information at the time of sampling, enabling rapid decision-making. Data obtained from the real-time monitors are used to assure proper selection of PPE, engineering controls, and work practices. Overall, the instruments provide the user the capability to determine if the site personnel are being exposed to concentrations which exceed exposure limits or action levels for specific hazardous materials.

Real-time monitors can be useful in identifying any Action Level, PEL, or IDLH conditions, and flammable atmospheres. Periodic monitoring of conditions is critical, especially if exposures may have increased since initial monitoring or if new activities have commenced.

Each day before activity begins, ambient air readings will be taken in the support area of the site, near the site entrance. After Site remedial activities have commenced, the selective monitoring of high-risk workers (i.e., those who are closest to the source of contaminant generation) is essential. Personal monitoring samples should be collected in the breathing zone and, if workers are wearing respiratory protective equipment, outside the facepiece. Those employees closest to the source have the highest likelihood of being exposed to concentrations, which exceed established exposure limits. Representative sampling approaches emphasizing worst case conditions, those employees with the greatest risk of

exposure, is acceptable. However, the sampling strategy may change if the operation or tasks change on-site or if exposures potentially increase.

A PID will be used to monitor air quality levels for total volatiles during remedial activities. If liquid waste is found, for safety reasons it will be assumed that the waste is vinyl chloride. In the event that PID readings exceed 1 above background, work in the area will be stopped and field Draeger tubes will be mobilized to measure air quality levels of vinyl chloride. If vinyl chloride is detected below 1 ppm, then the PID will be used on a continuous basis to determine the presence of total VOC's. Draeger tubes will be used to verify the presence of vinyl chloride every 5 ppm increase in PID readings, or as required by the SSO to verify that vinyl chloride in the breathing zone does not exceed the 1 ppm PEL.

## **6.2 SOP For Air Monitoring Equipment**

All calibration and handling procedures recommended by the manufacturer shall be conducted.

- Calibration;
- Maintenance;
- Manuals, etc.;
- Inspection.

An SOP for calibration and operation of the PID is included in Attachment F and the PID manual is included in Attachment F.

## **7.0 SITE CONTROL MEASURES**

The following section defines measures and procedures for maintaining site control. Site control is an essential component in the implementation of the site health and safety program. Medical personnel at the primary hospital, fire, and police departments will be informed of site hazards and activities prior to project initiation so that emergency situations can be handled most efficiently.

### **7.1 Buddy System**

During all Level C activities or when some conditions present a risk to personnel, the implementation of a buddy system is mandatory. A buddy system requires at least two people who work as a team, each looking out for the other member of the team.

### **7.2 Site Communication Plan**

Successful communications between field teams and contact with personnel in the support zone is essential. The following communications systems will be available during activities at the Site:

- Cellular Phone
- Two-way radios; and
- Vehicle Horn.

### **7.3 Work Zone Definition**

The general work zones established at the Site are the Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and the Clean Zone (CZ). The zones are located on Figure 7-1.

The EZ is defined as the area where contamination is either known or likely to be present, or because of activity, will provide a potential to cause harm to personnel. Entry into the EZ requires the use of PPE.

The CRZ is the area where personnel conduct personal and equipment decontamination. It is essentially a buffer zone between contaminated areas and clean areas. Activities to be conducted in this zone will require personal protection as defined in the decontamination Plan.

The CZ is an uncontaminated area. There should be line of site contact with the EZ, if possible. Activities to be conducted in this zone include visitor check-in, equipment storage, portable restrooms, and employee break areas.

#### **7.4 Nearest Medical Assistance**

In the event of a serious injury to site personnel, an ambulance shall be used for transportation to the nearest hospital. In the event of minor injuries or illness, the SSO or his designee may elect to have the injured transported to the nearest hospital by company vehicle. If there is any doubt about the severity of the injury, an ambulance shall be used.

Directions to the Hospital are shown on Figure 7-2 and summarized below:

Take Burgess Road West to Route 9 West

Turn left onto Dewey Avenue

Go four blocks South on Dewey Avenue

The hospital is on the right

#### **7.5 Safe Work Practices**

The following is a list of standing orders for the EZ:

- No smoking;
- No horse play;
- No matches or lighters in this zone;
- Check-in on entrance to this zone;
- Check-out on exit from this zone;
- Implement the communications system;
- Line-of-sight must be in position; and
- Wear the appropriate level of protection as defined in this HASP.

The following is a list of standing orders for the CRZ:

- No smoking;
- No horse play; and
- No matches or lighters in this zone.

The CZ activities should be limited to those that directly support work in the EZ and CRZ or employee health and safety.

## **8.0 DECONTAMINATION PLAN**

Consistent with the levels of protection required in this Plan, a step by step representation of the personnel decontamination process is presented below.

### **8.1 Standard Operating Procedures for Decontamination**

Decontamination involves the orderly controlled removal of contaminants. Standard decontamination sequences are presented below. All site personnel should minimize the need for extensive decontamination.

The following steps shall be used to decontaminate from Level D:

- Step 1 Remove outer garments (i.e., coveralls)
- Step 2 Remove over-boots
- Step 3 Remove gloves
- Step 4 Wash hands and face

If site personnel are required to upgrade to Level C, the following decontamination procedures shall be followed:

- Step 1 Segregate equipment drop
- Step 2 Boot cover and glove wash
- Step 3 Boot cover and glove rinse
- Step 4 Tape removal
- Step 5 Boot cover removal
- Step 6 Outer glove removal
- Step 7 Suit/safety boot wash
- Step 8 Suit/safety boot rinse
- Step 9 Safety boot removal
- Step 10 Splash suit removal
- Step 11 Inner glove wash

- Step 12 Inner glove rinse
- Step 13 Face piece or SCBA removal
- Step 14 Inner glove removal
- Step 15 Inner clothing removal
- Step 16 Field wash
- Step 17 Redress

## **8.2 Levels of Protection Required for Support Personnel**

The levels of protection required for personnel assisting will be the same as those that are being decontaminated. The SSO is responsible for monitoring decontamination procedures and determining their effectiveness.

## **8.3 Equipment Decontamination**

Excavation equipment and haul trucks will be decontaminated in accordance with Environmental Partners Standard Operating Procedures. These procedures shall include, at a minimum:

- Removing all visible soil;
- Rinsing with soap and water; and
- Rinsing with water.

The equipment shall be decontaminated on the landfill in the CRZ.

## **8.4 Decontamination Solutions**

Decontamination of equipment and personnel will be conducted on a routine basis throughout sampling activities. Equipment decontamination water will be containerized and tested for proper disposal.

## **9.0 EMERGENCY RESPONSE/CONTINGENCY PLAN**

This section describes contingencies and emergency Planning procedures to be implemented at the Site. This plan is compatible with local, state, and federal disaster and emergency management Plans as appropriate.

### **9.1 *Pre-Emergency Planning***

During the site briefings held daily or when operations change, all employees will be trained in and reminded of provisions of the Emergency Response Plan, communication systems, and evacuation routes. The hazardous conditions associated with site activities are limited to the inhalation and incidental ingestion of site contaminants adhered to soil.

### **9.2 *Personnel Roles and Lines of Authority***

The Project Manager – Mark White (contact information included in Section 9.5) has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area, and evacuation of adjacent residents. The project manager is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. The SSO may be called upon to act on the behalf of the Project Manager, and will direct responses to any medical emergency. The individual contractor or subcontractor is responsible for assisting the supervisor manager in his/her mission within the parameters of their scope of work.

### **9.3 *Emergency Recognition/Prevention***

Section 3.0 provides a listing of chemical and physical hazards on-site. Personnel will be familiar with techniques of hazard recognition from pre-assignment training and site specific briefing. The SSO is responsible for ensuring that prevention devices or equipment is available to personnel.

### **9.4 *Evacuation Routes/Procedures***

In the event of an emergency which necessitates an evacuation of the site, the following alarm procedures will be implemented: Evacuation alarm notification should be made using three short blasts on the air horn, supplemented using the hand held radios and cell phones. All personnel should evacuate to an upwind location. Ensure that a pre-determined location is identified off-site in case of an emergency, so

that all personnel can be accounted for. Personnel will be expected to proceed to the closest exit with your buddy, and mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until the re-entry alarm is sounded or an authorized individual provides further instructions.

The warning signals described below will be deployed in the event of an emergency. The following signals will be used during the respective emergencies:

<b><u>Emergency</u></b>	<b><u>Signal</u></b>
<b>Stop Work (Upgrade to Level C)</b>	<b>1 blast on vehicle horn</b>
<b>Fire</b>	<b>2 blasts on vehicle horn</b>
<b>Man Down</b>	<b>3 blasts on vehicle horn</b>

### **9.5 Emergency Contact/Notification System**

The following list provides names and telephone numbers for emergency contact personnel. In the event of a medical emergency, personnel will take direction from the SSO and notify the appropriate emergency organization. In the event of a fire or spill, the project manager or designated alternate will notify the appropriate local, state, and federal agencies. For additional questions on appropriate Health and Safety practices, contact Mark White at the number listed below.

#### **Emergency Response Telephone Numbers**

	<b><u>In Bennington, VT</u></b>	<b><u>Outside Bennington, VT</u></b>
Police	911	(802) 422-1030
Fire	911	(802) 422-1030
VtDEC - Waste Management Division (Gerold Noyes)		(802) 241-3877
Project Manager (Mark White)		(617) 657-0200
Vermont Health Department		(802) 863-7200
Southwestern Vermont Medical Center (Hospital), Dewey Avenue		(802) 442-6361

## **9.6 Emergency Medical Treatment Procedures**

Any person who becomes ill or injured in the EZ must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean overalls or wrapping in a blanket). First aid should be administered by designated personnel only, while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the project manager. Any person being transported to a clinic or hospital for treatment should take with them information on the chemical(s) they have been exposed to at the site.

## **9.7 Fire or Explosion**

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the project manager or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on-site. If it is safe to do so, site personnel may:

- Use firefighting equipment available on-site for defensive purposes only to assist in evacuation; and
- Remove or isolate flammable or other hazardous materials which may contribute to the fire.

## **9.8 Spill or Leaks**

In the event of a spill or leak, site personnel will:

- Inform the project manager immediately;
- Locate the source of the spillage and stop the flow if it can be done safely; and
- Begin containment and recovery of the spilled materials.

Additional spill response actions are outlined in the project RAWP/POP.

## **9.9 Responsibilities**

The SSO or his designee will be responsible for responding to all emergencies. The SSO or his designee will:

1. Notify appropriate individuals, authorities and/or health care facilities of the activities and hazards of the investigation;

2. Ensure that the following safety equipment is available at the site: eyewash station, first aid supplies, and fire extinguishers;
3. Have working knowledge of all safety equipment available at the site; and
4. Ensure that a map which details the most direct route to the nearest hospital is prominently posted with the emergency telephone numbers.

### **9.10 First-Aid Equipment**

As part of the site Health and Safety Plan, the SSO will have first-aid equipment onsite during site activities. At a minimum, first aid equipment will include the following items:

- A first aid kit with adhesive bandages, sterile gauze, adhesive tape, first aid cream, triangular bandage and antiseptic wipes.
- Sterile eye wash
- Insect repellent
- Cold pack
- Ointment for insect bites
- Safety air horn

### **9.11 Reporting Procedures**

Adherence to this site-specific HASP and any additional facility safety rules and regulations will significantly reduce the likelihood of personnel being exposed to toxic substances above permissible exposure limits and to physical hazards. However, in the event an incident does occur, it is imperative that specific reporting procedures be followed so that appropriate corrective action can be taken by the SSO and Site Supervisor. Upon notification of an incident, the SSO will contact the appropriate technical personnel for recommended medical diagnosis and, if necessary, treatment. The Project Manager or his/her designated person will investigate facility/site conditions to determine: (1) the severity of the incident, (2) the cause of the incident, and (3) the means to prevent the incident from recurring.

An incident reporting form (Attachment C) has been developed so that consistent and appropriate information is obtained regarding employee exposures. The form will be completed by the SSO and the exposed individual. The form will be filed on-site by the RPE, then subsequently at Environmental

Partners offices with the employee's medical and safety records to serve as documentation of the incident and the actions taken.

### **9.12 Extreme Temperature Effects**

The expected duration of the pre-design field work is six to 12 weeks, beginning in early September 2013. It is not anticipated that heat stress will be a significant factor in the health and safety of the workers. However, if heat stress does become a significant factor, Work/Rest regimens will be employed as necessary so that personnel do not suffer adverse effects from heat stress. Special clothing and an appropriate diet and fluid intake will be recommended to all site personnel to further reduce these temperature-related hazards. The impacts and corrective actions for extreme temperature effects are provided in Attachment D.

The work/rest regimens will be developed following the guidelines in the ACGIH, Threshold Limit Values and Biological Exposure Indices for 1988-1989 and other practices developed and used by experienced industrial hygienists. See Attachment D for specific heat stress guidance.

Effects of heat stress can occur as either heat exhaustion, or the more dangerous condition of heat stroke. Signs of heat exhaustion include pale, clammy skin, profuse perspiration, and extreme fatigue. There may be headache or vomiting. The body temperature will appear normal. Effects of heat stroke include hot, flushed or red, dry skin with extremely high body temperature, up to 41 deg. C (106 deg. F). The victim may experience dizziness, nausea, headache, rapid pulse or unconsciousness.

As currently scheduled, the RA activities are expected to be completed by late November and, therefore, it is unlikely that cold exposure will become a concern. The effects of cold exposure can be less apparent to the victim. It is extremely important that partners within the buddy system visually inspect their fellow workers often. Redness of the skin indicates the onset of cold exposure. A white or pale skin color, especially on extremities such as the nose, cheeks, chin, ears, fingers, and toes are indications that frostbite is setting in. Individuals should dress in layers, peeling off each layer as they get warmer from exertion. The SSO should keep informed of the wind-chill factor and be inspecting workers during cold exposure conditions.

### **9.13 Heavy Machinery/Equipment**

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn during site activities. This

protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others. Personnel working around heavy equipment must also wear safety vests.

### **9.14 Construction Materials and Site Refuse**

All construction materials and site refuse (spoil material) should be contained in appropriate areas or facilities. All trash and waste materials will be immediately and properly disposed. It is important to maintain clear areas of egress in case of an emergency.

### **9.15 Additional Safety Practices**

The following are important safety precautions, which will be enforced during the RA activities when contact with waste materials is possible.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, specifically, within the CRZ and Exclusion Zone.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after departing the site. At a minimum, personnel will be required to wash face and hands thoroughly prior to departing the site.
4. No excessive facial hair which interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit testing shall be performed prior to respirator use to ensure a proper seal is obtained by the wearer.
5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles, mud, or other discolored surfaces; kneel on ground; lean, sit or place equipment on drums, containers, vehicles, or the ground.
6. Medicine and alcohol can potentiate the effect from exposure to certain compounds. On-site personnel should consult with their physician regarding the use of prescribed drugs during the remedial operations.

7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.
8. Work areas for various operational activities should be established.
9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.
10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use by the worker.
11. Safety gloves and boots shall be taped to the disposable, chemical protective suits as necessary.
12. All unsafe equipment left unattended will be identified by a "DANGER – DO NOT OPERATE" tag.
13. Noise mufflers or ear plugs may be required for all site personnel working around heavy equipment. This requirement will be at the discretion of the SSO.
14. Cartridges for air-purifying respirators in use will be changed as directed by the SSO.
15. Air-purifying respirators will be inspected by the SSO, as necessary dependent upon use.
16. All Level C activities in the EZ will be conducted using the "Buddy System". The Buddy is another worker fully dressed in the appropriate PPE, who can perform the following activities:
  - Provide his/her partner with assistance;
  - Observe his/her partner for signs of chemical, heat or cold exposure;
  - Periodically check the integrity of his/her partner's PPE; and
  - Notify others if emergency help is needed.

## **10.0 HAZARD COMMUNICATION**

The Hazard Communication Program at the site will be in accordance with the “Right-to-Know” requirements of 29 CFR 1910.1200. All employees will be briefed on this program and informed as to the written requirements in this plan.

### ***10.1 Container Labeling***

All containers to be received on site will be inspected to ensure the following: (1) all containers will be clearly labeled as to the contents; (2) the appropriate warning hazards will be noted; and (3) the name and address of the manufacturer will be listed. All secondary containers will be labeled with either an extra copy of the original manufacturers label or with generic labels which have a block for identity and blocks for hazard warning.

### ***10.2 Material Safety Data Sheets***

Copies MSDSs for all hazardous chemicals known or suspected on site, including those that are delivered to the site, are provided in Attachment E. The MSDSs will be maintained at the site and will be available to all employees for review. MSDSs for the site will be made part of the project data and will be maintained by the Construction Management Team after the project is completed.

### ***10.3 Employee Training and Information***

Prior to starting work, each employee will attend a health and safety orientation lecture and will receive the following information:

1. an overview of the requirements of the Hazard Communication Standard, 29 CFR 1910.1200;
2. chemicals present at the workplace;
3. location and availability of the written hazard program;
4. physical and health effects of the site chemicals;
5. methods to be used to determine the presence or release of hazardous chemicals;
6. how to lessen or prevent exposure to the hazardous chemicals through usage of control/work practices and personal protective equipment;
7. emergency procedures to follow;

8. how to read labels and review MSDSs; and
9. location of MSDS files.

#### **10.4 Multi-Employer Worksite Responsibilities**

The Hazard Communication exchange and access requirements pertain to employers who introduce hazardous chemicals into the work site and expose another employer's employees. Subcontractors are required to exchange hazardous material information with others working at the site and will coordinate this information through the SSO. The SSO will in turn keep subcontractor personnel informed of any site changes.

#### **10.5 Lockout/Tagout Program**

Procedures for locking out equipment for maintenance and when equipment is not in use shall be communicated to all employees. Although specifics may vary from equipment to equipment, personnel that may be at risk should understand the basics of implementing lockout procedures.

Lockout/tagout is required anytime equipment is worked on for any reason, or when the equipment is not in use. Four basic steps will be made a part of the lockout/tagout program and will be enforced by the SSO. These steps include:

1. Lock the equipment to prevent its use. Any energized equipment should be shut down by turning the power off or closing valves to eliminate the possibility of electrocution, the inadvertent operation of machinery, or the release of hazardous materials.
2. Identify the equipment to let other personnel know it is not in service, when the lockout/tagout was initiated, and the purpose of the shutdown.
3. Clear the area to assure that other personnel are a safe distance from the equipment before the lockout is tested.
4. Test the equipment to verify that the equipment cannot be energized and that the lockout renders it inoperable. Before the test, check to be sure that all interlocks are engaged.

***ATTACHMENT A***  
***Signature Page***

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***ATTACHMENT C***  
***Incident Report Form***

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## INCIDENT REPORT FORM

CLIENT NAME:

LOCATION OF INCIDENT:

DATE:

EMPLOYEE NAME:

TYPE OF INCIDENT:

1. **EMPLOYEE JOB TITLE:**
2. **SPECIFIC JOB AT TIME OF INCIDENT:**
3. **LEVEL OF PROTECTION WORN AT TIME OF EXPOSURE:**
4. **INCIDENT SUMMARY:**

5. **CORRECTIVE ACTIONS:**

EMPLOYEE SIGNATURE:

6. **SITE SAFETY OFFICER:**

TIME & DATE OF REPORT:

***ATTACHMENT D***  
***Extreme Temperature Guidelines***

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## HEAT STRESS

The following should be used as guidelines in controlling heat stress. The SSO has the responsibility to monitor heat stress throughout each day and to make work/rest recommendations as appropriate. All workers are expected to follow these work/rest cycles.

Heat stress decisions will be based mostly on physiological measurements (pulse rate, skin temperature). Environmental data will also be recorded daily and considered in heat stress evaluations.

Initially, work/rest cycles will be established using pulse rates and the following guidelines. This work/rest schedule may be modified at the discretion of the SSO. The work/rest schedule is based upon guidance set by the ACGIH along with the professional judgment of the SSO:

### Work/Rest Schedule (°C)

<u>Level C</u>	<u>Level D</u>	<u>Work/Rest</u>
< 22.5	< 25.8	Normal
22.5-24.4	25.8-27.5	60/15
24.5-26.4	27.6-29.6	45/15
26.5-29.4	29.7-32.5	30/30
29.5-30.4	32.6-33.5	15/45
30.5-32	33.6-35.2	15/60
> 32	>35	Stop work

### Daily Protocol

- Employee body weights (semi-nude) will be taken immediately before work and at the end of the work day. If the weight loss exceeds 1.5%, the worker should be told to drink more liquids during that evening and the following work days. The worker will also be monitored during the next few work days to ensure the weight loss does not continue at an unacceptable rate.
- Pulse rates will be monitored routinely throughout the workday if temperatures exceed 22.5

°C, frequency depending ambient temperature readings. At minimum, the most active member of each work crew will be monitored during the first two breaks in the morning and the first break after lunch.

- If ambient temperatures exceed 22.5 °C, pulse rates will be taken as follows:

At the end of a cycle of work, the worker goes to a nearby location and sits on a stool or straight chair. At the moment he is seated the observer starts a stopwatch. At 30 seconds the observer begins a pulse count, having previously palpated the radial pulse. This count is continued until one minute. The 30-second count is multiplied by 2 and recorded as “P1”

If P1 exceeds 120, an additional pulse will be taken starting at 2 minutes and 30 seconds to 3 minutes; multiplied by 2 and recorded as P3.

Pulse rates readings:

120 and below (P1) - Worker will be allowed to continue the scheduled work/rest cycle.

Exceeding 120 (P1) - Worker will remain in the rest area until pulse rate returns to 90, or below; additional monitoring will depend upon the pulse rate recovery.

Pulse rate recovery - for individual with P1 greater than 120.

<b>Patterns</b>	<b>P3</b>	<b>P1 – P3</b>
Satisfactory (S)	<90	
High (H)	≥90	≥10
No Recovery (N)	≥90	<10

- Satisfactory patterns need no further comment.
- High recovery patterns indicate work at a high metabolic level with little or no accumulated body heat. Individuals showing this condition should be monitored during the next breaks while work periods are reduced until P1 is 120 or below.
- No recovery patterns indicate too much personal stress. Individuals showing “no recovery” heart rate patterns return to the decontamination trailers and rest for a period no less than one hour. The SSO must monitor the workers and determine if additional medical assistance is needed.

- Fluid intake should be encouraged for workers throughout the day. Workers should frequently drink small amounts; the equivalent of one cup every 15-20 minutes.

## **COLD EXPOSURE**

Personnel working outdoors in low temperatures are subject to cold exposure. Toes, fingers, ears, cheeks, and the nose are especially vulnerable to cold exposure.

Factors influencing the development of a cold injury include ambient temperature, wind velocity, humidity, type of exposure, and duration of exposure. Frostbite and hypothermia are two cold injuries which may occur.

Frostbite is a local injury resulting from cold exposure. It is characterized by a white or pale coloring of the skin. Its symptoms are exhibited in the following stages:

- Just before frostbite occurs, the affected skin may be slightly flushed;
- The skin changes to white or grayish-white in appearance;
- Pain is sometimes felt early but subsides later (often there is no pain);
- Blisters may appear later;
- The affected part feels intensely cold and numb; and
- The victim frequently is not aware of frostbite.

The objectives of first aid are to protect the frozen area from further injury, to warm the affected area rapidly, and to maintain respiration.

Hypothermia is an overall cooling of the body. Its symptoms are usually exhibited in five stages:

- Shivering;
- Apathy, listlessness, sleepiness;
- Unconsciousness, glassy stare, slow pulse, and slow respiratory rate;
- Freezing of the extremities; and
- Death.

To avoid cold exposure injuries, personnel should dress in layers, removing clothing as they generate heat from working. The buddy system must be instituted to ensure signs of frost bite or hypothermia will be noted as soon as possible. Generally, it is easier for someone else to see these signs before the person who is exhibiting them will notice. A work rest regimen, designated by the Site Safety Officer should be implemented early to avoid personnel casualties. If any cold exposure injuries are detected, the Site Safety Officer must be notified immediately.

***ATTACHMENT E***  
***Material Safety Data Sheets***

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# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 1. Product and Company Information

**Product Name:** Rantec® /Procol® / Viscol® Guar Gum

**Manufacturer/Supplier:** Rantec Corporation  
**Address:** 17 Kukuchka Lane  
Ranchester, WY 82839

**Phone Number:** (307) 655-9565  
**Fax Number:** (307) 655-9528  
**e-mail:** [rantec@ranteccorp.com](mailto:rantec@ranteccorp.com)

## 2. Hazards Identification

**OSHA Hazardous Material:** Yes

**OSHA Hazard Categories:**

1. Carcinogen – NO
2. Corrosive – NO
3. Highly Toxic – NO
4. Irritant – Yes
5. Sensitizer – Yes
6. Toxic – NO
7. Target Organ Effect Lung and Cutaneous -- Yes

### Emergency Overview:

Concentrations of dust suspended in the air present a fire and explosion hazard.

Inhalation of dust may cause respiratory irritation and possible lung injury with symptoms of shortness of breath and reduced lung function.

Guar gum is very slippery when wet.

### Acute Health Effects:

**Eye Contact:** Contact may cause irritation based on studies with laboratory animals.

**Skin Contact:** Contact may cause dryness.

**Inhalation:** Inhalation of dust may cause irritation of the nose, throat and respiratory passages. Symptoms include coughing, sore throat, nasal congestion, sneezing wheezing and shortness of breath. Guar gum may cause life-threatening allergic reaction in susceptible individuals.

**Ingestion:** DO NOT INGEST. While this product is not toxic by ingestion, swallowing small amounts could cause complete blockage of the mouth, pharynx, trachea, esophagus and/or gastrointestinal system which may cause choking, suffocation and/or other life threatening medical conditions. Get medical attention immediately.

### Chronic (long-term exposure) Health Effects:

- **Inhalation:** Overexposure to any nuisance dust may cause lung injury. Symptoms include cough, shortness of breath, difficulty breathing and reduced pulmonary function. Repeated exposures may cause allergic sensitization.
- **Carcinogenicity:** None of the components of this product are listed as carcinogens or suspected carcinogens by OSHA, IARC or NTP.
- **Medical Conditions Aggravated by Exposure:** Persons with pre-existing skin and respiratory disorders may be at an increased risk from exposure.



# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 3. Hazards Identification (continued)

### Physical Hazards:

- **Dust:** It is well documented that a dust cloud will fuel an explosion in a confined area with sufficient oxygen and an ignition source. Surface (passive) and airborne (active) dust (fuel) is a potential hazard and the appropriate protective measures should be taken when handling guar outside of the bag in confined work spaces, dust collectors, dryers, mills, sifters, blender, pneumatic conveyance systems, storage tanks, etc. Utilize good housekeeping to remove surface dust from floors, walls, beams, around equipment, etc.
- **Slick Surfaces:** It is possible that an employee will be exposed to guar powder or dust in combination with water on work platform, floor or stair, which will result in a slippery surface.

## 3. Composition / Information on Ingredients

Ingredient	CAS Number	% Weight
Guar Gum	9000-30-0	100
Chemical Family:	Carbohydrate	
Formula:	Approximately $(C_6H_{10}O_5)_n$	

## 4. First Aid Measures

**Eye:** Flush immediately with large amounts of water. Eyelids should be held away from the eyeball to ensure thorough rinsing. If irritation persists get medical attention.

**Skin:** First aid is not normally needed. Wash exposed skin with soap and water after use. If irritation or rash develops get medical attention. Use skin lotion if dryness occurs.

**Inhalation:** If symptoms of irritation or allergy develop, remove person from source of exposure to fresh air. If symptoms persist get medical attention.

**Ingestion:** Swallowing even small amounts may have serious, life-threatening effects. Get immediate medical attention.

## 5. Firefighting Measures

**Flashpoint:** Not Applicable

**Auto-ignition Temperature:** Not Determined

**Lower Explosion Limit:** 0.040 oz/cf

**Upper Explosion Limit:** Not determined

**Extinguishing Media:** Use water fog, dry chemical, carbon dioxide or foam. Do not use streams of water as dust dispersed by water streams can explode.

**Special Fire Fighting Procedures:** Wear positive pressure, self-contained breathing apparatus and full protective clothing.

**Unusual Fire and Explosion Hazards:** Powder has the potential to form explosive mixtures with air. It is well documented that a dust cloud will fuel an explosion hazard. Surface (passive) and airborne (active) dust (fuel) are a potential hazard and the appropriate protective measures should be taken when handling guar gum outside of the original packaging. Avoid creating dust. Keep away from heat, sparks and open flames. As with all dusty materials, use preventative measures including spark proof motors and ventilation to control dust. Utilize good housekeeping to remove surface dust from floors, walls, beams, around equipment, etc.

**Combustion Products:** Oxides of carbon and nitrogen.



# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 6: Accidental Release Measures

Wear appropriate protective clothing and equipment. Caution: Guar gum is **very slippery when wet**. Suspended dust may present a serious dust explosion hazard. Sweep up or vacuum, avoiding the creation of airborne dust. Keep spilled product away from flammable and combustible materials. Use vacuum equipment specifically designed for combustible dusts. Collect into a suitable container for disposal. Wash residual traces with hot water after sweep-up is complete. Test area for residual slippery conditions.

## 7. Handling and Storage

**Handling:** Avoid generating and breathing dust. Avoid eye contact. Use with adequate local exhaust ventilation and dust collection to maintain the concentration of airborne dust below the exposure limits. If clothing becomes contaminated, remove and launder before re-use. Wash thoroughly after handling. Keep product away from oxidizers and all sources of ignition including flames, electrical sparks, hot surfaces, pilot lights, etc.

**Storage:** Keep product dry. Store in a cool, dry area. Keep containers closed to avoid moisture absorption.

## 8. Exposure Controls / Personal Protection

Ingredient	Exposure Limits
Guar Gum	15 mg/m <sup>3</sup> (Total Particulate) PEL-TWA 5 mg/m <sup>3</sup> (Respirable Particulate) TLV-TWA

**Engineering Controls:** Consult a qualified engineer for evaluation of materials handling and explosion protection system(s).

### Personal Protective Equipment (PPE):

- **Eye Protection:** Safety glasses or goggles recommended.
- **Skin Protection:** Rubber, plastic or leather gloves recommended.
- **Respiratory Protection:** If the concentrations exceed the Threshold Value Limit (TLV), a NIOSH approved dust respirator, supplied air respirator or self-contained breathing apparatus is recommended. Select appropriate respiratory protection for respirable particulates based on consideration of the airborne workplace concentrations and duration of exposure. Select and use respirators in accordance with 29 CFR 1910.134 <http://www.access.gpo.gov/nara/cfr/cfr-retrieve.html#page1> , ANSI Z88.2 <http://www.ansi.org/>, the NIOSH Respirator Decision Logic and good industrial hygiene practice <http://www.cdc.gov/niosh/homepage.html>. To simplify selection of the appropriate respirator, OSHA has developed the Advisor Genius. Available online, the advisor genius allows a safety professional to input the conditions under which the respirator will be used and receive a recommendation of the type of respirator to use. The advisor also contains information about types of respirators and factors that affect respirator use. The online advisor contains a set of options as to the use of the respirator (firefighting, welding, escape purposes, confined areas) and then generates a report with the relevant OSHA standard indicated. The advisor is available at [http://www.osha.gov/SLTC/etools/respiratory/respirator\\_selection.html](http://www.osha.gov/SLTC/etools/respiratory/respirator_selection.html).

## 9. Physical and Chemical Properties

**Boiling Point:** Not Applicable

**Melting Point:** Decomposes

**Vapor Pressure:** Not Applicable

**Vapor Density (Air=1):** Not Applicable

**% Solubility in Water:** Complete

**Odor/Appearance:** Creamy white powder with a bean-like odor.

**Specific Gravity:** Not applicable

**% Volatile:** Not applicable

**Evaporation Rate (Butyl Acetate=1):** Not Applicable

**pH:** 5-8

**Octanol/Water Partition Coefficient:** Not Applicable



# MATERIAL SAFETY DATA SHEET

Guar Gum  
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## 10. Stability and Reactivity

**Stability:** Material is stable.

**Incompatibility:** Avoid high temperatures, sparks, open flames and moisture. Avoid contact with strong oxidizing agents.

**Hazardous Reactions-Decomposition Products:** Combustion may produce carbon dioxide, carbon monoxide and oxides of nitrogen.

**Hazardous Polymerization:** Will not occur.

## 11. Toxicological Information

**Guar Gum:** Oral rat LD50: 9.4g/kg

Guar gum is a natural food additive, although direct use in powder or pill form is banned by the FDA due to the risk of respiratory or gastrointestinal blockage

## 12. Ecological Information

NOEC – 100%

No other ecotoxicity data is available at this time.

## 13. Disposal Considerations

Dispose in compliance with all applicable federal, state and local regulations. Do not dump down sewers or drains as this may cause blockage.

## 14. Transport Information

### U.S. Department of Transportation (DOT)

**Proper Shipping Name:** Not Regulated

**Hazard Class:** N/A

**UN/NA Code:** N/A

**Packing Group:** N/A

**Labels Required:** N/A

### IMDG CODE

**Proper Shipping Name:** NOT REGULATED

**Hazard Class:** N/A

**UN/NA Code:** N/A

**Packaging Group:** N/A

**Labels Required:** N/A

## 15. Regulatory Information

### Regulatory Information

The United States Food and Drug Administration, the European Economic Community and the World Health Organization accept guar gum as a food additive/ingredient providing it meets specified purity standards and dosage limitations. Maximum usage levels permitted may vary from country to country. Guar gum has been affirmed as GRAS by the United States Food & Drug Administration under title 21, CFR, part 184.1339; it is listed as item G.3 of Table IV, Division 16, of the Canadian Food and Drug Regulations and is referenced E-412 under the EEC Council Directives.

### Comprehensive Environmental Response and Liability Act of 1980 (CERCLA) Reportable Quantity:

This product is not subject to CERCLA reporting requirements as it is sold.



# MATERIAL SAFETY DATA SHEET

Guar Gum  
10 November 2009

## 15. Regulatory Information (continued)

**OSHA Hazard Categories:** Irritant, Sensitizer, Target Organ Effect.

**Superfund Amendments and Reauthorization Act (SARA) Title III Information:**

**SARA Section 311/312 Hazard Categories:** Fire Hazard, Acute Health

**This product contains the following toxic chemical(s) subject to reporting requirements of SARA Section 313:** None

**California Proposition 65:** Guar gum is not a chemical known to the State of California to cause cancer or reproductive toxicity under the "Safe Drinking Water and Toxic Enforcement Act of 1986".

**Toxic Substances Control Act (TSCA):** All components of this product are listed on the TSCA inventory or exempt from notification requirements.

**Canadian Environmental Protection Act:** All of the components of this product are listed on the Canadian Domestic Substances List or exempt from notification requirements.

**European Inventory of Existing Commercial Chemical Substances (EINECS):** All of the components of this product are listed on the EINECS Inventory or exempt from notification requirements.

**Japan MITI:** All of the components of this product are existing chemical substances as defined in the Chemical Substance Control Law.

**Australian Inventory of Chemical Substances:** All of the components of this product are listed on the AICS Inventory or exempt from notification requirements.

**Canadian WHMIS Classification:** Class B, Division 4 (Flammable Solid)

## 16. Other Information

**NFPA Hazard Ratings:**

NFPA® Flammable (combustible dust) with representative diameter less than 420 microns (40 mesh).

Health: 1                      Flammability: 2                      Reactivity: 0

**HMIS Hazard Ratings:**

Health: 1                      Flammability: 1                      Reactivity: 0

**Abbreviations:**

ACGIH	American Conference Of Governmental Industrial Hygienists
ANSI	American National Standards Institute
CAS	Chemical Abstracts Service
CDC	Centers for Disease Control and Prevention
CFR	The Code of Federal Regulations
EEC	European Economic Community
EINECS	European Inventory of Existing Commercial Chemical Substances
EPA	United States Environmental Protection Agency
FDA	United States Food and Drug Administration
HMIS	Hazardous Materials Identification System
IARC	International Agency for Research on Cancer
IMDG	International Maritime Dangerous Goods



# MATERIAL SAFETY DATA SHEET

Guar Gum  
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## 16. Other Information -- Abbreviations (continued)

LD50	Lethal Dose expected to cause death in 50% of the test animals
MITI	Ministry of International Trade and Industry
NFPA	National Fire Protection Association
NIOSH	CDC - National Institute for Occupational Safety
NTP	National Toxicological Program
OSHA	U.S. Department of Labor, Occupational safety and health administration
PEL	OSHA - permissible exposure limit
TLV	ACGIH - threshold limit value
TWA	Time weighted average
UN/NA	United Nations / North America
US	United States
WHMIS	Workplace Hazardous Materials Information System

### NOTICE:

Information contained in the company's technical literature is believed to be accurate. It is a condition to any sale that buyer conduct an examination of the products under its own operating conditions within a reasonable time after the products have been delivered to buyer and determined to its own satisfaction that the products delivered hereunder are of acceptable quality and are suitable for buyer's contemplated use. The company makes no representation or warranty of any kind, express or implied, with respect to its products or to the use of its products by the buyer in combination with other substances, whether as to merchantability, fitness for a particular purpose, or any other matter. Statements concerning the possible use of the company's products are not intended as recommendations to use the company's products in the infringement of any patent.

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# BUSAN 1058

Revision date: 12/4/2009

Buckman Laboratories, Inc.  
1256 North McLean Boulevard  
Memphis, TN 38108  
Phone 1-800-282-5626

**24 Hour Emergency Phone****(901) 767-2722****SECTION 1*****OSHA HAZARD CLASSIFICATIONS*****Corrosive to eyes and skin. Weak sensitizer Avoid breathing vapors or spray mists.****SECTION 2*****HAZARDOUS COMPONENTS***

<u>Chemical Name</u>	<u>CAS Number</u>	<u>% by Weight</u>	<u>TLV</u>
Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione	533-74-4	24	Not available.
Sodium hydroxide	1310-73-2	11.25	ACGIH (United States). CEIL: 2 mg/m <sup>3</sup> OSHA (United States). TWA: 2 mg/m <sup>3</sup>

*While some substances are claimed as trade secret in accordance with the provision of OSHA 29 CFR 1910.1200(i), all known hazards are clearly communicated within this document.*

**SECTION 3*****FIRST AID INFORMATION***

- Eye Exposure: Flush immediately with copious amounts of tap water or normal saline (minimum of 15 minutes). Take exposed individual to a health care professional, preferably an ophthalmologist, for further evaluation.
- Skin Exposure: Wash exposed area with plenty of water. Repeat washing. Remove contaminated clothing and wash thoroughly before reuse. If irritation persists consult a health care professional.
- Inhalation: If exposure by inhalation is suspected, immediately move exposed individual to fresh air. If individual experiences nausea, headache, dizziness, has difficulty in breathing or is cyanotic, seek a health care professional immediately.
- Ingestion: **DO NOT INDUCE VOMITING.** Rinse with copious amounts of water or milk, first. Irrigate the esophagus and dilute stomach contents by slowly giving one (1) to two (2) glasses of water or milk. Avoid giving alcohol or alcohol related products. In cases where the individual is semi-comatose, comatose or convulsing, **DO NOT GIVE FLUIDS BY MOUTH.** In case of intentional ingestion of the product seek medical assistance immediately; take individual to nearest medical facility.

## SECTION 4

**PRIMARY ROUTES OF EXPOSURE****1. Effects from Acute Exposure:**

- Eye Exposure:** Very hazardous in case of eye contact (irritant, corrosive). Inflammation of the eye is characterized by redness, watering and itching.
- Skin Exposure:** Hazardous in case of skin contact (corrosive, irritant, sensitizer). Skin contact may produce burns. Skin inflammation is characterized by itching, scaling, reddening or, occasionally, blistering.
- Inhalation:** May be harmful if inhaled. Do not breathe spray mists of the undiluted product. Effects will depend upon solution strength and length of time of exposure.
- Ingestion:** Ingestion is not expected to be a primary route of exposure.

**2. Effects from Chronic Exposure:**

The effects from chronic exposure to this product have not been fully evaluated.

## SECTION 5

**Toxicological Information****Acute Effects:**

Acute Oral (LD50) = 1180 mg/kg Rat  
Acute Dermal (LD50) = >2000 mg/kg Rabbit

**Irritant / Sensitization Effects:**

Very hazardous in case of eye contact (irritant, corrosive). Inflammation of the eye is characterized by redness, watering and itching.  
Hazardous in case of skin contact (corrosive, irritant, sensitizer). Skin contact may produce burns. Skin inflammation is characterized by itching, scaling, reddening or, occasionally, blistering.  
May be harmful if inhaled. Do not breathe spray mists of the undiluted product. Effects will depend upon solution strength and length of time of exposure.

**Target Organs Effects:**

May cause damage to the following organs: upper respiratory tract, skin, eyes.

**Other Health Effects:**

None known.

## SECTION 6

**Environmental Toxicological Information**

No information available.

## SECTION 7

**Physical and Chemical Properties**

**Appearance** ..... Clear, yellow to amber liquid  
**Odor** ..... Pungent.  
**Density** ..... 1.15 g/cm<sup>3</sup> at 25°C (77°F)  
**Flash Point** ..... Open cup: >100°C (212°F) (ASTM D 1310).  
**Melting/Freezing Point** .... -23.333°C (-10°F)  
**Boiling Point** ..... Not available.  
**Solubility** ..... Easily soluble in cold water. Easily soluble in hot water.

<i>pH (Neat)</i> .....	>12 [Basic.]
<i>pH (100 ppm in water)</i> .....	8 - 9
<i>Vapor Pressure</i> .....	Not available.
<i>o/w Partition Coefficient</i> .....	Not available.
<i>Oxidizing/Reducing Properties</i> .	Not available.
<i>Viscosity</i> .....	Not available.
<i>Additional pH Information</i> .....	Not available.

**NOTE:** *The physical data presented above are typical values and should not be construed as specifications.*

<b>SECTION 8</b>	<i>Fire and Explosion Information</i>
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<i>Flammable Limits</i> .....	Not available.
<i>Extinguishing Media</i> .....	Water fog, carbon dioxide, foam, dry chemical.
<i>Special Firefighting Procedures</i> .....	Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

<b>SECTION 9</b>	<i>Reactivity Information</i>
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<i>Stability</i> .....	Stable under normal conditions of use and storage.
<i>Incompatibility</i> .....	Strong acids, strong bases, strong oxidizers, and reducing agents
<i>Hazardous Decomposition Products</i> .....	Carbon oxides (CO, CO <sub>2</sub> ), carbon disulfide, nitrogen oxides (NO, NO <sub>2</sub> ...), sulfur oxides (SO <sub>2</sub> , SO <sub>3</sub> ...), and hydrogen sulfide.

<b>SECTION 10</b>	<i>Handling Precautions</i>
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Eye wash fountains and safety showers in the work place are **STRONGLY** recommended. Chemical resistant gloves, indirect ventilation goggles, body-protective clothing, and chemical resistant safety shoes are required. When splashing can occur, a neoprene apron or neoprene rain suit and a face shield are advisable. Local exhaust should be maintained to control vapor and mist levels. Provide dilution ventilation to control vapor and/or mist level. When misting may occur in the work area, a NIOSH/MSHA approved respirator may be required. Use a respirator approved for the material and level of exposure. A comprehensive respiratory protection program is needed when respirators must be used. The handling precautions for this product are based on the characteristics of the neat product unless otherwise specified.

<b>SECTION 11</b>	<i>Satisfactory Materials of Construction</i>
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Teflon.  
 Polypropylene  
 PVC - rigid  
 Polyethylene - low density  
 Polyethylene - high density  
 Van leer epoxy liner 136

**NOTE:** With respect to all other materials not listed above, user should be aware that use of such materials with this product may be hazardous and result in damages to such materials and other property and personal injuries. No data concerning such materials not listed above should be implied by the user.

## SECTION 12

*Spill, Leak, and Disposal Procedures***SPILL AND LEAK RESPONSE GUIDELINES:**

**Important:** Before responding to a spill or leak of this product, review each section of this MSDS. Follow the recommendations given in the Handling Precautions sections. Check the Fire and Explosion Data section to determine if the use of non-sparking tools is merited. Insure that spilled or leaked product does not come into contact with materials listed as incompatible. If irritating fumes are present, consider evacuation of affected areas.

**Emergency Response Assistance:** Emergency technical assistance is available at any time from Buckman Laboratories, Inc., by calling (901) 767-2722. Collect calls are accepted.

Initially minimize area affected by the spill or leak. Block any potential routes to water systems (e.g., sewers, streams, lakes, etc.). Based on the product's toxicological and chemical properties, and on the size and location of the spill or leak, assess the impact on contaminated environments (e.g. water systems, ground, air equipment, etc.). There are no methods available to completely eliminate any toxicity this product may have on aquatic environments. Minimize adverse effects on these environments. Buckman Laboratories, Inc. can be contacted for technical assistance. Determine if federal, state, and/or local release notification is required (see Regulatory Information section of this MSDS). Recover as much of the pure product as possible into appropriate containers. Later, determine if this recovered product can be used for its intended purpose. Address clean-up of contaminated environments. Spill or leak residuals may have to be collected and disposed of. Clay, soil, or commercially available absorbents may be used to recover any material that can not readily be recovered as pure product. Flushing residual material to an industrial sewer, if present at the site of a spill or leak incident, may be acceptable if authorized approval is obtained. If product and/or spill/leak residuals are flushed to an industrial sewer, insure that they do not come into contact with incompatible materials.

**DISPOSAL GUIDELINES**

**Note:** Follow federal, state, and local regulations governing the disposal of waste materials.

**Neat Product:** Contact your Buckman representative.

**Contaminated Materials:** Determine if waste containing this product can be handled by available industrial effluent system or other on-site waste management unit. If off-site management is required, contact a company experienced in industrial waste management.

**Container Disposal:** If assistance is needed, contact your Buckman sales representative.

## SECTION 13

*Transportation and Shipping Information**DOT Shipping Information:*

**UN1824 , SODIUM HYDROXIDE SOLUTION , Class 8, P.G. III , ( ERG Guide 154 )**

*IMO/IMDG Shipping Information:*

**UN1824 , SODIUM HYDROXIDE SOLUTION , Class 8, P.G. III , ( EmS No. 8-06 , ERG Guide 154, HazMat Code 4935240 )**

*IATA Shipping Information:*

**UN1824 , SODIUM HYDROXIDE SOLUTION , Class 8, P.G. III , ( ERG Guide 154, ERG Code 8L )**  
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**When shipped in a single package containing MORE THAN 922 GAL (8,850 LBS), this product contains a reportable quantity of SODIUM HYDROXIDE and the shipping description should be preceded or followed by the letters "RQ".**

*Unless otherwise stated, the shipping information provided above applies only to non-bulk containers of this product. Proper shipping name and general shipping information may vary depending on packaging and mode of shipment. All products shipped from Buckman locations have been properly packaged and labeled according to appropriate hazardous materials shipping regulations. If any alteration of packaging, product, or mode of transportation is further intended, different shipping information, including but not limited to proper shipping name, RQ designation, and labeling may apply. For further information pertaining to the shipping requirements for this product, contact Buckman's Transportation Department or DOT Coordinator.*

## SECTION 14

*Regulatory Information*

The following Regulations are known to apply to the use and disposal of this product. Additional Federal, State and Local regulations may also be applicable.

SARA (Superfund Amendments and Reauthorization Act)

SARA 302 Extremely Hazardous Substances List ...

No components of this product are listed.

SARA 312 Hazard Category ...

Immediate (Acute) Health Hazard

SARA 313 Toxic Chemicals List ...

This product contains the following toxic chemical(s) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372 :

Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione

CERCLA (Comprehensive Environmental Response, Compensation and Liability Act)

Sodium hydroxide ..... RQ = 1000 lbs.

RCRA (Resource Conservation and Recovery Act) Listed Hazardous Waste

No components of this product are listed; however, this product may need to be disposed of as a Hazardous Waste due to its corrosivity characteristics (pH >12).

CWA (Clean Water Act) Listed Substances

No components of this product are listed.

FDA ( Food and Drug Administration)

This product is allowed under the following FDA (21 CFR) sections :175.105, 176.230, 176.300, 178.3120.

Bundesinstitut für Risikobewertung (BfR) (The Federal Institute for Risk Assessment)

XXXVI, XXXVI/2, XIV

TSCA (Toxic Substances Control Act) Applicability

All components are listed on the TSCA Inventory. Registered pesticides are exempt from the requirements of TSCA.

FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act)

This product is a registered pesticide. EPA Reg. No. 1448-103

HMIS/NPCA Rating ... Health 3 Flammability 1 Reactivity 1

NFPA Ratings ..... Health 3 Flammability 1 Reactivity 1

State Regulations

Various State Right To Know Acts ...

Non-proprietary hazardous chemicals are listed in Section 2 of this MSDS. Should you require further information on specific proprietary or inert ingredients please contact Buckman Laboratories' Regulatory Affairs Department.

The information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application which is not described in the Data Sheet is the responsibility of the user. This Material Data Safety Sheet was prepared to comply with the OSHA Hazard Communication regulations. While some components are claimed Trade Secret under OSHA Hazard Communication regulations, all known OSHA hazards associated with the Trade Secret component(s), if contained in this product, are fully disclosed.

Buckman Laboratories, Inc. warrants that this product conforms to its chemical description and is reasonably fit for the purpose referred to in the directions for use when used in accordance with the directions under normal conditions. Buyer

assumes the risk of any use contrary to such directions.

**Seller makes no other warranty or representation of any kind, express or implied, concerning the product, including NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS OF THE GOODS FOR ANY OTHER PARTICULAR PURPOSE. No such warranties shall be implied by law and no agent of seller is authorized to alter this warranty in any way except in writing with a specific reference to this warranty.**

**The exclusive remedy against seller shall be in a claim for damages not to exceed the purchase price of the product, without regard to whether such a claim is based upon breach of warranty or tort.**

**Any controversy or claim arising out or relating to this contract, or breach thereof, shall be settle by arbitration in accordance with the commercial arbitration rules of the American Arbitration Association, and judgement upon the rendered by the Arbitrator(s) may be entered in any court having jurisdiction thereof.**

MSDS # 7522



Arch Chemicals, Inc.

**MATERIAL  
SAFETY DATA**

FOR ANY EMERGENCY, CALL 24 HOURS/7 DAYS:	1-800-654-6911
FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC®:	1-800-424-9300
FOR ALL MSDS QUESTIONS & REQUESTS, CALL MSDS CONTROL:	1-800-511-MSDS

**PRODUCT NAME: CALCIUM HYPOCHLORITE****SECTION 1 PRODUCT AND COMPANY IDENTIFICATION**

REVISION DATE: 03-04-2004 SUPERCEDES: 10-01-2003  
MSDS NO: 00002-0211 - 30518

MANUFACTURER: Arch Chemicals, Inc. 501 Merritt 7 PO Box 5204 Norwalk, CT 06856-5204

SYNONYMS: None

CHEMICAL FAMILY: Hypochlorite

FORMULA: Not Applicable/Mixture

~~DESCRIPTION: Sanitizer and oxidizer~~

OSHA HAZARD CLASSIFICATION: Oxidizer, toxic by inhalation, corrosive, skin and eye hazard, lung toxin

**SECTION 2 COMPONENT DATA****PRODUCT COMPOSITION**

CAS or CHEMICAL NAME: Calcium hypochlorite

CAS NUMBER: 7778-54-3

PERCENTAGE RANGE: 60-80%

HAZARDOUS PER 29 CFR 1910.1200: Yes

EXPOSURE STANDARDS: 3 mg/cubic meter (ceiling) as Chlorine:Manufacturer's Internal Exposure Standard

CAS or CHEMICAL NAME: Sodium chloride

CAS NUMBER: 7647-14-5

PERCENTAGE RANGE: 10-20%

HAZARDOUS PER 29 CFR 1910.1200: No

EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium chlorate

CAS NUMBER: 10137-74-3

PERCENTAGE RANGE: 0-5%

HAZARDOUS PER 29 CFR 1910.1200: Yes

EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium chloride

CAS NUMBER: 10043-52-4

PERCENTAGE RANGE: 0-5%

HAZARDOUS PER 29 CFR 1910.1200: Yes

EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium hydroxide

CAS NUMBER: 1305-62-0

PERCENTAGE RANGE: 0-4%

00002-0211- 30518

CALCIUM HYPOCHLORITE

Page 1 of 9

HAZARDOUS PER 29 CFR 1910.1200: Yes

## EXPOSURE STANDARDS:

	OSHA (PEL)		ACGIH (TLV)	
	ppm	mg/cubic-meter	ppm	mg/cubic-meter
TWA:	None			5
CEILING:	None		None	
STEL:	None		None	

CAS or CHEMICAL NAME: Calcium carbonate

CAS NUMBER: 471-34-1

PERCENTAGE RANGE: 0-5%

HAZARDOUS PER 29 CFR 1910.1200: Yes

## EXPOSURE STANDARDS:

	OSHA (PEL)		ACGIH (TLV)	
	ppm	mg/cubic-meter	ppm	mg/cubic-meter
TWA:		15 (Total Dust) 5 (Respirable fraction)		10
CEILING:	None		None	
STEL:	None		None	

CAS or CHEMICAL NAME: Water

CAS NUMBER: 7732-18-5

PERCENTAGE RANGE: 5.5-10%

HAZARDOUS PER 29 CFR 1910.1200: No

EXPOSURE STANDARDS: None Established

## SECTION 3 PRECAUTIONS FOR SAFE HANDLING AND STORAGE

DO NOT TAKE INTERNALLY. AVOID INHALATION OF DUST AND FUMES. AVOID CONTACT WITH EYES, SKIN OR CLOTHING. UPON CONTACT WITH SKIN OR EYES, WASH OFF WITH WATER. REMOVE AND WASH CONTAMINATED CLOTHING BEFORE REUSE.

STORAGE CONDITIONS: Keep product tightly sealed in original containers. Store product in a cool, dry, well-ventilated area. Store away from combustible or flammable products. Keep product packaging clean and free of all contamination, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

DO NOT STORE AT TEMPERATURES ABOVE: 52 Deg.C (125 Deg.F)  
Storage above this temperature may result in rapid decomposition, evolution of chlorine gas and heat sufficient to ignite combustible products.

## PRODUCT STABILITY AND COMPATIBILITY

SHELF LIFE LIMITATIONS: Shelf life (that is, the period of time before the product goes below stated label strength) is determined by storage time and temperatures. Do not store product at temperatures above 52 Deg.C (125 Deg.F). When stored under moderate temperature conditions, product will maintain stated label strength for approximately two years. Prolonged storage at 35 Deg.C (95 Deg.F) or above will significantly shorten the shelf life. Storage in a climate-controlled storage area or building is recommended in those areas where extremes of high temperature occur.

INCOMPATIBLE MATERIALS FOR PACKAGING: Product packaging must be clean and free of contamination by other materials, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT: Do not allow product to come in contact with other materials, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

#### SECTION 4 PHYSICAL DATA

APPEARANCE: White, free flowing powder  
FREEZING POINT: Not Applicable  
BOILING POINT: Not Applicable  
DECOMPOSITION TEMPERATURE: Onset - Approximately 170-180 Deg.C  
(338-356 Deg.F)  
SPECIFIC GRAVITY: Not Applicable  
BULK DENSITY: 0.8 g/cc, loose  
pH @ 25 DEG.C: 10.4-10.8 (1% solution)  
VAPOR PRESSURE @ 25 DEG.C: Not Applicable  
SOLUBILITY IN WATER: Approximately 18% @ 25 Deg.C (Product also contains calcium hydroxide and calcium carbonate which will leave a residue.)  
VOLATILES, PERCENT BY VOLUME: Not Applicable  
EVAPORATION RATE: Not Applicable  
VAPOR DENSITY: Not Applicable  
MOLECULAR WEIGHT: 143 (Active ingredient)  
ODOR: Chlorine-like  
COEFFICIENT OF OIL/WATER DISTRIBUTION: Not Applicable

#### SECTION 5 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

##### PERSONAL PROTECTION FOR ROUTINE USE OF PRODUCT:

RESPIRATORY PROTECTION: Wear NIOSH approved respirator if dusts are created.  
VENTILATION: Use local exhaust ventilation to minimize dust and chlorine levels where industrial use occurs. Otherwise, ensure good general ventilation.  
SKIN AND EYE PROTECTIVE EQUIPMENT: Wear gloves, and safety glasses to avoid skin and eye contact. Where industrial use occurs, chemical goggles or full impermeable suit may be required.

##### EQUIPMENT SPECIFICATIONS (WHEN APPLICABLE):

RESPIRATOR TYPE: NIOSH approved full face-piece respirator with chlorine cartridges and dust/mist prefilter.  
PROTECTIVE CLOTHING TYPE: Neoprene  
(This includes: gloves, boots, apron, protective suit)

#### SECTION 6 FIRE AND EXPLOSION HAZARD INFORMATION

This product is chemically reactive with many substances. Any contamination of the product with other substances by spill or otherwise may result in a chemical reaction and fire. This product is a strong oxidizer which is capable of intensifying a fire once started.

##### FLAMMABILITY DATA:

FLAMMABLE: No  
COMBUSTIBLE: No  
PYROPHORIC: No  
FLASH POINT: Not Applicable  
AUTOIGNITION TEMPERATURE: Not Applicable  
FLAMMABLE LIMITS AT NORMAL ATMOSPHERIC TEMPERATURE AND PRESSURE (PERCENT VOLUME IN AIR): UEL - Not Applicable LEL - Not Applicable

## NFPA RATINGS:

Health: 3  
Flammability: 0  
Reactivity: 1  
Special Hazard Warning: OX (OXIDIZER)

## HMIS RATINGS:

Health: 3  
Flammability: 0  
Reactivity: 1

## EXTINGUISHING MEDIA:

Water only

## FIRE FIGHTING TECHNIQUES AND COMMENTS:

Use water to cool containers exposed to fire. Also see Section 11.

OTHER: Do not use dry extinguishers containing ammonium compounds

## SECTION 7 REACTIVITY INFORMATION

## CONDITIONS UNDER WHICH THIS PRODUCT MAY BE UNSTABLE:

TEMPERATURES ABOVE: 170 Deg.C (338 Deg.F)

MECHANICAL SHOCK OR IMPACT: No

ELECTRICAL (STATIC) DISCHARGE: No

HAZARDOUS POLYMERIZATION: Will not occur

INCOMPATIBLE MATERIALS: This product is chemically reactive with many substances, including, e.g., other pool treatment products, acids, organics, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, corrosive, flammable or combustible materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Chlorine gas

OTHER CONDITIONS TO AVOID: Storage at temperatures >125 Deg.F (52 Deg.C)

Prevent ingress of humidity and moisture into container or package.  
Always close the lid.

## SUMMARY OF REACTIVITY: (See also Section 6)

OXIDIZER: Yes  
PYROPHORIC: No  
ORGANIC PEROXIDE: No  
WATER REACTIVE: No

OTHER: Arch calcium hypochlorite products meet the specifications of ASTM method E-487-74 as set forth in 49 C. F. R. Sec. 173.21, Title 49-Code of Federal Regs. (DOT Regs.)

## SECTION 8 FIRST AID

EYES: Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Call a physician at once.

SKIN: Immediately flush with water for at least 15 minutes. Call a physician. If clothing comes in contact with the product, it should be removed immediately and laundered before reuse.

INGESTION: Immediately drink large quantities of water. DO NOT induce vomiting. Call a physician at once. DO NOT give anything by mouth if the person is unconscious or if having convulsions.

INHALATION: Remove victim to fresh air. Support respiration if needed. Call a physician.

## SECTION 9 TOXICOLOGY AND HEALTH INFORMATION

## ROUTES OF ABSORPTION

Inhalation, skin and eye contact, ingestion

## WARNING STATEMENT AND WARNING PROPERTIES

MAY BE FATAL IF SWALLOWED. AVOID BREATHING DUST OR FUMES. HARMFUL IF PRODUCT IS INHALED IN HIGH CONCENTRATIONS. CAUSES SKIN, EYE, DIGESTIVE TRACT AND RESPIRATORY TRACT BURNS.

## HUMAN RESPONSE DATA

ODOR THRESHOLD: Approximately 1.4 mg/cubic-meter, based on odor threshold of chlorine.

IRRITATION THRESHOLD: Approximately 13-22 mg/cubic meter, based on the irritation threshold of chlorine.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH: Approximately 45 mg/cubic-meter, based on IDLH concentration of chlorine.

## SIGNS, SYMPTOMS, AND EFFECTS OF EXPOSURE

## INHALATION

## ACUTE:

Inhalation of dust or vapor from this product can be irritating to the nose, mouth, throat and lungs. In confined areas, mechanical agitation can result in high levels of dust, and reaction with incompatible materials (as listed in Section VII) can result in high concentrations of chlorine vapor, either of which may result in burns to the respiratory tract, producing lung edema, shortness of breath, wheezing, choking, chest pains, impairment of lung function and possible permanent lung damage.

## CHRONIC:

Chronic (repeated) inhalation exposure may cause impairment of lung function and permanent lung damage.

## EYE

Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage.

## SKIN

## ACUTE:

Dermal exposure can cause severe irritation and/or burns characterized by redness, swelling and scab formation. Prolonged skin exposure may cause permanent damage.

## CHRONIC:

Effects from chronic skin exposure would be similar to those from single exposure except for effects secondary to tissue destruction.

## INGESTION

## ACUTE:

Irritation and/or burns can occur to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding and/or tissue ulceration. Due to the corrosive nature of this product, ingestion may be fatal.

## CHRONIC:

There are no known or reported effects from chronic exposure except for effects similar to those experienced from single exposure.

## MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Asthma, respiratory and cardiovascular disease

## INTERACTIONS WITH OTHER CHEMICALS WHICH ENHANCE TOXICITY

None known or reported

**ANIMAL TOXICOLOGY****ACUTE TOXICITY:**

Inhalation LC 50: Approximately 1300 mg/cubic-meter (1 hr., rat) -  
based on acute inhalation toxicity for chlorine  
Oral LD 50: 850 mg/kg. (rat)  
Dermal LD 50: > 2 g/kg. (rabbit)  
Causes burns to eyes and skin

**CHRONIC TOXICITY:**

There are no known or reported effects from repeated exposure.

**REPRODUCTIVE TOXICITY:**

Calcium hypochlorite has been tested for teratogenicity in laboratory animals. Results of this study have shown that calcium hypochlorite is not a teratogen.

**CARCINOGENICITY:**

This product is not known or reported to be carcinogenic by any reference source, including: IARC, OSHA, NTP or EPA. One hundred mice were exposed dermally 3 times a week for 18 months to a solution of calcium hypochlorite. Histopathological examination failed to show an increased incidence of tumors.

IARC (International Agency for Research on Cancer) reviewed studies conducted with several hypochlorite salts. IARC has classified hypochlorite salts as having inadequate evidence for carcinogenicity to humans and animals. IARC therefore considers hypochlorite salts to be not classifiable as to their carcinogenicity to humans.

**MUTAGENICITY:**

Calcium hypochlorite has been tested in the Dominant lethal assay in male mice, and it did not induce a dominant lethal response. Calcium hypochlorite has been reported to produce mutagenic activity in two in vitro assays. It has, however, been shown to lack the capability to produce mutations in animals based on results from the micronucleus assay. In vitro assays frequently are inappropriate to judge the mutagenic potential of bactericidal chemicals due to a high degree of cellular toxicity. The concentration which produces mutations in these in vitro assays is significantly greater than the concentrations used for disinfection. Based on high cellular toxicity in in vitro assays and the lack of mutagenicity in animals, the risk of genetic damage to humans is judged not significant.

**AQUATIC TOXICITY:**

Bluegill, 96 hr. LC50: 0.088 mg/l (nominal, static)  
Rainbow trout, 96 hr. LC50: 0.16 mg/l (nominal, static)  
Daphnia magna, 48 hr. LC50: 0.11 mg/l (nominal, static)

**TOXICITY TO WILDLIFE:**

Bobwhite quail, dietary LC50: > 5,000 ppm  
Mallard ducklings, dietary LC50: > 5,000 ppm  
Bobwhite quail, oral LD50: 3474 mg/kg.

**SECTION 10 TRANSPORTATION INFORMATION**

THIS MATERIAL IS REGULATED AS A DOT HAZARDOUS MATERIAL.

DOT DESCRIPTION FROM THE HAZARDOUS MATERIALS TABLE 49 CFR 172.101:  
LAND (U.S. DOT): CALCIUM HYPOCHLORITE, HYDRATED MIXTURES, 5.1,  
UN 2880, PG II

WATER (IMO): SAME AS ABOVE

AIR (IATA/ICAO): SAME AS ABOVE

HAZARD LABEL/PLACARD: OXIDIZER

REPORTABLE QUANTITY: 10 lbs. (Per 49 CFR 172.101, Appendix)

EMERGENCY GUIDE NO: 140

SPECIAL COMMENT: Under specific circumstances, this product can ship under two transport exceptions, Limited Quantity or Consumer Commodity. See Bill of Lading for proper shipping description.

#### SECTION 11 SPILL AND LEAKAGE PROCEDURES

FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC AT 800-424-9300.

REPORTABLE QUANTITY: 10 lbs. (as Calcium hypochlorite) Per 40 CFR 302.4

#### SPILL MITIGATION PROCEDURES:

Hazardous concentrations in air may be found in local spill area and immediately downwind. Remove all sources of ignition. Stop source of spill as soon as possible and notify appropriate personnel.

AIR RELEASE: Vapors may be suppressed by the use of a water fog. All water utilized to assist in fume suppression, decontamination or fire suppression may be contaminated and must be contained before disposal and/or treatment.

WATER RELEASE: This material is heavier than water. This material is soluble in water. Monitor all exit water for available chlorine and pH. Advise local authorities of any contaminated water release.

LAND SPILL: Contact at 1-800-654-6911 immediately.

DANGER: All spills of this product should be treated as contaminated. Contaminated product may initiate a chemical reaction which may spontaneously ignite any combustible material present, resulting in a fire of great intensity. In case of a spill, separate all spilled product from packaging, debris and other material. Using a clean broom or shovel, place all spilled product into plastic bags, and place those bags into a clean, dry disposal container, properly marked and labelled. Disposal containers made of plastic or metal are recommended. Do not seal disposal containers tightly. Immediately remove all product in disposal containers to an isolated area outdoors. Place all damaged packaging material in a disposal container of water to assure decontamination (i.e. removal of all product) before disposal. Place all undamaged packaging in a clean, dry container properly marked and labelled. Call for disposal procedures.

#### SPILL RESIDUES:

Dispose of per guidelines under Section 12, WASTE DISPOSAL.

This material may be neutralized for disposal; you are requested to contact at 800-654-6911 before beginning any such operation.

#### PERSONAL PROTECTION FOR EMERGENCY SPILL AND FIRE-FIGHTING SITUATIONS:

Response to a large quantity spill (100 pounds or greater) or when dusting or decomposition gas exposure could occur requires the use of a positive pressure full face supplied air respirator or self contained breathing

apparatus (SCBA), chemical resistant gloves, coveralls and boots. In case of fire, this personal protective equipment should be used in addition to normal fire fighter equipment.

#### SECTION 12 WASTE DISPOSAL

If this product becomes a waste, it meets the criteria of a hazardous waste as defined under 40 CFR 261 and would have the following EPA hazardous waste number: D001.

If this product becomes a waste, it will be a hazardous waste which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly.

As a hazardous solid waste, it must be disposed of in accordance with local, state, and federal regulations in a permitted hazardous waste treatment, storage and disposal facility by treatment.

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL. THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

#### SECTION 13 ADDITIONAL REGULATORY STATUS INFORMATION

##### TOXIC SUBSTANCES CONTROL ACT:

~~This substance is listed on the Toxic Substances Control Act inventory.~~

NSF LIMITS: NSF Maximum Drinking Water Use Concentration - 15 mg/l  
as calcium hypochlorite product

##### SUPERFUND AMENDMENT AND REAUTHORIZATION ACT TITLE 3:

HAZARD CATEGORIES, PER 40 CFR 370.2:

###### HEALTH:

Immediate (Acute)

###### PHYSICAL:

Fire and Reactivity

##### EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW, PER 40 CFR 355, APP.A:

EXTREME HAZARDOUS SUBSTANCE - THRESHOLD PLANNING QUANTITY:

None Established

SUPPLIER NOTIFICATION REQUIREMENTS, PER 40 CFR 372.45:

None Established

#### SECTION 14 ADDITIONAL INFORMATION

REGULATED UNDER FIFRA, USDA & FDA

MSDS REVISION STATUS: Revision to Section 11

#### SECTION 15 MAJOR REFERENCES

1. Ishidate, M. et al. (1984). Primary mutagenicity screening of food additives currently used in Japan. *Fd. Chem. Toxicol.* 22:623-636.
2. Hayashi, M. et al. (1988). Micronucleus tests in mice on 39 food additives and eight miscellaneous chemicals. *Fd. Chem. Toxicol.* 26:487-500.
3. Report on the Acute Inhalation in Rats, Acute Oral LD50 in Rats, Eye Irritation in Rabbits, Dermal Irritation in Rabbits, and Acute Dermal Toxicity in Rabbits of HTH. Biometric Testing Laboratories, Inc., Whippany, NJ. Experiment Reference #A-1490 (RC-30406), February 9, 1975.

4. Report on the Teratogenic Study with Calcium Hypochlorite in Albino Rats. Industrial Bio-Test Laboratories, Inc., Northbrook, IL. IBT #B758b, April 18, 1972.
  5. Report on the Mutagenic Study with Monosodium Cyanurate and Calcium Hypochlorite (HTH) in Albino Mice. Industrial Bio-Test Laboratories, Inc., Northbrook, IL. IBT #E756. April 18, 1972.
  6. Chemical Hazard Summary No. 20: Calcium Hypochlorite. Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada L8N 1H6. December 1986.
  7. Report on 18-Month Dermal Carcinogenicity Study with Monosodium Cyanuric Acid and HTH in Swiss White Mice. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-00751, April 9, 1974.
  8. Report to PPG Industries, Inc. on the Acute Toxicity Studies with PITCHLOR (Granular Calcium Hypochlorite). Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #601-06659, May 7, 1975.
  9. Report on the Acute Toxicity of HTH to Bluegill, Rainbow Trout and the Water Flea. E G & G, Bionomics Aquatic Toxicology Laboratory, Wareham, MA, July 1977.
  10. Report on the 8-Day Dietary LD50 Study with HTH in Mallard Ducklings. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-06184, May 15, 1975.
  11. Report on the 8-Day Dietary LC50 with HTH in Bobwhite Quail. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-06183.
  12. Final Report on the Acute Oral LD50 of Calcium Hypochlorite in Bobwhite Quail. Wildlife International, LTD., Easton, MD, Project #133-107, July 15, 1977.
  13. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Vol. 52: Chlorinated Drinking Water; Chlorination By-Products; Some Other Halogenated Compounds; Cobalt and Cobalt Compounds. World Health Organization, International Agency for Research on Cancer (IARC), Lyon, France, 1991.
  14. Sittig, Marshall, Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd Ed., Noyes Publications, Park Ridge, NJ, 1985.
  15. Chemical Hazard Response Information System (CHRIS), Vol. II, U.S. Coast Guard, Washington, D.C., 1984.
  16. Chlorine and Your Health. The Chlorine Institute, Inc., Washington, D.C., August 1988.
  17. ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth Edition, 1991. American Conference of Governmental Industrial Hygienists, Inc., Cincinnati, OH.
  18. Amore, John E. and Earl Hautala, Odor as an Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatiles for 214 Industrial Chemicals in Air and Water Dilution. Journal of Applied Toxicology, Vol. 3, No. 6, pp. 272-290, 1983.
  19. Forsberg, K., and S.Z. Mansdorf, Quick Selection Guide to Chemical Protective Clothing, Second Edition, Van Nostrand Reinhold, N.Y., 1993.
- (Additional references are available upon request)

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. ARCH CHEMICALS BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION BUT, MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS MSDS IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT ARCH CHEMICALS MSDS CONTROL AT THE PHONE NUMBER ON THE FRONT PAGE TO MAKE CERTAIN THAT THIS DOCUMENT IS CURRENT.

Arch Chemicals, Inc.  
MSDS Control  
501 Merritt 7  
PO Box 5204  
Norwalk, CT 06856-5204

Technical data

**Soda Ash**

CAS No 497-19-8

<b>Chemical name</b>	Sodium carbonate, anhydrous
<b>CAS name</b>	Disodium carbonate
<b>Formula</b>	Na <sub>2</sub> CO <sub>3</sub>
<b>Molecular weight (mol)</b>	105.99
<b>General physical properties</b>	
Description	white granular solid
Melting point, °C (°F)	851 (1564)
<b>General chemical properties</b>	
Solubility, max % @ 35.4°C	33.2
pH, 1% solution @ 25°C	11.4
Heat of fusion, MJ/kg (BTU/lb)	0.318 (136)
Heat of hydration, MJ/kg (BTU/lb)	
monohydrate	0.126 (54)
heptahydrate	0.653 (282)
decahydrate	0.874 (376)

# Dense Grades

## Chemical properties

	Grade 160		Grade 260	
	Typical	Specification	Typical	Specification
Na <sub>2</sub> O, % by weight	58.4	58.0 min	58.4	58.0 min
Na <sub>2</sub> CO <sub>3</sub> , %	99.8	99.2 min	99.8	99.2 min
Na <sub>2</sub> SO <sub>4</sub> , %	0.06	0.20 max	0.05	0.20 max
NaCl, %	0.03	0.20 max	0.02	0.20 max
Fe <sub>2</sub> O <sub>3</sub> , ppm	7	20 max	4	20 max
Water insolubles, %	0.00	0.05 max	0.01	0.05 max
Ignition loss, %	0.1		0.1	
Heavy metals (as Pb), ppm	<10		<10	
COD (as O <sub>2</sub> ), ppm	40		200	
Pb, ppm	1		1	
As <sub>2</sub> O <sub>3</sub> , ppm	0.1		0.1	
B, ppm	3		6	
CaO, ppm	140		80	
Cu, ppm	0.1		0.1	
MgO, ppm	50		20	
SiO <sub>2</sub> , ppm	30		150	

## Physical properties

	Grade 160		Grade 260	
	Typical	Specification	Typical	Specification
Bulk density, lb/ft <sup>3</sup>	59	54-62	65	60-70
g/cm <sup>3</sup>	0.95	0.86-0.99	1.06	0.96-1.12
Particle density, g/cm <sup>3</sup>	1.826		1.960	
Particle shape	Needle-like		Blocky	
Angle of repose, deg	52		40	
Screen analysis, cumulative %				
On U.S. 30 (600 μm)	0.4		1.5	
U.S. 40 (425 μm)	8	15 max	16	27 max
U.S. 100 (150 μm)	88		90	
Thru U.S. 200 (75 μm)	1	5 max	2	7 max

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**Uses**

Glass manufacture, detergent manufacture, sodium chemicals and carbonate chemicals manufacture, pulp and paper, brine treatment, water hardness removal, pH adjustment in water or waste water, flue gas desulfurization.

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**Standard containers**

Bulk hopper cars and trucks; 100 lb (45.4 kg) multi-wall paper bags.

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***ATTACHMENT F***  
***PID Standard Operating Procedure***

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## ***Standard Operating Procedures (SOP) for Photo-ionization Detector (PID)***

### **Introduction**

During drilling operations, ambient air and soil cores will be screened in the field for Total Volatile Organic Compounds (VOCs) using a Photovac PID. The PID will also be used to perform jar-headspace field screening of samples from the soil cores and split spoons. The methodology for performing soil screening and jar headspace screening is described in Section 2.4.3 of the FSP.

### **Equipment Description**

A Photovac Model 2020 PID or equivalent will be used to measure total VOCs in the ambient air and in soil cores and split spoons. The PID will be equipped with a standard 10.6 eV UV lamp, which will provide an operating concentration range of 0.5 to 2,000 ppm as isobutylene equivalent. Specifications for the Photovac 2020 are provided in the attached User's Manual.

### **Instrument Calibration**

The primary air contaminants to be expected at the site are trichloroethene (TCE), tetrachlorethene (PCE) and vinyl chloride. Photovac recommends that isobutylene at a concentration of 100 ppm be used as the span calibration gas. The PID will be calibrated with a two point calibration, including zero air and 100 ppm isobutylene. The PID calibration will also be checked at the end of the day with zero air and the 100 ppm isobutylene standard. The calibration will be checked more frequently if the meter appears to be giving erroneous readings (i.e., readings that will not stabilize or readings that are not consistent with prior sampling events). The site is located in a rural area, on the west flank of Harmon Hill at the edge of the Green Mountain National Forest; therefore, an area of ambient air that is free of VOCs to be used for zero air calibration exists in the vicinity of the site. The zero air location shall be selected at the time of calibration.

The PID will be calibrated using the procedure presented in Section 3.2.2 of the User's Manual. The procedure is summarized below:

- Connect a dedicated regulator to the gas cylinder containing the calibration gas (isobutylene at 100 ppm).
- To zero the instrument, from the main menu select "Enter", "Set", "Cal" and "Zero". When prompted by the instrument, expose the PID to clean air by holding the tip of the PID pointing upwind.
- Select "Set", "Cal" and "Span". The PID asks for the span gas concentration (the isobutylene mixture). Do not press Enter to confirm it.

- Connect the PID to the adaptor tubing on the calibration gas regulator.
- Open the regulator by turning the valve counterclockwise. Open the regulator until the ball is 1/8-inch from its resting position.
- Press the ENTER key. When the PID reverts to the default display it is calibrated and ready for use.
- Remove the adaptor tubing from the inlet and close the regulator.

A summary of calibration information and corrective actions is presented at the end of this SOP. Additional information regarding calibration of the PID and corrective actions is presented in the attached User's Manual, and QAPP Table 2-3.

### **General Operating Instructions**

The meter will be set for a resolution of 0.1 ppm for all measurements. All readings will be collected using the Peak reading mode, which displays the current detected concentration. The reading is updated once per second.

### **Summary of Equipment Calibration, Instrument Maintenance, Testing and Inspection Activities**

The following table summarizes instrument calibration, maintenance, testing and inspection activities for the Landtec meter.

<b><i>Equipment</i></b>	<b><i>PE Photovac 2020</i></b>
<b><i>Calibration Information</i></b>	
Calibration	Zero air and calibration standard 100 ppm isobutylene with a Response Factor of 1.0
Test Method	Zero and 100 ppm isobutylene calibration to be made at beginning and end of each sampling day and more frequently if readings are erratic (see above).
Acceptance Criteria	Zero $\bar{1.0}$ ppm 100 ppm isobutylene $\bar{5}$ ppm
Corrective Action	If the zero or isobutylene checks are outside acceptance criteria, then recalibrate the instrument and resample the ambient air/passive gas vent locations. If still not within acceptance limits, return to factory for maintenance and calibration
<b><i>Maintenance Testing and Inspection</i></b>	
Maintenance Activity	Return to factory for service, maintenance and calibration every six months.
Inspections	Visual inspection daily before use. Acceptance criteria, no defective parts noted.
Corrective Actions	Replace parts or instrument if defective.

This Page Reserved for  
Photo-ionization Detector Users Manual



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