OPERATIONS AND MAINTENANCE (O&M) PLAN

REVISION 1

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

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Acronyms and Abbreviations

%	percent
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
bgs	below ground surface
Black & Veatch	Black & Veatch Special Projects Corp.
COC	Chemical of Concern
cy	cubic yards
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
ERRB	Emergency Response and Recovery Branch
FS	Feasibility Study
ft	feet/foot
GAEPD	Georgia Environmental Protection Division
GCL	Geosynthetic clay liner
GDOT	Georgia Department of Transportation
HRS	Hazard Ranking System
IC	institutional control
ISCO	*in situ* chemical oxidation
NPL	National Priorities List
O&F	Operational & Functional
O&M	Operations and Maintenance
ORP	oxidation-reduction potential
Owner	City of Camilla
PCP	pentachlorophenol
pH	hydrogen ion concentration
PPE	Personal Protective Equipment
psi	pounds per square inch
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SESD	Science and Ecosystem Support Division
Site	Camilla Wood Preserving Site

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1.0 Introduction

Ongoing maintenance is critical for ensuring continued effectiveness of the various remedy components constructed at the Camilla Wood Preserving Site (Site). Ideally, a local program should address operations and maintenance (O&M) concerns proactively instead of reacting to problems. O&M activities can include mowing, re-seeding, cleaning and maintenance of the perimeter drainage ditches, inspection and repair of monitoring wells and associated equipment, inspection and repair of transducer array elements, routine groundwater monitoring and other structural controls.

1.1 INTENT OF DOCUMENT

Black & Veatch Special Projects Corp. (Black & Veatch) has prepared this Post-Construction O&M Manual for the Site for the U.S. Environmental Protection Agency (EPA), Georgia Environmental Protection Division (GAEPD) and the City of Camilla (City). This manual is a supplement to the Remedial Action (RA) report documents submitted to the EPA under separate cover. Construction activities relating to the barrier wall were completed during 2013. Construction activities relating to the containment cell cap began in 2013 and were completed in early 2014. Construction activities relating to the concrete foundations began in early 2014 and were completed in late 2014. *In situ* chemical oxidation (ISCO) construction activities began in early 2014 and were completed in late 2014 with additional injection activities occurring in early 2016.

This manual is intended for use by the EPA, GAEPD and the City of Camilla for the physical maintenance of the low permeability barrier wall, engineered cap, cap perimeter drainage ditches, transducers and monitoring wells located at the Site. An O&M Manual for the Site storm water collection system and detention pond were submitted in April, 2016. General components of the remedy addressed in this O&M Manual include the following:

- Inspection and maintenance of installed remedial systems, including monitoring wells, pressure transducers and related equipment.
- Completion of routine groundwater monitoring activities.
- Inspection and maintenance of the final cover, rip rap lined perimeter ditches, and concrete foundations.
- Site security for protection of remedial systems.
- Enforcement of deed restrictions applied to the Site.

This section briefly summarizes the background information for the Site. This section also describes general post-construction care requirements in accordance with GAEPD to identify when and how the post-construction care period begins and ends.

1.2 SITE LOCATION

The Site is located in the community of Camilla, Mitchell County, Georgia, approximately 0.25 miles west of U.S. Highway 19, bordered by South Harney Street to the west, railroad tracks to the east and Bennett Street to the north. A Georgia Department of Transportation (GDOT) facility and City of Camilla landfill border the facility to the south. The Site is comprised of an approximately 41-acre area. The adjacent properties located to the south of the eastern portion of the Site (including the GDOT facility and a former City dump) comprise approximately 11 acres. The western portion of the site, comprising approximately 23 acres, was remediated by EPA in 2006 and currently serves as an athletic complex,

including soccer fields, a storm water detention pond and administrative offices for Mitchell County Recreation. The site location and site layout are shown on Figures 1-1 and 1-2, respectively.

1.3 SITE HISTORY

Wood treating operations began at the Site in 1947. The facility was constructed by the Louis Wood Preserving Company on land that was previously a cypress swamp. In 1950, the Escambia Treating Company purchased the property and continued wood preserving operations. In 1985, through a series of corporate reorganizations and stock transfers, International Utility and Supply Corporation assumed control of the company and facility operations. The Escambia Treating Company retained the surface impoundments and their associated environmental liabilities. At that time, the name of the operating company was changed to Camilla Wood Preserving, Inc. On February 8, 1991, Camilla Wood Preserving, Inc., filed for bankruptcy protection, and on February 26, 1991, the facility closed.

During 44 years of wood treating operations, the facility prepared trees for treatment by debarking, cutting to size, and drilling holes. Treatment consisted of using trams to load peeled poles into two pressure treating cylinders, and then steaming the poles for ten hours. A vacuum was then applied to the cylinders to remove water from the poles. Following the vacuum (dewatering) stage, approximately 25,000 gallons of treating solution was pumped into the treatment cylinders through aboveground pipes. The treating solution, either creosote or a solution of ten percent (%) pentachlorophenol (PCP) in diesel fuel, was forced into the poles through pressurization. The poles were treated for a variable amount of time, depending on their moisture content. After treatment, the poles were removed to the drip area located in the vicinity and south of the railroad tracks for drying and storage.

Wastewater was generated throughout the process, in particular during the steam treating process (part of the dewatering step), preservative recovery, the cleansing of drums, storage tanks, and the production area. Initially, the wastewater was collected in unlined impoundments located in the northeastern portion of the Site near the corner of Thomas and Bennett Streets. Later, the waste streams were treated in an onsite wastewater treatment system, before being discharged to the City of Camilla's wastewater treatment plant. The location of the municipal sewer connection is undetermined but is believed to be located on the north side of the Site along Bennett Street.

1.3.1 Removal Activities

After facility closure in 1991, the EPA Region 4 Emergency Response and Recovery Branch (ERRB) secured the Site by placing a fence around the perimeter. Water from a storage impoundment was pumped into a storage tank located at the wastewater treatment area. In addition, approximately 50,000 gallons of wastewater were discharged to the City of Camilla's wastewater treatment system. During site stabilization efforts, drums were gathered and staged onsite and the impoundment area was backfilled with onsite soils. Approximately 25% of the impoundment area remained open and contained sludge (Black & Veatch, 2011).

In 1992, approximately 95,000 gallons of wastewater were treated onsite, the sludge in the impoundment was solidified, and the impoundment was capped (Black & Veatch, 2011).

In 1994, the EPA initiated treatment of site standing water and the dismantling of the process facility. Approximately 522,000 gallons of water were treated and discharged to an onsite evaporation pond. Additionally, 30,723 gallons of PCP and creosote were removed from onsite tanks and shipped offsite for disposal. In October 1994, approximately 5,000 cubic yards (cy) of soil were removed from a site parking lot, an easement along Bennett Street, and four residential properties across Bennett Street.

The removal was based on the results of dioxin sampling and soil stockpiled in a lined, bermed, onsite staging area (Black & Veatch, 2011).

In 1995, the remainder of contaminated soils was removed, completing the soil removal activities that were initiated in 1994. Approximately 5,000 tons of soil was shipped offsite for disposal (Black & Veatch, 2011). A Hazardous Ranking System (HRS) Package was prepared for the Site in June of 1995. After review of the HRS Package, the Site was proposed to the National Priorities List (NPL) in 1998. The previous soil and sediment contamination on the western portion of the Site has been addressed through a soil removal action and ditch remediation which was conducted in 2006 and 2007 by EPA. The removal action included the removal and disposal of the former pole barn structures, the excavation of a minimum of one foot (ft) of soil in previously identified contaminated areas of the Site, re-grading with a minimum of one ft of clean fill in excavated areas, capture and relocation of several species inhabiting the onsite ditches, excavation of contaminated ditch sediments, and additional ditch channel improvements.

1.3.2 EPA Emergency Response Action

The previous soil and sediment contamination on the western portion of the Site has been addressed through a soil removal action and ditch remediation which was conducted in 2006 and 2007 by EPA. The removal action included the removal and disposal of the former pole barn structures, the excavation of a minimum of one ft of soil in previously identified contaminated areas of the site, re-grading with a minimum of one ft of clean fill in excavated areas, capture and relocation of several species inhabiting the onsite ditches, excavation of contaminated ditch sediments, and additional ditch channel improvements. Excavated soils and sediments were either transported to an offsite disposal facility or placed on the eastern portion of the Site to be addressed along with the soil remedy for the eastern portion of the Site. Approximately 10,000 cy of soil were placed in a lined and capped soil pile on the eastern portion of the Site. These soils were to be addressed as part of the remedy for the in-place soils on the eastern portion of the Site (Black & Veatch, 2011).

1.3.3 Site Investigations

Numerous investigations of the Site have occurred since the facility ceased operations in February 1991. In May, June, and July 1997, under the direction and oversight of the GAEPD, Ecology and Environment Inc. conducted a site assessment to characterize soil and groundwater contamination in the extreme northeastern portion of the Site. Results indicated that elevated levels of wood treating solution compounds (Resource Conservation and Recovery Act [RCRA] K001), historically used at both facilities, were present in the underlying soil and groundwater. A Remedial Investigation (RI)/Feasibility Study (FS) was completed in 2009, which summarized the nature of the contaminants and identified, evaluated and recommended remedial alternatives for the Site. Remedial design (RD) investigations were conducted in 2009 through 2011 and summarized by the RD Basis of Design Report (Black & Veatch, 2011). Annual groundwater sampling events have also occurred at the Site from 2006 through 2017.

1.4 REMEDIAL ACTION OBJECTIVES

Following are the Remedial Action Objectives (RAO) for the Site:

- Prevent ingestion, inhalation, or direct contact with surface soils that contain concentrations in excess of the performance standard.

- Control migration and leaching of contaminants in site soils and sediments to groundwater that could result in future groundwater contamination in excess of drinking water standards and/or health-based levels.
- Prevent ingestion or inhalation of soil particles in air that contain concentrations in excess of the performance standard.
- Control future releases of contaminants to ensure protection of human health.
- Prevent ingestion of groundwater having concentrations in excess of drinking water standards and/or health-based levels.
- Restore the groundwater aquifer to drinking water standards and health-based-levels.
- Control migration and leaching of contaminants from site soils, sediments, and groundwater to surface water that would exceed surface water quality standards.

1.5 O&M REQUIREMENTS

1.5.1 O&M Activities

Required long term O&M activities are the responsibility of the City of Camilla, Mitchell County, GAEPD and EPA. Activities covered in this document include:

- Inspection of the constructed caps/covers and the stormwater conveyance systems.
- Maintenance of the integrity of the caps/covers, including routine mowing, fertilizing the soil, and making repairs to the cover system, as necessary, and correcting the effects of settling, subsidence, erosion, or other events.
- Monitoring groundwater elevations within and outside the capping system.
- Prevent surface water run-on and runoff from eroding or otherwise damaging the cap.
- Ensure that the on-site institutional controls (ICs) are enforced.

Section 3.0 discusses the specifics on how site O&M is to be performed for these tasks.

At a minimum, O&M activities require maintenance of all inspection reports prepared for the EPA and GAEPD, or other party(ies) as required. Field reports documenting inspections and in-house records, such as laboratory analytical reports and contractor's logs, are to be maintained as hard copy and electronically for EPA and GAEPD, so that appropriate documentation will be available to certify that site care is being conducted.

1.6 ENVIRONMENTAL HEALTH AND SAFETY

In accordance with EPA regulations, after construction, the owner (City of Camilla) will comply with post-construction requirements, including maintenance and monitoring throughout the post-construction care period. No one shall dig into, excavate, or otherwise disturb the barrier wall or containment cell cap without first notifying EPA and GAEPD. At a minimum, the following personal protective equipment (PPE) should be worn during O&M inspections:

- Safety glasses with side shields meeting the requirements and specifications of the current American National Standards Institute (ANSI) Z87 standard.

- Safety-toed boots meeting the requirements and specifications for impact and compression resistance, as required by American Society for Testing and Materials (ASTM) F2412/F2413 (formerly ANSI Z41, Class 75, for footwear purchased prior to March 2005).

1.7 ORGANIZATION OF THIS MANUAL

This manual discusses site-specific needs to operate, provide appropriate upkeep, and maintenance of the installed RA construction items including the facilities, equipment, and appropriate engineered and ICs pertaining to post-construction at this Site. The text references GAEPD requirements as well.

The format of this manual provides an easy reference to specific O&M topics. Section 2 presents an overview of the design and functional description of key components of the remedy, Section 3 describes Site monitoring, inspection, and maintenance procedures, and Section 4 provides references.

Appendices are included at the end of this manual to provide supporting documentation. Appendix A contains the relevant figures and As-Built surveys from the Site RA Report (Black & Veatch, 2015). Appendix B provides copies of manufacturer's catalog data detailing specific liners/equipment installed at the Site as part of the construction project. Appendix C contains typical details of wells installed during the RA. Appendix D provides information pertaining to the grass seed used for the vegetative cap cover.

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2.0 Design and Function of the Remediation Components

2.1 INTRODUCTION

This section presents an overview of the design and functional description of the following key elements of the Site RA, specifically the construction of a low permeability barrier wall and augmented clay cap, an engineered containment cell cap with drainage system, concrete foundations which will be integrated into a future recreational complex by Mitchell County and an ISCO well network that has been used to deliver oxidant to the subsurface. Primary components of the remedy include:

- Installation of a 2,600 linear ft by 40 ft deep on average low permeability barrier wall around the most contaminated portion of the Site
- Installation of an augmented clay cap and biaxial geogrid over the barrier wall
- Power screening, placement, and compaction of 40,000 cy of contaminated soil previously stockpiled within the footprint of the barrier wall
- Raising of existing monitoring wells within the footprint of the barrier wall
- Installation of a geosynthetic clay layer (GCL) above the graded contaminated soil
- Installation of a geocomposite drainage layer above the GCL
- Placement of at least a 3 ft thick clean soil layer over the drainage layer followed by placement of a 6 inch topsoil layer and site seeding
- Placement of a cap perimeter drain system
- Installation of rip rap lined channels on the cap slopes to enhance surface water shedding from the cap
- Installation of seven groundwater performance monitoring wells
- Injection of approximately 300,000 gallons of potassium permanganate into the subsurface
- Installation and operation of an array of pressure transducers around the barrier wall and capped area
- Installation of concrete foundations for future use by the City of Camilla and Mitchell County
- *In situ* groundwater treatment using chemical oxidation (ISCO) to enhance natural degradation of site contaminants in groundwater outside the engineered cap
- Long-term monitoring to ensure that the remedy is protective of human health and the environment. This monitoring includes groundwater sampling outside the slurry walls, and hydraulic head measurements collected from both inside and outside the slurry walls to ensure the integrity of the slurry walls.
- Engineering controls to control surface water runoff, dust, air quality, etc. and ensure that RAOs are met during and after putting the remedy in place.
- ICs to restrict future land use and groundwater use, as necessary. These controls shall also restrict future activity at the Site that would compromise the effectiveness of the remedy.

Drawings showing the location and details of the constructed remedial systems listed above are included in Figures 1-2 and 2-1, 2-2 and in Appendix A.

2.2 SUBSURFACE BARRIER WALL

Construction of a vertical subsurface barrier wall began in February 2013. The barrier wall was installed to a total average depth of approximately 40 ft below ground surface (bgs), but the actual depth ranged from 24 ft to 46 ft bgs. The depth varied according to the presence of shallow competent limestone layers that resulted in excavator refusal. The bottom of the slurry wall extended 3 to 5 ft into a competent clay or limestone unit continuously along the slurry wall alignments. The total length of the installed barrier wall is 2,536 linear ft. Based upon field conditions encountered, such as proximity to roadways or other features and equipment capabilities, the alignment of the barrier wall was installed along a slightly different alignment than designed.

Approximately 2,000 cy of excess spoils were generated from the barrier wall construction that subsequently required stabilization. Due to historic rainfall events during the construction of the barrier wall, there were several areas of the Site, including where the excess wall spoils were placed, that were extremely soft and not suitable for use. These soils were amended with fly ash and mixed thoroughly prior to reuse onsite. Upon completion of each section of the barrier wall trench excavation, the slurry wall section was backfilled with the design mix of native clay soils with 5% bentonite slurry and 1% dry bentonite powder. Installation of the barrier wall was completed in April 2013.

Following completion of the wall construction and backfilling, a survey was conducted to document the final as-built location of the barrier wall. The as-built barrier wall alignment may be found in Appendix A.

2.3 ENGINEERED CAP

Activities associated with construction of the engineered cap over the 10-acre containment cell began in May 2013. Due to the cap construction following immediately after the barrier wall installation, the barrier wall did not have a full 60 days of curing time before traffic over the wall was anticipated. To ensure that the barrier wall would not be damaged by truck traffic traversing the top of the wall, a 10-ft wide protective cap, centered on the barrier wall, was constructed to a depth equal to the top of the barrier wall (approximately 2 ft bgs). The cap was constructed by lining the shallow excavation with a biaxial geogrid, then backfilling with imported clay and compacting the material to 100 pounds per square inch (psi) as measured with a pocket penetrometer. At the main site entrance, this trench was backfilled with imported clay soils that were amended with Portland cement and compacted to a minimum of 100 psi as measured with a pocket penetrometer.

Approximately 40,000 cy of contaminated soil generated during previous phases of work had been stockpiled within the footprint of the barrier wall for use as fill material during construction of the cap. It was determined that the soils in the stockpile were not suitable for use beneath the engineered cap due to the high volume of metal and wood debris. A power screen was used to remove the excess debris from the contaminated soil stockpile prior to construction of the cap. Between May 2013 and July 2013, approximately 40,000 cy of soil were power screened and approximately 12 truckloads of concrete and wood debris were removed from the contaminated stockpile and disposed of offsite.

The composite cap consisted of screened soil placed and compacted in lifts, a geosynthetic liner, a geonet drainage layer, a minimum of 3-ft thick common fill soil layer placed and compacted in lifts, a 6-inch to 9-inch topsoil layer, and a vegetative cover The total area of the engineered is approximately 10 acres. As-built drawings of the engineered cap may be found in Appendix A.

2.4 INSTALLATION OF FINAL SITE FINISHES

In 2013 through 2015, a reuse for the site was designed. Per discussion with the City of Camilla and Mitchell County Recreation, the site reuse plan included a Little League baseball Tournament Complex, concession stands, walking trails and a playground. Construction of the components included in the reuse plan began in October 2014 and included the following:

- Six high-mast light pole foundations, approximately 18.5 ft deep
- Twelve parking and pedestrian light pole foundations, approximately 12 ft deep
- Four 110-linear ft spread footings in support of 24-ft high backstop fencing, installed to approximately 2.5 ft bgs
- Eight 6 ft x 8 ft spread footings for the dugouts at each field, installed to approximately 2 ft bgs
- Fence post foundations for the field and perimeter fencing, approximately 2 ft bgs

The foundations for four backstops and eight dugouts were laid out, excavated to the proper depth and framed for the placement of rebar cages and placement of concrete. Each of the four fields had a backstop and two dugouts installed per the approved drawings. The foundations of these structures did not penetrate the GCL. The soil excavated from these foundations was clean and was used to backfill around the poured foundations

The foundations for the fencing installation did not penetrate the GCL liner. Twenty four-inch diameter holes were drilled to an average depth of thirty inches then filled with concrete. Once the concrete was poured, fence post sleeves were installed at the correct depth and location.

The foundations for the athletic field, parking area and pedestrian area lighting required excavation to a depth below the GCL. Soil removed above the GCL was uncontaminated and was stockpiled and used for backfill. The contaminated soil excavated from beneath the cap was placed into a lined stockpile area.

Due to the depth of the excavations for the high-mast light poles, groundwater was encountered in two of the holes drilled. Groundwater was allowed to collect until it was time to backfill the holes with concrete and then the water was pumped into a holding tank and the concrete immediately placed into the hole. The foundations for both the sports field lighting, pedestrian lighting, and the parking lot lighting were backfilled with clean soil once the placement of the sonotube form was positioned at the correct depth. After placement of the sonotube and prior to the placement of soil, new GCL material was used to patch around the excavation and the sonotube to make sure that the liner was sealed back over the contaminated soil.

The contaminated soils and groundwater removed from beneath the GCL were collected and analyzed prior to disposal. Approximately 195 tons of contaminated soil was stockpiled in a designated location where it was sampled and analyzed for characterization. 300 gallons of contaminated groundwater was pumped into a frac tank for storage where it was sampled and analyzed for characterization. The sample results indicated that both the soil and water could be disposed of offsite and non-hazardous waste. Each waste stream was transported and disposed accordingly at an approved off-site disposal facility.

Ten rip-rap lined spillways were installed around the perimeter of the site to help with the drainage of the water from the cap. The spillways were constructed by removing six to eight inches of soil from the

slope of the cap and placing a geosynthetic liner prior to placement of six to eight inches of rip rap rock within the spillway. The Site was graded and all disturbed areas were hydro seeded to complete the work.

2.5 GROUNDWATER REMEDIATION SYSTEM

In addition to the barrier wall and engineered cap described in Sections 2.2 and 2.3, the Site has a groundwater remediation system using ISCO to treat contaminated groundwater outside the engineered cap. The system consists of a total of 47 wells installed in 2014. The wells, as shown on Figure 1-2 and Figure 2-1, include 36 injection wells, 2 extraction wells, 7 performance monitoring wells (monitoring wells located within the ISCO treatment area), and 2 sentinel monitoring wells. Between 2014 and 2016, approximately 300,000 gallons of potassium permanganate solution were injected into the Site subsurface to foster destruction of the chemicals of concern (COCs) present in the intermediate groundwater. EPA is responsible for maintaining the groundwater remediation and monitoring system for 10 years. At the end of this period, GAEPD will be responsible for monitoring groundwater as discussed in this document.

2.6 POST-CLOSURE GROUNDWATER MONITORING PROGRAM

To accomplish the monitoring goals specified in the Record of Decision (ROD; EPA 2009), the post-closure monitoring program will include:

- Measurements of the water levels and calculation of groundwater elevation in monitoring wells inside and outside of the barrier wall / engineered cap.
- Sampling and analyses of wells down gradient of the containment area to evaluate the trends in groundwater quality which will indicate the effectiveness and integrity of the barrier wall (this task will be conducted by EPA through 2022, after which the state will assume this responsibility).

Monitoring wells will also be used for groundwater elevation monitoring. Table 2-2 includes well construction information for all of the onsite monitoring wells. Figure 2-2 shows the locations of the wells. Table 2-3 presents a summary of monitoring points and monitoring frequency. Results of post-closure monitoring will be evaluated and reported annually. At the completion of five years of post-closure monitoring, the program will the thoroughly evaluated to determine if changes in the program are warranted.

3.0 Site Monitoring, Inspection, and Maintenance

3.1 GENERAL

This section addresses inspection, monitoring, and maintenance procedures for the site monitoring elements. O&M, as addressed in this plan, includes considerations for groundwater monitoring, inspections, mowing, and other types of maintenance. This plan specifies reasonable monitoring and maintenance activities for the site facilities.

3.2 O&M

The Operational and Functional (O&F) milestone for portions of the remedy, including the barrier wall and cap system, officially began on September, 2016. This date triggered the beginning of GAEPD's O&M. O&M for the containment areas will continue indefinitely unless changed by a bilateral agreement between EPA and GAEPD. O&M will be conducted in accordance with the EPA and GAEPD regulations.

3.3 USE OF PROPERTY

ICs will be used to insure the long-term integrity of the containment cell. The restrictive covenant will state that no one shall dig into, excavate, or otherwise disturb the containment cell and the 3-ft of clean soil capping the containment cell, without first notifying and obtaining approval from EPA and GAEPD. Further, the covenant will state that no one will construct any groundwater wells within the restricted portions of the Site or use the shallow groundwater on-site for any purpose. A 6-ft chain link security fence surrounding the containment cell serves to restrict access and use of the Site.

3.3.1 Inspection, Monitoring, and Maintenance Requirements

Compliance with O&M and Site care requirements, including inspection, maintenance, and monitoring will be required. Throughout the O&M period, the GAEPD will monitor the effectiveness of the remedial measures throughout the life of the remedy. Inspection, monitoring and maintenance requirements for the O&M include:

- Maintaining the integrity of the final cover, including making necessary repairs to the cover components and cap penetrations, to correct the effects of settling, subsidence, erosion or other events.
- Monitoring the effectiveness of the cover system.
- Monitoring the effectiveness of the containment cell.
- Preventing surface water run-on and runoff from eroding or otherwise damaging the cap.
- Ensuring that the security of the monitoring wells is maintained.
- Ensuring the engineering controls and institution controls are being enforced.

3.3.2 Inspections

Inspections should be performed on a regular basis (e.g. monthly, semi-annually, or annually) and may be adjusted based upon ongoing observations of the remedial remedy elements. A schedule of required inspections is included on Table 3-1.

3.3.3 Maintenance Scheduling and Performance

Maintenance activities can be divided into two types: scheduled and corrective. Scheduled maintenance tasks are those that are typically accomplished on a regular basis such as monthly or quarterly. These items consist of such things as vegetation maintenance (such as grass mowing) and trash and debris removal from the perimeter drainage ditches. These tasks are required at well-defined time intervals.

Corrective tasks consist of items such as cap slope erosion repair that is done on an as-needed basis. These tasks are typically scheduled based on inspection results. Corrective maintenance sometimes calls for more specialized expertise and equipment than for scheduled tasks.

3.4 INSPECTION ITEMS, FREQUENCY, AND ROUTINE MAINTENANCE

Inspections and maintenance will be conducted as specified in this O&M Plan. Small problems that can easily worsen to more significant problems should be addressed and repaired in a timely manner. The following items will require periodic inspection and maintenance:

- Maintaining the integrity of the final cover, including making necessary repairs to the cover components, to correct the effects of settling, subsidence, erosion or other events
- Monitoring the effectiveness of the cover system
- Monitoring the effectiveness of the low permeability barrier wall
- Preventing surface water run-on and runoff from eroding or otherwise damaging the cap
- Ensuring that the security of the monitoring wells is maintained
- Ensuring the engineering controls and ICs are being enforced
- Perimeter storm water ditches
- Concrete foundations
- Site security facilities
- Vegetative cover

Table 3-1 presents a summary of many of the potential problems typically associated with each of the above listed items and associated schedule of inspection. The inspection schedule is approximate. Table 3-2 presents a schedule of routine, preventive maintenance items typically required for each of the above items. The schedule for routine maintenance is approximate and may be revised, based on operator experience, to an as needed basis. Table 3-3 presents a summary of suggested O&M inspection items and the party responsible for each inspection. Table 3-4 presents an example report form that may be used to document O&M inspections. Table 3-5 presents an inspection log that may be used by the inspector to document completion of each inspection. Table 3-6 presents a summary of the estimated costs for years 1-30 of the recommended O&M program.

3.5 INSPECTION REPORTING

An inspection log with explanations of observations made will document each inspection and become part of the operating records for the RA at the Site. Inspection logs will be in a checklist/fill-in-the blank-format. All inspection reports will include the date, time, and location of inspected item, weather conditions, and name of the individual conducting the inspection. An example of a typical inspection log is provided in Table 3-4. The log is formatted to ensure a specific itinerary is followed and that all

pertinent item/component identified is inspected. The log also includes a checklist of typical problems associated with each item/component to be inspected. A blank space is provided to record observations and comments/suggested corrective action. The inspection logs will be supplemented, as necessary, with written reports documenting failures/problems and mitigating actions taken.

The inspection logs will be completed for each of the specific areas or equipment listed in the inspection schedule and will be maintained in a permanent binder. Separate written reports documenting maintenance activities and remedial actions shall be recorded together with these logs. These inspection and maintenance logs are critical in providing a post-construction case history for the Site.

Preventive, non-emergency maintenance shall be completed as soon as practical to preclude further damage and minimize the need for emergency corrective action. If a hazard is determined to be imminent or has already occurred during the course of the inspection or any time between inspections, corrective actions shall be implemented immediately with notification to the appropriate authorities. An example of a typical preventive maintenance log is provided in Table 3-5.

A discussion of specific inspection and maintenance objectives for each item addressed in Tables 3-1 through 3-5 is presented in the following paragraphs.

3.6 SPECIFIC INSPECTION AND MAINTENANCE OBJECTIVES

3.6.1 Subsurface Barrier Wall

A network of ten pressure transducers was installed into ten existing monitoring wells in November 2015. Wells containing transducers include CAP-02, CAP-03, CAP-04, CAP-05, CAP-06, CAP-08, MW-04S, MW-08S, MW-01I and MW-01S. The purpose of the pressure transducers is to monitor for changes and trends in groundwater elevations both inside and outside the barrier wall, which can be used to help assess the integrity of the barrier wall and capping containment system at the Site. Maintenance of the transducers is anticipated approximately every six months; however, more frequent maintenance visits might be required if anomalous data is identified. Anticipated general maintenance includes checking the transducer batteries and replacing as necessary, inspecting the transducer, cables and cellular transmitter to ensure that they are functioning as expected and free from damage, collecting manual groundwater depth measurements to verify data recorded by the transducers and completing repairs as necessary.

3.6.2 Engineered Cap and Perimeter Drainage Ditches

Field inspections should be made of the containment cell and capped area of the site on a quarterly basis for the first two years. Additionally, field inspections should be conducted within 72 hours of any major storm event (hurricanes, tornados, storm events producing > 2” rainfall per hour). If the capped area is found to be sound and free of damage during the first year, the frequency of inspections can be reduced to semi-annually. Annual inspections can be performed after three years of a well-established cover system.

Maintaining the integrity of the cover during the O&F period and confirming that the cap is functioning as designed is of key importance. Inspections of various components of the final cover are required to identify the need for maintenance. The following components of the overall capped areas should be inspected.

3.6.2.1 Cap Grading

Cap grading promotes controlled drainage by eliminating depressions or settlement. Some settlement is anticipated, but excessive or localized settlement could cause water to pond or concentrate runoff. Standing water could kill vegetation, causing cap instability, or could lead to significant erosion of the cover soil. Specific observations to be documented include:

- Presence and location of erosion gullies.
- Presence and location of settling (subsidence), uplift areas, depressions, or cracks.
- Presence and location of standing water.

3.6.2.2 Cover Vegetation.

Final cover vegetation prevents erosion of the final cover soils. Inadequate vegetation can allow erosion to occur in the barren area and on the down slopes. Vegetation loss can be caused by mowing too low, inadequate moisture, soil compaction, infertile soils, poor seed quality, standing water, or other causes. Specific observations to be documented include:

- Areas of sparse, dead, or missing vegetation.
- Stressed vegetation.
- Small rill erosion.
- Animal burrows/mounds.

Locations where deficiencies are observed should be recorded by a field sketch and placed in the field logs with reference (distance) to easily recoverable site features. Surface elevations should be determined by field survey in areas of localized subsidence or overall settlement, as necessary. Permanent site features may be used for horizontal control in documenting minor suspect areas, however a field survey is recommended to document any areas where significant differential movements have occurred. The O&M contractor should keep a photographic record of all site features and inspections.

Routine maintenance of grassed areas may include annual reseeding, as necessary, for those areas of sparse or stressed vegetation. As a minimum, the grass should be mowed down to 4 or 5 inches to promote growth of shallow rooted grass and to kill seedlet trees, shrubs, weeds or other pioneer species. Bare, sparsely covered and drought-damaged areas shall be reseeded no later than early September as the soil moisture content returns to normal levels. Soil testing, including hydrogen ion concentration (pH) measurements, may be performed every 3 years to determine fertilizer and lime requirements, if any. All required soil amendment additions will be completed before September 15 in a given year.

Routine maintenance activities related to the items identified above may include:

- Filling ruts and gullies in eroded berms/ conveyance ditches and re-grading fill and topsoil to match surrounding condition.
- Filling and grading areas of subsidence with fill material and topsoil to match existing surface grading.
- Removal of accumulated vegetation and debris from storm water conveyance ditches.

- Repair or replacement of fencing.
- Replacement of washed out or missing rip rap.

Localized subsidence or surface depressions (visual or evidenced by the presence of ponded water following a rain event) will require backfilling and re-grading to reestablish final grading and to ensure proper drainage, as discussed below

3.6.2.3 Cover Maintenance

Routine cover maintenance may include annual reseeding, as necessary. Soil testing, including pH measurements, may be required every year to determine fertilizer and lime requirements, if any. All required soil amendment additions will be completed during the active growing season for the vegetative cover. No chemical control for weeds or other evasive species of plant material is prescribed. If, based on recommendations from the O&M contractor, chemical controls are needed, a written request and authorization is required from the regulatory agencies prior to application. Appendix D contains a plant fact sheet on the vegetative cap cover, Argentine Bahia.

Localized subsidence or surface depressions (visual or evidenced by the presence of standing water following a rain event) will require backfilling and grading to reestablish final grading and to ensure proper drainage. The area should be brought to grade with clean, uncontaminated soil, using care not to disturb the underlying GCL. The top 6 inches of soil will be topsoil. Vegetative re-establishment may be necessary to repair areas of sparse, missing, or dead vegetation on the final cover, including areas that have been re-graded as follows:

- Evaluate the need for fertilization or soil amendment, and perform as necessary.
- Scarify the area, if necessary.
- Seed with the appropriate permanent seed mixture.
- Incorporate an additional temporary seed mixture, if necessary.
- Cover with temporary or permanent erosion control matting or mulch.

<u>Repairs to Geocomposite Drainage Net (Geonet)</u>

Repairs shall be made by placing a patch of the geosynthetic drainage layer over the damaged area. GSE Fabrinet 200 mil geocomposite, or equivalent, should be used. The patch shall extend a minimum of 2 ft beyond the edge of the damage. Approved fasteners, spaced every 6 inches around the patch, shall be used to hold the patch in place. Repairs shall be consistent with the technical specifications included as Appendix B.

<u>Repairs to GCL</u>

Holes or tears in the capping system GCL shall be repaired by placing a patch of GCL extending a minimum of 12 inches beyond the edges of the hole or tear on all sides. CETCO Lining Technology's Bentomat® ST, or equivalent, should be used. Granular bentonite or bentonite mastic shall be applied in the overlap area. Patches shall be secured with construction adhesive or other approved methods as recommended by the manufacturer. Repairs shall be consistent with the technical specifications included as Appendix B.

3.6.2.4 Erosion Prevention

Erosion could cause breaches in the cap system. Erosion can be caused by either water or wind. Erosion can be minimized by maintaining vegetative cover on soils and by providing protection in areas where storm water or wind flows tend to concentrate. Erosion prevention measures include:

- Inspect for erosion gullies, surface erosion, and vegetation stressed by surface-water flow; repair such problems as soon as possible to prevent progressive erosive degradation of cover integrity.
- Inspect for areas of unexpected concentrations of surface water flow and manage flow in such areas to prevent excessive scour or erosion of the cover system.
- Inspect along toes of slopes to see if there is any evidence of impending erosion; repair any problems and evaluate design alternative that could prevent such problems in the future.
- Inspect edges of the cap where wind concentrates to see if there is evidence of wind erosion. Repair erosion problems by evaluating design alternatives to prevent the concentration of wind forces.

3.6.2.5 Animal Intrusions

Animal intrusions can cause holes in the cover, which can cause damage to the cover system. Animal intrusion is typically a problem by burrowing animals. Intrusions can be prevented by installing barriers, rocks or cobbles. Animal intrusion prevention guidelines include:

- Check for evidence of animal traffic on cover (e.g. tracks, trails, droppings). If such evidence exists and the animals are of a type that could damage the integrity of the cover, consider ICs to prevent animal access to the cover areas.
- Check for animal holes in the capped area which could be a conduit for liquid migration. Fill holes as needed and consider the need for features that prevent animal intrusion.
- When evaluating the cause of seeps consider the possibility that the seeps could be caused by animal intrusion.
- Recognize that if there is one animal intrusion hole, there may likely be many such holes. A more comprehensive survey should be completed for additional holes.
- Fill animal intrusion holes as soon as possible to discourage population increase.

3.6.2.6 Settlement

Excessive settlement or subsidence can cause damage to the cover, which can result in a variety of problems. Problems caused by excessive settlement include (a) standing water on the cover, which can lead to increased infiltration, buildup of water, instability; and (b) cracking of the cover, which can lead to increased erosion or infiltration into the cap and resulting instability. Settlement controls include:

- Perform periodic surveys to evaluate settlement of the cap.
- If settlement is affecting the performance of the storm water runoff, consider reestablishing grades to promote positive drainage.

3.6.3 Groundwater Monitoring System

Groundwater monitoring at the site is intended to serve two functions: to assess the effectiveness of the ISCO remedy in the intermediate groundwater aquifer and to assess how the combination of remedies installed at the Site is impacting groundwater in the vicinity of the Site in both the shallow and intermediate aquifers. The ISCO performance monitoring will be implemented semi-annually for the first two years. After two years, the sampling program may be modified as necessary. The groundwater remedy will be considered complete when sampling confirms that there is no contamination above groundwater remedial goals (listed in Table 2-1) in site monitoring wells for two consecutive years.

Annual monitoring of the shallow and intermediate groundwater wells across the Site will be performed for at least 5 years. After 5 years, the overall effectiveness of the remedy should be evaluated and the annual monitoring may be adjusted accordingly. Table 2-3 lists the frequency and parameters for each well.

At each monitoring event, the groundwater levels in the monitoring wells will be measured, recorded, and evaluated to verify the water is below the base of the cell. In addition, the following parameters will be recorded in the field: ferrous iron, dissolved oxygen (DO), oxidation-reduction potential (ORP) and pH. Sampling procedures should follow the approved Quality Assurance Project Plan (QAPP), Revision 2.0, July 2017, current EPA procedures as provided in the Quality System and Technical Procedures for Science and Ecosystem Support Division (SESD) Field Branches (https://www.epa.gov/quality/quality-system-and-technical-procedures-sesd-field-branches) and Table 2-3 of this O&M plan.

In addition to water level measurements, monitoring wells shall be maintained so that they are clearly visible to maintenance crews and their subcontractors. Requirements include:

- Trimming the grass around the wells using a string trimming device in late spring and fall.
- Maintenance of the high visibility paint on the wells' protective casings on an as-needed basis. If wells are repainted, the well identification number must be clearly labeled after repainting.
- Assuring that the wells' security locks are in place.
- Assuring that the concrete well pads are in good condition, in particular, those in roadways and walkways.

3.6.4 Concrete Foundations

Significant issues with the foundations are not anticipated; however, the concrete and sonotubes should be visually inspected annually for cracks, movement, spalling, or other obvious defects. Record locations of all major defects and the magnitude of observed defects. Repairs to defects should be made as necessary. After rainfall events, check sonotubes for standing water and drain if necessary

3.6.5 Site Security

The integrity of all fencing should be inspected at least monthly during the post-construction monitoring period. The outer aluminum casings over the monitoring wells will also be locked. Agency personnel will have codes and keys to all the security locks. During each site visit, the O&M inspection will check for:

- Missing locks, hinges, etc. from gates.
- Integrity of monitoring wells.

- Vehicle tracks.
- Foot traffic tracks.
- Cans, bottles or other trash.
- Other signs of unauthorized access or vandalism.

3.7 ENFORCEMENT OF DEED/CONSTRUCTION RESTRICTIONS

The restrictive covenant will state that no one shall dig into, excavate, or otherwise disturb the containment cell and the 3 ft of clean soil capping the containment cells, without first notifying and obtaining approval from EPA and GAEPD. The O&M inspection shall make observations of all intrusive activities over the capped areas. Any damage to the cap systems or monitoring wells shall be repaired in a timely manner by the inspecting agency.

3.8 COST ESTIMATE

A summary of the estimated costs for periodic site inspections, water level measurements and reporting, and routine maintenance for 30 years is presented in Table 3-5 (note that cost estimates for Superfund sites are typically based on a 30-year period, although O&M costs will continue beyond 30 years). The cost estimates were based on the following assumptions:

- Local resources will be employed for maintenance.
- The base year's fully loaded labor rate for the site inspector is $100 per hour.
- An inflation rate of 5 percent annually over the 30-year period will persist.
- The EPA will be conducting the groundwater sampling, analysis, and transducer maintenance efforts.

4.0 References

Black & Veatch, 2011. Black & Veatch Special Project Corp., *100% Remedial Design Basis of Design Report, Camilla Wood Preserving Site.* March 2011

Black & Veatch, 2015. Black & Veatch Special Project Corp., *Remedial Action Report for the Camilla Wood Preserving Site.* July 31, 2015

EPA, 2009. U.S. Environmental Protection Agency, *Camilla Wood Preserving Site Record of Decision*. September 2009

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Tables

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Table 2-1
Groundwater Remedial Goal Summary
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Chemical of Concern	Remedial Goal (ppb)	Basis
Shallow Groundwater		
Benzene	5	MCL
2,4-Dimethylphenol	313	Child Resident
2-Methylnaphthalene	31	Child Resident
cPAHs BaP	0.2	MCL
Carbazole	48	Lifetime Resident
Dibenzofuran	31	Child Resident
Naphthalene	156	Child Resident
Pentachlorophenol	1	MCL
Phenanthrene	469	Child Resident
Arsenic	10	MCL
Manganese	300	Lifetime Health Advisory
Intermediate Groundwater		
Benzene	5	MCL
Ethylbenzene	700	MCL
2-Methylnaphthalene	31	Child Resident
Acenaphthene	469	Child Resident
cPAHs BaP	0.2	MCL
Carbazole	48	Lifetime Resident
Dibenzofuran	31	Child Resident
Flouroene	313	Child Resident
Naphthalene	156	Child Resident
Pentachlorophenol	1	MCL
Phenanthrene	469	Child Resident
Heptachlor Epoxide	0.2	MCL
Arsenic	10	MCL
Manganese	300	Lifetime Health Advisory
Nickel	313	Child Resident

Notes:

BaP - Benzo(a)pyrene equivalent

cPAH - Carcinogenic Polynuclear Aromatic Hydrocarbon

MCL - Maximum Contaminant Level

ppb - parts per billion

RGO - remedial goal objective

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Table 2-2
Well Construction Details
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Well ID	Date	Depth (ft bls)	Screened Interval (ft bls)	Casing Elevation	Depth to Water at Time of Drilling (ft BTOC)	Screen Material	Aquifer	Easting	Northing	Notes
AFMW-01I	3/3/2003	165	145–165	179.47	44.1	2-in SS	Intermediate	2286078.691	444237.666	Athletic field, downgradient sentinel well, ISCO performance well
AFMW-02I	3/13/2004	91	81.0-90.6	175.64	47.83	2-in SS	Intermediate	2285967.004	444710.913	Athletic field, downgradient sentinel well, ISCO performance well
AFMW-03I	12/14/2006	97	81.0-90.6	176.73	NR	2-in SS	Intermediate	2285959.529	444532.816	Athletic field, downgradient sentinel well, ISCO performance well
AFMW-04D	2/11/2013	349	279-349	181.78	NR	2-in SS	Intermediate	2286329.516	444666.683	Athletic field, downgradient sentinel well, ISCO performance well
AFMW-05I	9/12/2013	146	136-146	177.32	53.00	2-in SS	Intermediate	2285967.200	444550.900	Athletic field, downgradient sentinel well, ISCO performance well
AFMW-06I	9/26/2013	170	160-170	178.17	51.00	2-in SS	Intermediate	2285964.250	444411.300	Athletic field, downgradient sentinel well, ISCO performance well
AFMW-07I	7/8/2014	90	80-90	178.17	NR	2-in SS	Intermediate	2285971.021	444381.689	Athletic field, downgradient sentinel well, ISCO performance well
AFMW-08I	7/9/2014	121	111-121	181.23	NR	2-in SS	Intermediate	2286332.667	444653.113	Athletic field, downgradient sentinel well, ISCO performance well
CAP-01	-	-	-	169.70	-	2-in-PVC	Shallow	2285368.280	444817.385	Barrier wall groundwater elevation monitoring, not used
CAP-02	11/20/2015	19.4	9-4-19.4	171.65	4.61	2-in-PVC	Shallow	2285610.200	444439.610	Barrier wall groundwater elevation monitoring, transducer installed
CAP-03	11/20/2015	18.93	8.93-18.93	168.31	2.72	2-in-PVC	Shallow	2285057.280	444050.190	Barrier wall groundwater elevation monitoring, transducer installed
CAP-04	11/20/2015	25.8	15.8-25.8	175.76	15.85	2-in-PVC	Shallow	2285585.950	444440.200	Barrier wall groundwater elevation monitoring, transducer installed
CAP-05	11/20/2015	25.38	15.38-25.38	176.22	18.82	2-in-PVC	Shallow	2285557.320	444169.900	Barrier wall groundwater elevation monitoring, transducer installed
CAP-06	11/20/2015	24.34	14.34-24.34	175.06	18.69	2-in-PVC	Shallow	2285064.410	444100.130	Barrier wall groundwater elevation monitoring, transducer installed
CAP-08	11/20/2015	25.53	15.53-25.25	175.58	16.25	2-in-PVC	Shallow	2285052.420	444768.340	Barrier wall groundwater elevation monitoring, transducer installed
CMW-01I	5/29/1997	120	110.0-120.0	172.15	44.91	2-in PVC	Intermediate	2285714.001	444455.375	ISCO performance monitoring well
CMW-01S	5/29/1997	20	10.0-20.0	172.15	5.88	2-in PVC	Shallow	2285715.509	444499.593	Barrier wall/excavation performance monitoring well
EW01	2/25/2014	95	80-95	172.08	NR	4-in SS	Intermediate	2285764.345	444439.501	ISCO extraction well
EW02	7/26/2014	111	81-111	172.30	NR	4-in SS	Intermediate	2285731.222	444367.615	ISCO extraction well
F15MWI	2/28/2003	79	69–79	169.68	50.34	2-in SS	Intermediate	2284507.861	444545.587	Barrier wall performance monitoring well
IW01-A	7/8/2014	85	66-81	171.71	NR	2-in SS	Intermediate	2285766.596	444497.269	ISCO injection well
IW02-A	7/14/2014	85	69-84	171.94	NR	2-in SS	Intermediate	2285807.560	444497.296	ISCO injection well
IW03-B	7/11/2014	95	83-93	171.56	NR	2-in SS	Intermediate	2285747.651	444461.175	ISCO injection well
IW04-A	7/10/2014	90	83-93	171.79	NR	2-in SS	Intermediate	2285782.699	444461.225	ISCO injection well
IW04-B	7/14/2014	75	63-73	171.95	NR	2-in SS	Intermediate	2285788.361	444461.042	ISCO injection well
IW05-A	8/5/2014	86	68-83	172.23	NR	2-in SS	Intermediate	2285812.724	444469.986	ISCO injection well
IW06-A	7/21/2014	80	69-79	171.29	NR	2-in SS	Intermediate	2285684.439	444424.964	ISCO injection well
IW06-B	7/23/2014	106	89-104	171.18	NR	2-in SS	Intermediate	2285691.614	444428.054	ISCO injection well
IW07-A	7/23/2014	86	69-84	171.64	NR	2-in SS	Intermediate	2285718.979	444414.062	ISCO injection well
IW07-B	7/12/2014	105	89-104	171.76	NR	2-in SS	Intermediate	2285726.417	444411.100	ISCO injection well
IW08-A	7/13/2014	80	63-78	172.10	NR	2-in SS	Intermediate	2285775.079	444423.746	ISCO injection well
IW08-B	7/13/2014	100	83-98	172.10	NR	2-in SS	Intermediate	2285770.125	444423.688	ISCO injection well
IW09-A	7/23/2014	80	64-79	172.48	NR	2-in SS	Intermediate	2285806.664	444422.943	ISCO injection well
IW09-B	7/22/2014	101	83-98	172.81	NR	2-in SS	Intermediate	2285811.871	444424.700	ISCO injection well
IW10-A	8/6/2014	85	69-84	172.78	NR	2-in SS	Intermediate	2285813.482	444399.061	ISCO injection well

Prepared by: John Weir 5-26-17
Checked by: Carrie McCoy 6-01-17

Table 2-2
Well Construction Details
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Well ID	Date	Depth (ft bls)	Screened Interval (ft bls)	Casing Elevation	Depth to Water at Time of Drilling (ft BTOC)	Screen Material	Aquifer	Easting	Northing	Notes
IW11-A	7/13/2014	80	70-80	171.68	NR	2-in SS	Intermediate	2285683.906	444379.764	ISCO injection well
IW11-B	7/13/2014	104	89-104	171.65	NR	2-in SS	Intermediate	2285683.603	444385.843	ISCO injection well
IW12-A	7/27/2014	75	65-75	171.71	NR	2-in SS	Intermediate	2285707.113	444382.692	ISCO injection well
IW12-B	7/25/2014	90	79-89	171.68	NR	2-in SS	Intermediate	2285700.317	444391.408	ISCO injection well
IW12-C	7/24/2014	110	95-110	171.83	NR	2-in SS	Intermediate	2285712.235	444392.218	ISCO injection well
IW13-A	7/26/2014	75	65-75	172.26	NR	2-in SS	Intermediate	2285746.967	444389.887	ISCO injection well
IW13-B	7/23/2014	91	79-89	172.29	NR	2-in SS	Intermediate	2285750.536	444397.299	ISCO injection well
IW13-C	7/22/2014	111	94-109	172.23	NR	2-in SS	Intermediate	2285745.192	444396.751	ISCO injection well
IW15-A	7/13/2014	80	63-78	172.79	NR	2-in SS	Intermediate	2285801.129	444381.185	ISCO injection well
IW15-B	7/13/2014	100	83-98	172.84	NR	2-in SS	Intermediate	2285805.670	444380.773	ISCO injection well
IW16-A	8/7/2014	90	75-90	173.88	NR	2-in SS	Intermediate	2285816.885	444325.625	ISCO injection well
IW17-A	8/9/2014	86	70-85	171.71	NR	2-in SS	Intermediate	2285684.346	444342.157	ISCO injection well
IW17-B	8/9/2014	104	89-104	172.69	NR	2-in SS	Intermediate	2285689.723	444342.646	ISCO injection well
IW18-A	8/9/2014	85	69-84	172.15	NR	2-in SS	Intermediate	2285726.436	444338.418	ISCO injection well
IW18-B	8/9/2014	110	94-109	172.16	NR	2-in SS	Intermediate	2285720.017	444338.010	ISCO injection well
IW19-A	8/10/2014	81	66-81	173.09	NR	2-in SS	Intermediate	2285747.687	444347.805	ISCO injection well
IW19-B	8/9/2014	105	90-105	172.82	NR	2-in SS	Intermediate	2285747.670	444343.504	ISCO injection well
IW20-A	7/10/2014	80	69-79	173.23	NR	2-in SS	Intermediate	2285802.275	444343.105	ISCO injection well
IW20-B	7/11/2014	100	83-98	173.28	NR	2-in SS	Intermediate	2285807.456	444343.034	ISCO injection well
IW21-A	8/8/2014	90	74-89	173.55	NR	2-in SS	Intermediate	2285788.805	444294.866	ISCO injection well
IW22-A	7/27/2014	101	90-100	172.57	NR	2-in SS	Intermediate	2285749.852	444301.242	ISCO injection well
LMW-01I	2/25/2003	59	49–59	169.77	43.0	2-in stainless	Intermediate	2284941.675	444966.786	Downgradient monitoring well (Lincoln Street)
MASMW-01I	12/8/2006	137	116.0-136.0	180.19	NR	2-in SS	Intermediate	2286321.809	443832.983	Downgradient monitoring well
MASMW-02I	12/12/2006	97	81.0-90.6	178.79	NR	2-in SS	Intermediate	2286075.348	443816.875	Downgradient monitoring well
MW-01A	Unknown	40.28*	Unknown	171.28	Unknown	6-in PVC	Intermediate	2285710.185	444696.567	Barrier wall/excavation performance monitoring well
MW-01I	5/14/1997	67	55.0-67.0	168.9	42.36	2-in PVC	Intermediate	2284787.053	444631.566	Groundwater monitoring well, transducer installed
MW-01S	5/19/1997	20	9.0-20.0	168.82	5.3	2-in PVC	Shallow	2284817.892	444636.045	Groundwater monitoring well, transducer installed
MW-02	Unknown	80.5	60.0-80.5	169.92	47.99	3-in steel	Intermediate	2285608.833	444162.715	Closed, replaced by MW29I
MW-02I	5/16/1997	65	55.0-65.0	169.55	43.01	2-in PVC	Intermediate	2284920.009	444367.728	Barrier wall performance monitoring well
MW-02S	5/19/1997	20	9.0-20.0	169.61	5.67	2-in PVC	Shallow	2284922.149	444360.999	Barrier wall performance monitoring well
MW-03A	Unknown	92*	Unknown	178.62	102.02	4-in PVC	Intermediate	2285111.980	444635.883	Inside barrier wall, intermediate aquifer monitoring well
MW-03B	Unknown	56.3*	Unknown	169.32	101.5	4-in PVC	Intermediate	2284973.359	444680.868	Barrier wall performance monitoring well
MW-03I	5/18/1997	100	90.0-100.0	179.16	43.92	2-in PVC	Intermediate	2285207.028	444226.605	Inside barrier wall, intermediate aquifer monitoring well
MW-03S	Unknown	22.24*	Unknown	179.31	99.61	2-in PVC	Shallow	2285211.976	444234.578	Inside barrier wall, assessment well only

Prepared by: John Weir 5-26-17
Checked by: Carrie McCoy 6-01-17

Table 2-2
Well Construction Details
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Well ID	Date	Depth (ft bls)	Screened Interval (ft bls)	Casing Elevation	Depth to Water at Time of Drilling (ft BTOC)	Screen Material	Aquifer	Easting	Northing	Notes
MW-04A	Unknown	74*	Unknown	170.56	Unknown	4-in PVC	Intermediate	444799.740	2285034.390	Barrier wall performance monitoring well
MW-04S	5/15/1997	15	5.0-15.0	170.13	4.36	2-in PVC	Shallow	2285602.486	444160.997	Groundwater monitoring well, transducer installed
MW-05I	5/21/1997	75	65.0-75.0	175.23	44.44	2-in PVC	Intermediate	2285571.073	444557.910	Inside barrier wall, intermediate aquifer monitoring well
MW-05S	5/21/1997	20	10.0-20.0	175.62	16.8	2-in PVC	Shallow	2285571.230	444563.601	Inside barrier wall, assessment well only
MW-06I	5/18/1997	175	165.0-175.0	175.62	43.59	2-in PVC	Intermediate	2285565.459	444790.728	Inside barrier wall, intermediate aquifer monitoring well
MW-06S	5/19/1997	20	8.0-20.0	175.89	5.37	2-in PVC	Shallow	2285556.872	444780.835	Inside barrier wall, assessment well only
MW-07I	5/20/1997	110	100.0-110.0	176.22	43.33	2-in PVC	Intermediate	2285360.861	444792.507	Inside barrier wall, intermediate aquifer monitoring well
MW-07S	5/21/1997	20	10.0-20.0	176.21	5.15	2-in PVC	Shallow	2285371.384	444792.803	Inside barrier wall, assessment well only
MW-08S	5/14/1997	16	6.0-16.0	170.02	2.93	2-in PVC	Shallow	2285047.342	444794.061	Groundwater monitoring well, transducer installed
MW09I	12/7/2006	67	56.0-66.0	178.57	NR	2-in SS	Intermediate	2285422.866	444184.077	Inside barrier wall, intermediate aquifer monitoring well
MW10I	12/11/2006	76	65.0-75.0	174.87	NR	2-in SS	Intermediate	2285588.450	444382.990	Closed, replaced by MW32D
MW-11I	4/17/2010	75	64.83-74.83	172.25	NR	2-in SS	Intermediate	2285682.046	444357.450	ISCO performance monitoring well
MW-11S	4/17/2010	25	14.95-24.80	171.75	NR	2-in SS	Shallow	2285676.395	444403.708	Barrier wall/excavation performance monitoring well
MW-12S	4/16/2010	25	14.95-24.80	172.89	NR	2-in SS	Shallow	2285833.703	444428.892	Barrier wall/excavation performance monitoring well
MW-13S	4/15/2010	25	14.95-24.80	171.14	NR	2-in SS	Shallow	2285704.174	444694.709	Barrier wall/excavation performance monitoring well
MW-14S	4/16/2010	25	14.95-24.80	170.42	NR	2-in SS	Shallow	2285597.936	444881.647	Barrier wall/excavation performance monitoring well
MW-15I	4/14/2010	75	64.83-74.83	174.69	NR	2-in SS	Intermediate	2285388.960	444516.305	Inside barrier wall, intermediate aquifer monitoring well
MW-16I	4/13/2010	105	94.83-104.83	179.2	NR	2-in SS	Intermediate	2285459.478	444359.002	Inside barrier wall, intermediate aquifer monitoring well
MW-17I	4/13/2010	85	74.83-84.83	177.89	NR	2-in SS	Intermediate	2285539.402	444284.597	Inside barrier wall, intermediate aquifer monitoring well
MW-18I	4/16/2010	85	74.83-84.83	173.98	NR	2-in SS	Intermediate	2285830.336	444352.038	ISCO performance monitoring well
MW-19I	4/22/2010	75	64.83-74.83	174.21	NR	2-in SS	Intermediate	2285728.168	444091.878	Barrier wall performance monitoring well
MW-20I	4/15/2010	75	64.83-74.83	167.24	NR	2-in SS	Intermediate	2284818.230	443449.814	Downgradient monitoring well
MW-21I	4/21/2010	105	94.83-104.83	175.8	NR	2-in SS	Intermediate	2285015.221	443317.603	Downgradient monitoring well
MW-22S	4/22/2010	25	14.83-24.83	171.53	NR	2-in SS	Shallow	2285394.548	444327.751	Inside barrier wall, assessment well only
MW23I	12/5/2011	87	77-87	180.34	NR	2-in SS	Intermediate	2285219.817	444358.268	Inside barrier wall, intermediate aquifer monitoring well
MW-26A	10/3/2012	69	64-69	172.15	NR	2-in SS	Intermediate	2285734.985	444397.363	ISCO performance monitoring well
MW-26B	10/3/2012	81	71-81	172.10	NR	2-in SS	Intermediate	2285731.613	444393.954	ISCO performance monitoring well
MW-26C	10/2/2012	92	82-92	172.30	NR	2-in SS	Intermediate	2285739.267	444394.456	ISCO performance monitoring well
MW-26D	10/2/2012	105	95-105	172.30	60.50	2-in SS	Intermediate	2285735.389	444390.102	ISCO performance monitoring well
MW-27I	10/11/2012	156	146-156	167.63	NR	2-in SS	Intermediate	2284691.949	443424.225	Downgradient monitoring well, replaced MWPBCI
MW-28I	10/10/2012	85	75-85	167.79	NR	2-in SS	Intermediate	2284961.110	443434.305	Downgradient monitoring well, replaced MWPBEI
MW-29I	10/10/2012	74	64-74	170.13	NR	2-in SS	Intermediate	2285603.164	444160.844	Barrier wall performance monitoring well, replaced MW-02
MW-30D	1/17/2013	137	127-137	172.13	NR	2-in SS	Intermediate	2285733.980	444404.350	ISCO performance monitoring well
MW-31I	1/20/2013	97	87-97	175.12	NR	2-in SS	Intermediate	2285792.265	444471.713	ISCO performance monitoring well

Prepared by: John Weir 5-26-17
Checked by: Carrie McCoy 6-01-17

Table 2-2
Well Construction Details
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Well ID	Date	Depth (ft bls)	Screened Interval (ft bls)	Casing Elevation	Depth to Water at Time of Drilling (ft BTOC)	Screen Material	Aquifer	Easting	Northing	Notes
MW-32D	1/29/2013	147	137-147	171.79	NR	2-in SS	Intermediate	2285592.411	444357.202	Inside barrier wall, intermediate aquifer monitoring well, replaced MW10I
MW-33D	2/1/2013	147	137-147	173.63	NR	2-in SS	Intermediate	2285816.163	444348.385	Well obstructed, unable to be cleared
MW-34D*	9/16/2013	151	141-151	174.23	50.50	2-in SS	Intermediate	2285835.120	444261.200	ISCO performance monitoring well
MW-35D	2/27/2014	95	80-95	172.43	NR	2-in SS	Intermediate	2285764.212	444423.912	ISCO performance monitoring well
MW-36D	2/26/2014	95	80-95	172.13	NR	2-in SS	Intermediate	2285789.666	444437.988	ISCO performance monitoring well
MW-37	7/9/2014	85	66-81	171.75	NR	2-in SS	Intermediate	2285767.330	444470.541	ISCO performance monitoring well
MW-38A	7/15/2014	85	70-85	171.68	NR	2-in SS	Intermediate	2285712.660	444444.745	ISCO performance monitoring well
MW-38B	7/22/2014	105	87-102	171.27	NR	2-in SS	Intermediate	2285703.224	444437.285	ISCO performance monitoring well
MW-39A	7/14/2014	80	64-79	172.31	NR	2-in SS	Intermediate	2285788.305	444407.920	ISCO performance monitoring well
MW-39B	7/14/2014	100	84-99	172.30	NR	2-in SS	Intermediate	2285792.738	444413.433	ISCO performance monitoring well
MW-40	7/12/2014	105	94-104	173.14	NR	2-in SS	Intermediate	2285812.743	444368.521	ISCO performance monitoring well
MW-41	7/24/2014	85.5	74-84	171.52	NR	2-in SS	Intermediate	2285742.292	444518.118	ISCO performance monitoring well
MWPBCI	Unknown	200	Unknown	NR	50	Unknown	Intermediate	2284694.200	443433.440	Closed, replaced by MW27I
MWPBEI	Unknown	66	Unknown	NR	45.68	4-in steel	Intermediate	2284959.650	443438.400	Closed, replaced by MW28I
MWPBWI	Unknown	61.5	Unknown	NR	45.02	4-in steel	Intermediate	2284350.240	443510.680	Closed, not replaced
PWM-01I	3/14/2004	71	61.4-71.0	172.78	45.03	2-in SS	Intermediate	2285706.267	444178.346	Barrier wall performance monitoring well (Powell Street)
SMW-01I	2/26/2003	129	119–129	169.77	26.5	2-in SS	Intermediate	2285337.580	444874.578	Downgradient monitoring well (Singleton Street)
SMW-01S	3/1/2003	18	8–18	173.53	NR	2-in SS	Shallow	2285331.240	444943.900	Barrier wall performance monitoring well (Singleton Street)
SMW-02I	3/16/2004	96	86.4-96.0	171.51	40.13	2-in SS	Intermediate	2285329.877	444950.538	Downgradient monitoring well (Singleton Street)
SMW-03I	3/9/2004	81	71.43-81.0	183.1	44.29	2-in SS	Intermediate	2285350.480	445320.810	Downgradient monitoring well (Singleton Street)
TMW-01I	3/2/2003	109	99–109	170.74	47.63	2-in SS	Intermediate	2285633.876	445031.067	Downgradient monitoring well (Thomas Street)
TMW-02I	12/8/2006	97	76.0-96.0	172.87	NR	2-in SS	Intermediate	2285835.040	443382.820	Downgradient monitoring well (Thomas Street)

Notes:

bls	Below land surface
BTOC	Below top of casing
ft	feet
in	inch
NR	Not recorded
PVC	Polyvinyl chloride
SS	Stainless Steel
*	Total well depth below top of casing

Prepared by: John Weir 5-26-17
Checked by: Carrie McCoy 6-01-17

Table 2-3
Recommended Groundwater Monitoring Program
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Well ID	Easting	Northing	Total Well Depth (ft)	Monitoring Frequency and Analyses		
				Semi-Annual SVOC	Semi-Annual TAL Metals	Annual VOCs, SVOC and Metals
AFMW-01I	2286078.69	444237.67	165	X[1]		X[1]
AFMW-02I	2285967.00	444710.91	91	X[1]		X[1]
AFMW-03I	2285959.53	444532.82	97	X[1]		X[1]
AFMW-04D	2286329.52	444666.68	349	X[1]		X[1]
AFMW-05I	2285967.20	444550.90	146	X[1]	X	X[1]
AFMW-06I	2285964.25	444411.30	170	X[1]	X	X[1]
AFMW-07I	2285971.02	444381.69	90	X[1]		X[1]
AFMW-08I	2286332.67	444653.11	121	X[1]		X[1]
CMW-01I	2285714.00	444455.38	120	X[1]		X[1]
CMW-01S	2285715.51	444499.59	20			X
F15MWI	2284507.86	444545.59	79			X[1]
LMW-01I	2284941.675	444966.79	59			X[1]
MASMW-01I	2286321.81	443832.98	137			X[1]
MASMW-02I	2286075.35	443816.88	97			X[1]
MW-01A	2285710.19	444696.57	40.28			X
MW-01I	2284787.05	444631.57	67			X[1]
MW-01S	2284817.89	444636.05	20			X[1]
MW-02I	2284920.01	444367.73	65			X[1]
MW-02S	2284922.15	444361.00	20			X[1]
MW-03A	2285111.98	444635.88	92			X[1]
MW-03B	2284973.36	444680.87	56.3			X[1]
MW-03I	2285207.03	444226.61	100			X[1]
MW-04A	444799.74	2285034.39	74			X[1]
MW-04S	2285602.49	444161.00	15			X
MW-05I	2285571.07	444557.91	75			X
MW-06I	2285565.46	444790.73	175			X[1]
MW-07I	2285360.86	444792.51	110			X[1]
MW-08S	2285047.34	444794.06	16			X[1]
MW09I	2285422.87	444184.08	67			X[1]
MW-11I	2285676.40	444403.71	25	X		X
MW-11S	2285833.70	444428.89	25			X
MW-12S	2285704.17	444694.71	25			X
MW-13S	2285597.94	444881.65	25			X
MW-14S	2285597.94	444881.65	25			X
MW-15I	2285388.96	444516.31	105			X[1]
MW-16I	2285459.48	444359.00	105			X[1]
MW-17I	2285539.40	444284.60	85			X[1]
MW-18I	2285830.34	444352.04	85	X		X
MW-19I	2285728.17	444091.88	75			X[1]
MW-20I	2284818.23	443449.81	75			X[1]
MW-21I	2285015.22	443317.60	105			X[1]
MW-23I	2285219.82	444358.27	87			X[1]
MW-26A	2285734.99	444397.36	69	X		X
MW-26B	2285731.61	444393.95	81	X		X
MW-26C	2285739.27	444394.46	92	X		X
MW-26D	2285735.39	444390.10	105	X		X
MW-27I	2284691.95	443424.23	156			X
MW-28I	2284961.11	443434.31	85			X

Prepared by: John Weir 05.26.17
Checked by: Carrie McCoy 06.01.17

Table 2-3
Recommended Groundwater Monitoring Program
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Well ID	Easting	Northing	Total Well Depth (ft)	Monitoring Frequency and Analyses		
				Semi-Annual SVOC	Semi-Annual TAL Metals	Annual VOCs, SVOC and Metals
MW-29I	2285603.16	444160.84	74			X
MW-30D	2285733.98	444404.35	137	X		X
MW-31I	2285792.26	444471.71	97	X		X
MW-32D	2285592.41	444357.20	147			X
MW-34D	2285835.12	444261.20	151	X		X
MW-35D	2285764.21	444423.91	95	X		X
MW-36D	2285789.67	444437.99	95	X		X
MW-37	2285767.33	444470.54	85	X	X	X
MW-38A	2285712.66	444444.74	85	X		X
MW-38B	2285703.22	444437.29	105	X		X
MW-39A	2285788.30	444407.92	80	X		X
MW-39B	2285792.74	444413.43	100	X		X
MW-40	2285812.74	444368.52	105	X	X	X
MW-41	2285742.29	444518.12	85.5	X	X	X
PMW-01I	2285706.27	444178.35	71			X
SMW-01I	2285337.58	444874.58	129			X
SMW-01S	2285331.24	444943.90	18			X[1]
SMW-02I	2285329.88	444950.54	96			X[1]
SMW-03I	2285350.48	445320.81	81			X[1]
TMW-01I	2285633.88	445031.07	109			X[1]
TMW-02I	2285835.04	443382.82	97			X[1]
		Number of Sample Locations		27	5	69
		Samples Requiring SIM Analysis		9	0	37

Notes:

Shallow monitoring well

ft - feet

1 -Select ion monitoring (SIM) analysis should be run for Polynuclear Aromatic Hydrocarbons (PAHs) and Pentachlorophenol (PCP)

SVOC - Semi-volatile Organic Compounds

VOC - Volatile Organic Compounds

TAL - Target Analyte List, includes 23 metals

SVOCs will be analyzed for by EPA Method 8270D

VOCs will be analyzed for by EPA Method 8260D

TAL Metals will be analyzed for by EPA Method 6010

Prepared by: John Weir 05.26.17
Checked by: Carrie McCoy 06.01.17

Table 3-1
Schedule of Inspections
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Specific Item	Typical Problems	Minimum Suggested Frequency				Notes
		Monthly	Semi-annually	Annually	After Major Storms	
Final Cover	Erosion		X		X	Written report will be made if problems are observed/ encountered.
	Vegetation stress		X		X	
	Settling/Ponding of Water		X		X	
	Uplift		X		X	
	Washouts		X		X	
	Animal Burrows		X			
	Slope Instability		X			
	Rock Drainage Ring		X			
	Rip Rap Drainage Channels		X			
	Evidence of Leakage Around Penetrations		X			
	Scouring		X		X	
Monitoring Wells	High Water Table			X		Written report will be made if problems are observed/ encountered.
	Missing Locks, Damaged Casing, Damage to Pad			X		
	Routine monitoring			X		Written annual report will summarize analytical data.
Barrier Wall	Rising Groundwater Levels	X				Data from transducer array to be analyzed on a monthly basis. Written semi-annual report will summarize transducer data and identify rising groundwater level trends.
	Evidence of Settling		X			
	Routine Maintenance of Transducer Array		X			
Perimeter Stormwater Ditches	Trash, Vegetation, Sedimentation			X	X	Written report will be made if problems are observed/ encountered.
Concrete Foundations	Spalling/Cracking			X		Written report will be made if problems are observed/encountered
	Ponding Water			X		
	Settlement			X		
Site Security	Trespassing / Vandalism	X				Written report will be made if problems are observed/ encountered.
Enforcement of Deed / Construction Restrictions	Unapproved Land Use			X		Written report will be made if problems are observed/ encountered.

Prepared by: John Weir 05.26.17
Checked by: Carrie McCoy 06.01.17

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Table 3-2
Schedule of Preventive (Routine) Maintenance
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Specific Item	Typical Problems	Minimum Suggested Frequency					Notes
		Quarterly	Semi-annually	Annually	After Major Storms	File Report [1]	
Final Cover	Mowing	X					Frequency depends on visual observation / as-needed basis.
	Regrading / Backfilling			X	X	X	
Barrier Wall	Transducer Maintenance		X				Frequency depends on proper functioning of units and as-needed.
Perimeter Stormwater Ditches	Trash, Vegetation, Sedimentation			X	X	X	Clean out ditches as necessary to maintain overland flow.
Concrete Foundations	Spalling/Cracking, Settlement			X		X	Frequency depends on visual observation / as-needed basis.

Notes:

1. File report at completion of maintenance activity.

Prepared by: John Weir 05.26.17
Checked by: Carrie McCoy 06.01.17

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Table 3-3
O Inspection Items Frequency and Responsibility
Camilla Wood Preservng Site
Camilla, Mitchell County, Georgia

Inspection Item	Frequency	Responsible Party*
Maintain the integrity of the final cover, including making necessary repairs to the cover components, to correct the effects of settling, subsidence, erosion or other events	After major storm events, semi-annually	GAEPD
Monitoring the effectiveness of the cover system	Annually	GAEPD
Monitoring the effectiveness of the low permeability barrier wall	Semi-annually	GAEPD
Preventing surface water run-on and runoff from eroding or otherwise damaging the cap	After major storm events, semi-annually	GAEPD
Ensuring that the security of the monitoring wells is maintained	Annually	GAEPD
Ensuring the engineering controls and institutional controls are being enforced	Annually	GAEPD
Perimeter storm water ditches	After major storm events, annually	GAEPD
Concrete foundations	Annually	GAEPD
Site security facilities	Monthly, as needed	GAEPD
Vegetative cover	Semi-annually	GAEPD

Notes:

* - The City of Camilla and Mitchell County have expressed a willingness to assist the Georgia Environmental Protection Division (GAEPD)

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Table 3-4
Operations and Maintenance Inspection Report
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

INSPECTOR INFORMATION	
Name:	
Organization:	
Department:	
Phone:	

Date: Sheet: of:

Weather: Report No.:

ITEMS TO INSPECT	TYPICAL PROBLEMS ENCOUNTERED	CONDITIONS OBSERVED		
		Sat	Unsat	N/A
MONTHLY / AS NEEDED				
Site Security	Trespassing / Vandalism			
Barrier Wall	Monitor Rising Groundwater Levels			
AFTER MAJOR STORM				
Final Cover	Erosion			
	Vegetation stress			
	Settling / Ponding of Water			
	Uplift			
	Washouts			
	Evidence of Leakage Around Penetrations			
	Scouring			
Perimeter Stormwater Ditches	Trash/Vegatative Matter/Sedimentation			
SEMI-ANNUALLY				
Final Cover	Erosion			
	Vegetation stress			
	Settling / Ponding of Water			
	Uplift			
	Washouts			
	Animal Burrows			
	Slope Instability			
	Rock Drainage Ring			
	Rip Rap Drainage Channels			
	Evidence of Leakage Around Penetrations			
	Scouring			
	Mounds			
Barrier Wall	Evidence of Settling			
	Maintentance of Transducer Array			

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Checked by: Carrie McCoy 06.01.17

Table 3-4
Operations and Maintenance Inspection Report
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

ANNUALLY				
Final Cover	Vegetation Stress			
	Regrading/Backfilling			
Monitoring Wells	High Water Table			
	Missing locks, damaged casing			
	Routine monitoring			
Concrete Foundations	Spalling/Cracking			
	Settlement			
Enforcement of Deed/Construction Restrictions	Unapproved Land Use			

Comments/Recommendations:

Entered by: John Weir 05.26.17
Checked by: Carrie McCoy 06.01.17

Table 3-5
Preventive Maintenance Log
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

INSPECTOR INFORMATION	
Name:	
Organization:	
Department:	
Phone:	

Date: Sheet: of:

Weather: Report No.:

ITEMS TO INSPECT	TYPICAL PROBLEMS ENCOUNTERED	CONDITIONS OBSERVED		
		Sat	Unsat	N/A
MONTHLY / AS NEEDED				
Site Security	Replace lock(s), Repair Fencing			
SEMI-ANNUALLY				
Final Cover and Vegetation	Erosion, vegetative stress, settling / ponding of water			
Monitoring Wells	Missing locks, damaged casing			
ANNUALLY				
Final Cover and Vegetation	Erosion, vegetative stress, settling / ponding of water			
Monitoring Wells	Missing locks, damaged casing			
Perimeter Stormwater Ditches	Trash/Vegetation, Sedimentation			
Concrete Foundations	Spalling/Cracking, Settlement			
AFTER MAJOR STORM				
Final Cover and Vegetation	washout, erosion, debris accumulation			
Perimeter Stormwater Ditches	Trash/Vegetation, Sedimentation			

Comments:

Prepared by: John Weir 05.26.17
Checked by: Carrie McCoy 06.01.17

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Table 3-6
Summary of Estimated Operations and Maintenence Costs Years 1 through 30
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

SUMMARY OF O&M COSTS			
Item Description	Total Annual Cost Dollars	Operation Time Years	Present Worth Dollars
Cap Maintenance	$6,000	30	$70,862
Groundwater Monitoring (Years 1-5)	$110,380	5	$446,585
Groundwater Monitoring (Years 6-30)	$93,400	25	$1,041,125
Transducer O&M	$5,050	30	$59,642
O&M SUBTOTAL (Years 1-5)	$121,430		$577,090
O&M SUBTOTAL (Years 6-30)	$104,450		$1,171,630
CONTINGENCY (25% of Subtotal for Years 1-5)	$30,358		$144,272
CONTINGENCY (25% of Subtotal for Years 6-30)	$26,113		$292,907
SUBTOTAL (Years 1-5)	$151,788		$721,360
SUBTOTAL (Years 6-30)	$130,563		$1,464,540

CAP MAINTENANCE						
Item Description	Quantity	Units	Unit Price Dollars	Total Annual Cost Dollars	Operation Time, Years	Present Worth
Maintain Vegetation over Capped Area	4	quarterly	$1,500	$6,000	30	$70,862
SUBTOTAL				$6,000		$70,862
CONTINGENCY (25% of Subtotal)				$1,500		$17,716
TOTAL				$7,500		$88,580

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Table 3-6
Summary of Estimated Operations and Maintenence Costs Years 1 through 30
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

GROUNDWATER MONITORING - One ISCO Event (Semi-Annual) and One Comprehensive Event Per Year (Assumes that ISCO Performance Monitoring will continue for 5 years and that Comprehensive Monitoring includes ISCO Performance Wells)						
Item Description	**Quantity**	**Units**	**Unit Price Dollars**	**Total Annual Cost Dollars**	**Operation Time, Years**	**Present Worth**
ISCO PERFORMANCE MONITORING (27 SAMPLES)						
Personnel (2-man crew @ 6 12-hour days)	144	hours	$100	$2,880	5	$12,469
Supplies/ Travel	6	days	$1,000	$6,000	5	$25,977
Groundwater Sampling and Lab Testing	27	sample	$300	$8,100	5	$35,069
COMPREHENSIVE ANNUAL MONITORING (69 SAMPLES)						
Personnel (6-man crew @ 6 12-hour days)	432	hours	$100	$43,200	30	$664,090
Supplies/ Travel	6	days	$3,000	$18,000	30	$276,704
Groundwater Sampling and Lab Testing	69	sample	$300	$20,700	30	$318,210
IDW Disposal	1	lump sum	$3,500	$3,500	30	$53,804
Report Preparation (ISCO and Comprehensive Event Results)	80	hours	$100	$8,000	30	$122,980
O&M SUBTOTAL (Years 1-5)				$110,380		$1,509,301
O&M SUBTOTAL (Years 6-30)				$93,400		$1,435,787
CONTINGENCY (25% of Subtotal for Years 1-5)				$27,595		$377,325
CONTINGENCY (25% of Subtotal for Years 6-30)				$23,350		$358,947
SUBTOTAL (Years 1-5)				$137,975		$1,886,630
SUBTOTAL (Years 6-30)				$116,750		$1,794,730

Entered by: John Weir 05.26.17
Checked by: Carrie McCoy 06.01.17

Table 3-6
Summary of Estimated Operations and Maintenence Costs Years 1 through 30
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

TRANSDUCER O&M (Assumes that repairs and equipment checks will be completed during groundwater monitoring activities)						
Item Description	**Quantity**	**Units**	**Unit Price Dollars**	**Total Annual Cost Dollars**	**Operation Time, Years**	**Present Worth**
Equipment Replacement (assumes replacement every 10 years)	1	lump sum	$17,500	$1,750	30	$26,902
Annual Cellular Contract	1	lump sum	$2,100	$2,100	30	$32,282
Monthly Data Analysis (Reporting included with Annual GW Report)	12	hours	$100	$1,200	30	$18,447
O&M SUBTOTAL				$5,050		$77,631
CONTINGENCY (25% of Subtotal)				$1,263		$19,408
SUBTOTAL				$6,300		$97,040

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Figures

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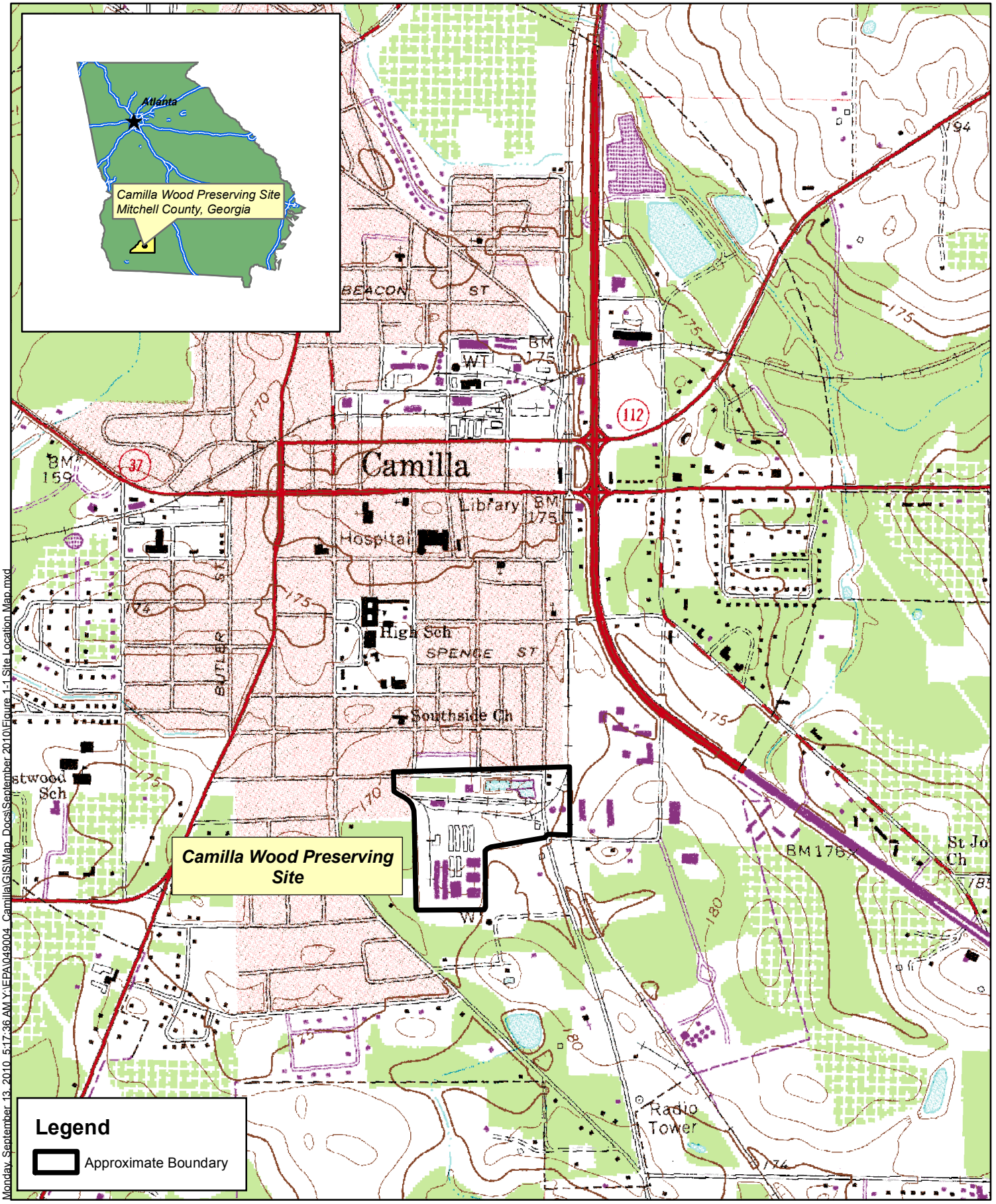
Atlanta
Camilla Wood Preserving Site
Mitchell County, Georgia
Camilla
Camilla Wood Preserving Site
Legend
Approximate Boundary
N
0
0.125
0.25
0.5
Miles
NAD83 State Plane GA West, Feet
Site Location Map
Camilla Wood Preserving Site
Mitchell County, Gerogia
Figure
1-1
Monday, September 13, 2010 5:17:36 AM Y:\EPA\049004_Camilla\GIS\Map_Docs\September 2010\Figure 1-1 Site Location Map.mxd

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Legend

Monitoring Well (by depth)

- Shallow
- Intermediate
- CAP Well
- PHASE 1 - Excavated Soils
- PHASE 1 - Stormwater Detention Pond
- PHASE 2 - Barrier Wall
- PHASE 4 - ISCO Intermediate Treatment Area
- Railroad
- Site Boundary

N

0 250 500

Feet

NAD83 State Plane Georgia West, Feet

Site Layout Map
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Figure 1-2

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(ca2067 7/1/2015 1:24:45 PM C:\PRO_ECT\S1100006\1669 Camilla\GIS\Map Docs\ISCO Injection and Monitoring Network.mxd)

ISCO Injection and Monitoring Network
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Figure 2-1

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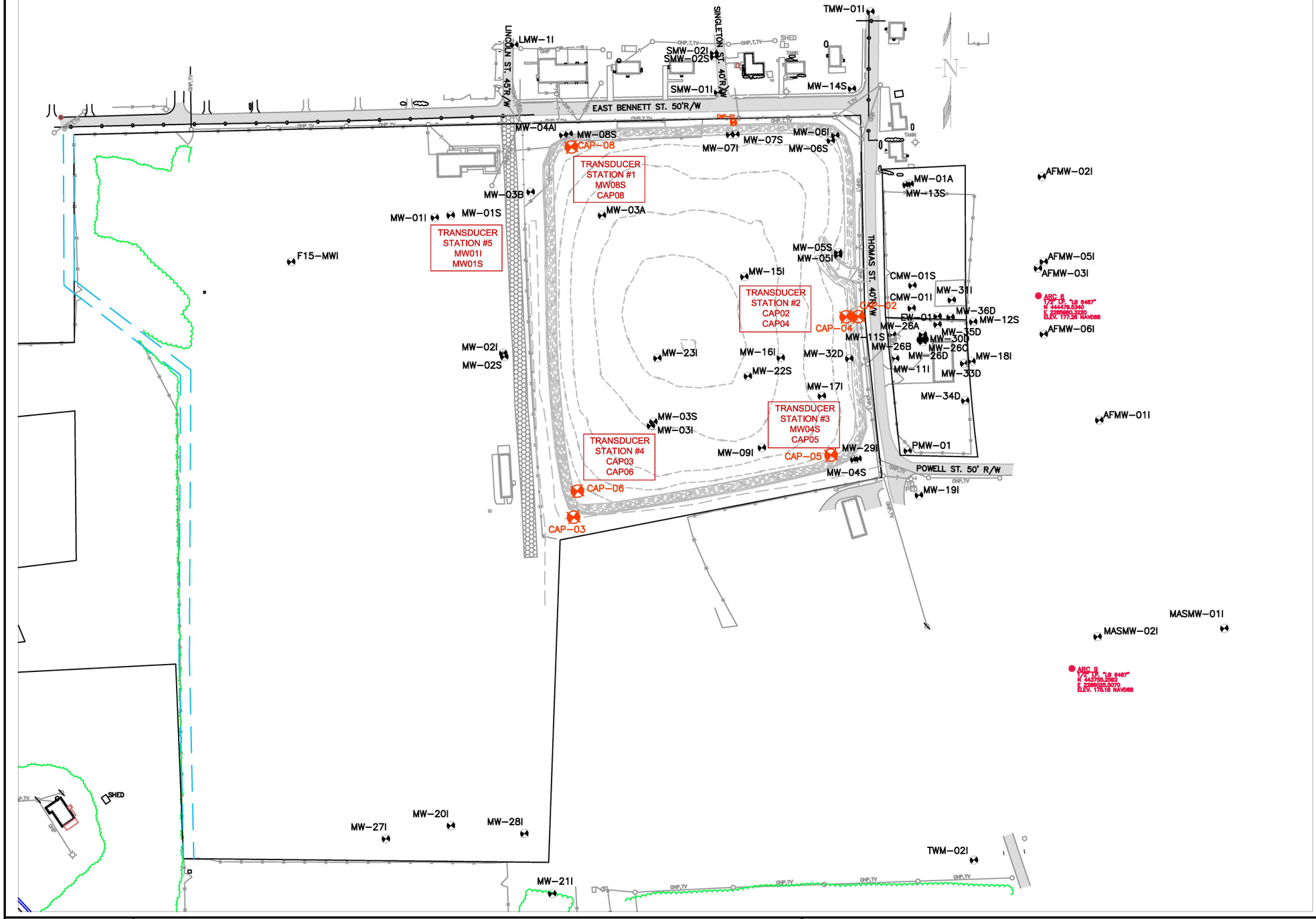

	CAMILLA WOOD PRESERVING SITE CAMILLA, MITCHELL COUNTY, GEORGIA	MONITORING WELL LOCATION MAP	FIGURE 2-2

ORIGINAL DWG SIZE
11 x 17
LOCATION: R:\49062\0144\03 Eng Support\ACAD\Mon Well Map 8-3-15
MOST RECENT REVISION
REVISION DATE:
DRAFTERS INITIALS: JLW
CAD DWG NAME: Groundwater Report Maps
DATE: 8\5\15
PLOT SCALE: 1:1

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Appendix A. Figures and As-Built Surveys From RA Report, Rev 1, and Report of Installation of Final Site Finishes, Rev 0

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N

0 100 200

Feet

NAD83 State Plane Georgia West, Feet

As-Built Barrier Wall Alignment
Camilla Wood Preserving Site
Camilla, Mitchell County, Georgia

Figure 4-8

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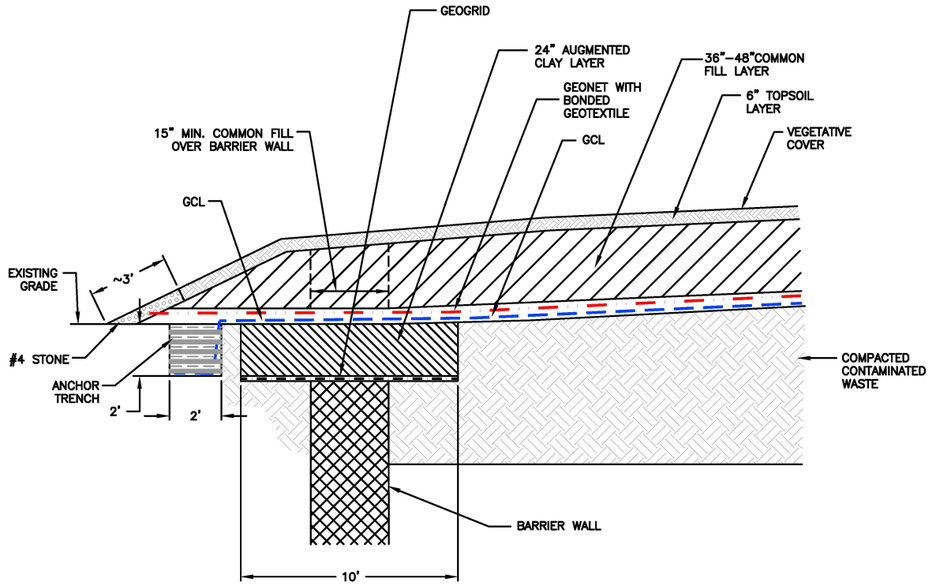
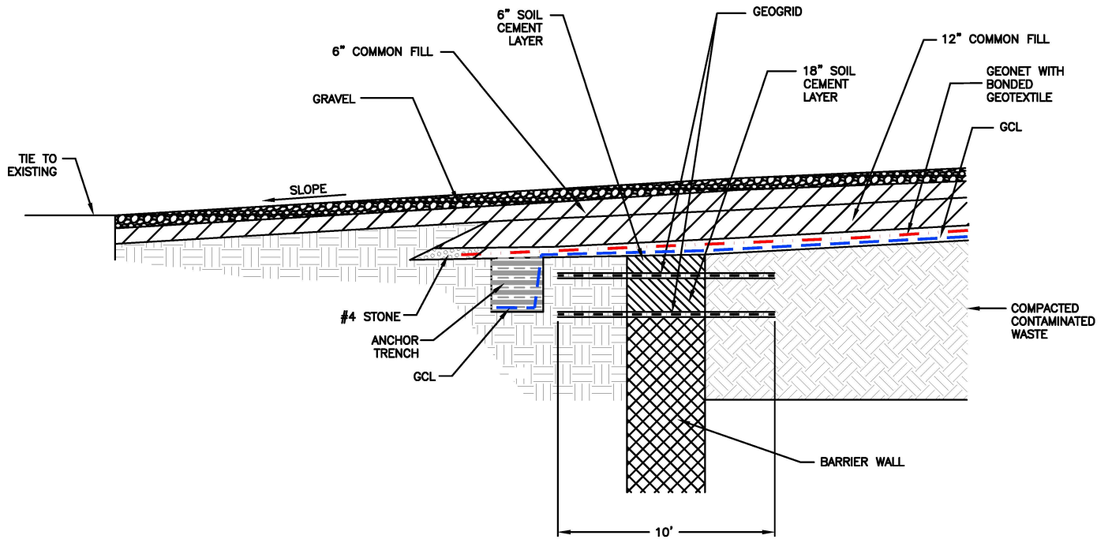
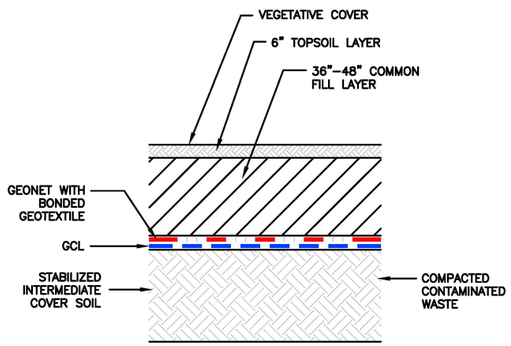


EDGE OF CAP



EDGE OF CAP AT ENTRANCE



TYPICAL SECTION THROUGH COVER

BLACK & VEATCH
Special Projects Corp.
11720 SANCTUARY PARKWAY SUITE 200
ALPHARETTA, GEORGIA 30009
PHONE: (770) 751-4317 FAX: (770) 751-8322
WEBSITE: WWW.BV.COM

Rev.	Description	Date Apr.

Drawn by: JLW
Check by: CH
Design by: JLW
Review by: ECH
Date: 6/29/15
Project #: 49062

CAMILLA WOOD PRESERVING SITE
CAMILLA, MITCHELL COUNTY, GA

AS BUILT CAP
AND BARRIER WALL
CROSS SECTION DETAILS

FIGURE
4-9

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NOTES:

1.

N/F
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
DB 547, PG 40
ONE GEORGIA CENTER
600 WEST PEACHTREE NW
ATLANTA, GA 30308

N

0 50 100

BLACK & VEATCH
Building a world of difference.

CAMILLA WOOD PROCESSING

INSTALLED
FOUNDATIONS

FIGURE 4-13

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Appendix B. Installed Material Cut Sheets

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Tensar International Corporation
2500 Northwinds Pkwy, Suite 500
Alpharetta, Georgia 30009
Phone: 800-TENSAR-1
www.tensarcorp.com

Product Specification - Biaxial Geogrid BX1100

Tensar International Corporation reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance.

Product Type: **Integrally Formed Biaxial Geogrid**
Polymer: **Polypropylene**
Load Transfer Mechanism: **Positive Mechanical Interlock**
Primary Applications: **Spectra System (Base Reinforcement, Subgrade Improvement)**

Product Properties

Index Properties	Units	MD Values[1]	XMD Values[1]
▪ Aperture Dimensions[2]	mm (in)	25 (1.0)	33 (1.3)
▪ Minimum Rib Thickness[2]	mm (in)	0.76 (0.03)	0.76 (0.03)
▪ Tensile Strength @ 2% Strain[3]	kN/m (lb/ft)	4.1 (280)	6.6 (450)
▪ Tensile Strength @ 5% Strain[3]	kN/m (lb/ft)	8.5 (580)	13.4 (920)
▪ Ultimate Tensile Strength[3]	kN/m (lb/ft)	12.4 (850)	19.0 (1,300)
Structural Integrity			
▪ Junction Efficiency[4]	%	93	
▪ Flexural Stiffness[5]	mg-cm	250,000	
▪ Aperture Stability[6]	m-N/deg	0.32	
Durability			
▪ Resistance to Installation Damage[7]	%SC / %SW / %GP	95 / 93 / 90	
▪ Resistance to Long Term Degradation[8]	%	100	
▪ Resistance to UV Degradation[9]	%	100	

Dimensions and Delivery

The biaxial geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 3.0 meters (9.8 feet) or 4.0 meters (13.1 feet) in width and 75.0 meters (246 feet) in length. A typical truckload quantity is 185 to 250 rolls.

Notes

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759-02. Brief descriptions of test procedures are given in the following notes.
2. Nominal dimensions.
3. Determined in accordance with ASTM D6637-10 Method A.
4. Load transfer capability determined in accordance with ASTM D7737-11.
5. Resistance to bending force determined in accordance with ASTM D7748-12, using specimens of width two ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs, and of length sufficiently long to enable measurement of the overhang dimension.
6. Resistance to in-plane rotational movement measured by applying a 20 kg-cm (2 m-N) moment to the central junction of a 9 inch x 9 inch specimen restrained at its perimeter in accordance with GRI GG9.
7. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in clayey sand (SC), well graded sand (SW), and crushed stone classified as poorly graded gravel (GP). The geogrid shall be sampled in accordance with ASTM D5818 and load capacity shall be determined in accordance with ASTM D6637.
8. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
9. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355-05.

This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped prior to February 1, 2013.

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BENTOMAT® ST

GEOSYNTHETIC CLAY LINER

BENTOMAT ST CERTIFIED PROPERTIES			
MATERIAL PROPERTY	**TEST METHOD**	**TEST FREQUENCY ft²(m²)**	**REQUIRED VALUES**
Bentonite Swell Index[1]	ASTM D 5890	1 per 50 tonnes	24 ml/2g min.
Bentonite Fluid Loss[1]	ASTM D 5891	1 per 50 tonnes	18 ml max.
Bentonite Mass/Area[2]	ASTM D 5993	40,000 ft² (4,000 m²)	0.75 lb/ft² (3.6 kg/m²) min
GCL Grab Strength[3]	ASTM D 6768	200,000 ft² (20,000 m²)	30 lbs/in (53 N/cm) MARV
GCL Peel Strength[3]	ASTM D 6496	40,000 ft² (4,000 m²)	3.5 lbs/in (6.1 N/cm) min
GCL Index Flux[4]	ASTM D 5887	Weekly	1×10^{-8} m³/m²/sec max
GCL Hydraulic Conductivity[4]	ASTM D 5887	Weekly	5×10^{-9} cm/sec max
GCL Hydrated Internal Shear Strength[5]	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) typ @ 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

[1] Bentonite property tests performed at a bentonite processing facility before shipment to CETCO's GCL production facilities.

[2] Bentonite mass/area reported at 0 percent moisture content.

[3] 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.

[4] 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. This flux value is equivalent to a permeability of 5×10^{-9} cm/sec for typical GCL thickness. 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.

[5] Peak values 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.

TR 401-BMST 5/07

North America: 847.851.1800 | 800.527.9948 | www.CETCO.com

TDS_BENTOMATST_AM_EN_201402_v1

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PRODUCT DATA SHEET

GSE FabriNet 200 mil Geocomposite

GSE FabriNet geocomposite consists of a 200 mil thick GSE HyperNet geonet heat-laminated on one or both sides with a GSE nonwoven needle-punched geotextile. The geotextile is available in mass per unit area range of 6 oz/yd² to 16 oz/yd². The geocomposite is designed and formulated to perform drainage function under a range of anticipated site loads, gradients and boundary conditions.

AT THE CORE:

A 200 mil thick HyperNet geonet heat-laminated on one or both sides with a nonwoven needlepunched geotextile.

Product Specifications

Tested Property	Test Method	Frequency	Minimum Average Roll Value[1]		
Geocomposite			6 oz/yd²	8 oz/yd²	10 oz/yd²
Transmissivity[2], gal/min/ft, (m²/sec) Double-Sided Composite Single-Sided Composite	ASTM D 4716	1/540,000 ft²	 0.5 (1x10⁻⁴) 4.8 (1x10⁻³)	 0.5 (1x10⁻⁴) 4.8 (1x10⁻³)	 0.4 (9x10⁻⁵) 4.3 (9x10⁻⁴)
Ply Adhesion, lb/in	ASTM D 7005	1/50,000 ft²	1.0	1.0	1.0
Geonet Core[1,3] – GSE HyperNet					
Geonet Core Thickness, mil	ASTM D 5199	1/50,000 ft²	200	200	200
Transmissivity[2], gal/min/ft (m²/sec)	ASTM D 4716		9.6 (2 x 10⁻³)	9.6 (2 x 10⁻³)	9.6 (2 x 10⁻³)
Density, g/cm³	ASTM D 1505	1/50,000 ft²	0.94	0.94	0.94
Tensile Strength (MD), lb/in	ASTM D 7179	1/50,000 ft²	45	45	45
Carbon Black Content, %	ASTM D 4218	1/50,000 ft²	2.0	2.0	2.0
Geotextile[1,3]					
Mass per Unit Area, oz/yd²	ASTM D 5261	1/90,000 ft²	6	8	10
Grab Tensile Strength, lb	ASTM D 4632	1/90,000 ft²	160	220	260
Grab Elongation	ASTM D 4632	1/90,000 ft²	50%	50%	50%
CBR Puncture Strength, lb	ASTM D 6241	1/540,000 ft²	435	575	725
Trapezoidal Tear Strength, lb	ASTM D 4533	1/90,000 ft²	65	90	100
AOS, US sieve[1], (mm)	ASTM D 4751	1/540,000 ft²	70 (0.212)	80 (0.180)	100 (0.150)
Permittivity, sec⁻¹	ASTM D 4491	1/540,000 ft²	1.5	1.3	1.0
Water Flow Rate, gpm/ft²	ASTM D 4491	1/540,000 ft²	110	95	75
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	per formulation	70	70	70
NOMINAL ROLL DIMENSIONS[4]					
Roll Width, ft			14.75	14.75	14.75
Roll Length, ft	Double-Sided Composite Single-Sided Composite		270 300	260 300	230 290
Roll Area, ft²	Double-Sided Composite Single-Sided Composite		3,982 4,425	3,835 4,425	3,392 4,277

NOTES:

- [1] All geotextile properties are minimum average roll values except AOS which is maximum average roll value and UV resistance is typical value. Geonet core thickness is nominal value.
- [2] Gradient of 0.1, normal load of 10,000 psf, water at 70˚F between steel plates for 15 minutes. Contact GSE for performance transmissivity value for use in design.
- [3] Component properties prior to lamination.
- [4] Roll widths and lengths have a tolerance of ±1%.

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.

GSE ENVIRONMENTAL™

[DURABILITY RUNS DEEP] For more information on this product and others, please visit us at GSEworld.com, call 800.435.2008 or contact your local sales office.

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In-Situ Inc.

Innovations in
Water Monitoring

Rugged **TROLL**® 100 and 200 Data Loggers

Rugged TROLL 100 and 200 Data Loggers are designed for long- and short-term groundwater and surface water monitoring. These non-vented (absolute) water level data loggers measure and record changes in water level, pressure, and temperature. Ensure accurate results by using a Rugged BaroTROLL® Data Logger. All loggers are compatible with user-friendly Win-Situ® Software, which guides you through programming steps, automates level corrections, and accelerates report generation.

Affordable Titanium Data Loggers

- Get reliable data at a budget-friendly price.
- Use in harsh environments. Solid titanium construction offers chemical- and corrosion-resistance and outlasts specially-coated data loggers.
- Select the appropriate logging mode for your project: Linear, Fast Linear, or Event.

Flexible Deployment Options

- Deploy zero-maintenance loggers in flood-prone areas, high-humidity environments, and remote locations.
- Choose the cable length and termination type that works best for your project.
- Use suspension wire and backshell hanger for applications requiring minimal instrument access.

Simplified Setup and Data Retrieval

- Save time and reduce errors with the intuitive Win-Situ 5 and Win-Situ Mobile Software platform. Quickly program loggers, download data, graph results, and more.
- Use a Rugged TROLL Docking Station for programming and downloading data.
- Connect a cabled logger to a telemetry system, radio, controller, or a SCADA/PLC system via Modbus/RS485 or SDI-12 (only Rugged TROLL 200 and Rugged BaroTROLL).

Outstanding Service

- Receive **free**, 24/7 technical support and online resources.
- Order data loggers and accessories from the In-Situ e-store.
- Get guaranteed 7-day service for maintenance (U.S.A. only).

Applications

- Coastal wetland and estuary research
- Crest stage gaging and stream gaging
- Drilling and well development
- Flood and storm surge monitoring
- Landfill leachate monitoring

Rugged **TROLL**® 100 and 200 Data Loggers

General	*Rugged TROLL 100 & 200*	*Rugged BaroTROLL*
Temperature ranges[1]	Operational: 0-50° C (32-122° F) Storage: -40-80° C (-40-176° F) Calibrated: 0-50° C (32-122° F)	Operational: 0-50° C (32-122° F) Storage: -40-80° C (-40-176° F) Calibrated: 0-50° C (32-122° F)
Diameter	2.62 cm (1.03 in.)	2.62 cm (1.03 in.)
Length	14.43 cm (5.68 in.)	14.43 cm (5.68 in.)
Weight	170 g (0.37 lb)	170 g (0.37 lb)
Materials	Titanium body; Delrin® nose cone, hanger, backend	Titanium body; Delrin nose cone, hanger, backend
Output options	Rugged TROLL 100: USB or RS232 via docking station Rugged TROLL 200: USB or RS232 via docking station; Modbus/RS485 or SDI-12 via Rugged TROLL 200 Cable	USB or RS232 via docking station; Modbus/RS485 or SDI-12 via Rugged TROLL 200 Cable
Battery type & life[2]	3.6V lithium; 10 years or 2M readings	3.6V lithium; 10 years or 2M readings
External power	Rugged TROLL 100: NA Rugged TROLL 200: 8-36 VDC	8-36 VDC
Memory ***Data records***[3] ***Data logs***	1.0 MB 65,000 Rugged TROLL 100: 1 log Rugged TROLL 200: 2 logs	1.0 MB 65,000 2 logs
Fastest logging rate	1 per second	1 per minute
Fastest output rate	Rugged TROLL 200 only Modbus & SDI-12: 1 per second	Modbus & SDI-12: 1 per second
Log types	Linear, Fast Linear, and Event	Linear
Sensor Type/ Material	Piezoresistive; Ceramic	Piezoresistive; Ceramic
Range	9.0 m (30 ft) (Burst: 18 m; 60 ft) 30 m (100 ft) (Burst: 40 m; 134 ft) 76 m (250 ft) (Burst: 112 m; 368 ft)	7 to 30 psi; 0.5 to 2 bar
Accuracy[4]	±0.1% full scale (FS) typical ±0.3% FS max.	±0.1% FS typical ±0.3% FS max.
Resolution	±0.01% FS or better	±0.01% FS or better
Units of measure	Pressure: psi, kPa, bar, mbar, mmHg Level: in., ft, mm, cm, m	Pressure: psi, kPa, bar, mbar, mmHg, inHg
Temperature Sensor	Silicon	Silicon
Accuracy	±0.3° C	±0.3° C
Resolution	0.01° C or better	0.01° C or better
Units of measure	Celsius or Fahrenheit	Celsius or Fahrenheit
Warranty	2 years	2 years

Notes

[1] Temperature range for non-freezing liquids.
[2] Typical battery life when used within the factory-calibrated temperature range.
[3] 1 data record = date/time plus 2 parameters logged (no wrapping) from device within the factory-calibrated temperature range.
[4] Across factory-calibrated pressure and temperature ranges.
Delrin is a registered trademark of E.I. du Pont de Nemours & Co.
Specifications are subject to change without notice.

Rugged BaroTROLL® Data Logger

Use the titanium Rugged BaroTROLL with either a Rugged TROLL 100 or 200 Data Logger. Win-Situ® Baro Merge® Software simplifies post-correction of water level data for barometric pressure changes.

Rugged TROLL® 200 Cable

Access real-time data by using Rugged TROLL 200 Cable with a Rugged TROLL 200 or a Rugged BaroTROLL. Use a Cable Suspension Kit to anchor the cable in place. Available configurations:

- Modbus/RS485 stripped-and-tinned cable or SDI-12 stripped-and-tinned cable—Use with PLC, telemetry system, or logger.
- Modbus/RS485 top-of-well cable—Use with Rugged TROLL Com Device and a RuggedReader® Handheld PC or a PC.

Jacket options	TPU (thermoplastic polyurethane)
Conductors	4 conductors, 24 AWG, polypropylene insulation
Diameter	Cable: 5.1 mm (0.200 in.) Connector: 26.1 mm (1.03 in.)
Cable lengths	Modbus/RS485: Customizable up to 300 m (1,000 ft) SDI-12: Standard lengths up to 60 m (200 ft)
Minimum bend radius	5X cable diameter
Break strength	68 kg (150 lbs)

Rugged TROLL® Com Communication Device

Use the Rugged TROLL Com Device for communication between a cabled Rugged TROLL 200 or a cabled Rugged BaroTROLL and a RuggedReader Handheld PC or a laptop/PC.

Operating temp. range	0-50° C (32-122° F)
Storage temp. range	-40-80° C (-40-176° F)
Materials	Delrin, rubber, copper pins
Environmental rating	IP67 with battery cover closed
Dimensions (LxWxH)	8.9 x 2.9 x 4.8 cm (3.5 x 1.14 x 1.88 in.)
Input connection	Modbus/RS485
Output connection	Available with either USB or RS232
Power source	9V alkaline battery, user-replaceable
Cable	Black polyurethane, 91 cm (3 ft) long

Rugged TROLL® Docking Station

Use the docking station to program and download data from a Rugged TROLL 100 or 200 or from a Rugged BaroTROLL. The docking station is available with either a USB or RS232 communication interface. USB allows fast data transfer to a PC. Use the RS232 version with a laptop/PC or a RuggedReader Handheld PC.

In-Situ Inc.

Call to purchase—www.in-situ.com
221 East Lincoln Avenue, Fort Collins, Colorado, U.S.A. 80524
1-800-446-7488 (toll-free in U.S.A. and Canada)
1-970-498-1500 (U.S.A. and international)

Cellular Network Telemetry Systems

Quickly connect to remote monitoring stations by using cellular network technology. Economical, secure telemetry systems reduce data collection costs by providing real-time access to data, event notifications, and system status updates. Superior power supply management ensures long-lasting, independent operation at remote sites.

Real-Time Data

- Easily integrate systems into HydroVu data services for real-time evaluation of site data and conditions.
- Receive automatic data log uploads to your email, FTP site, or other current data management platform at customized intervals.
- Never miss a data point. The system recognizes missed data and sends that data on the next transmission.

Real-Time Decisions

- Integrate with HydroVu for up-to-date access to your data in the format you want, whenever and wherever you are, while simplifying the task of filtering the data for important results.
- Quickly respond to user-defined field events or to tampering. Automatic alarm notifications are sent to your email or phone via text message.
- Significantly reduce site visits. Receive system status updates, diagnose problems, and perform preventative and corrective maintenance from your office.

Tube Systems: For in-well deployments and low-profile installations, choose the battery-powered Tube 300R. For high-frequency sampling, choose the solar-powered Tube 300S.

Cube Systems: For sites that require multiple sensors, choose the battery-powered Cube 300R or the solar-powered Cube 300S. Connect up to five instruments to one Cube.

Both the Tube and Cube Systems offer data logging and transmission, and alarm notifications for parameter thresholds, instrument malfunction, and tampering detection.

Real-Time Support

- Receive free, 24/7 technical support and online resources.
- Order instruments and accessories from the In-Situ website.
- Troubleshoot deployment issues by using an external mode.
- Duplicate logs on the data logger and the telemetry system for confidence in the most remote locations.

Applications

- **Long-term groundwater and surface-water monitoring**
- **Event notification-crest stage gages, flood warning system, storm surge, slope stabillity**
- **Mine dewatering and acid mine drainage**
- **Stormwater management**
- **Tide gaging**

CALL OR CLICK TO PURCHASE OR RENT
1-800-446-7488 (toll-free in U.S.A. and Canada)
1-970-498-1500 (U.S.A. and international)
WWW.IN-SITU.COM

General	Tube 300R	Tube 300S	Cube 300R	Cube 300S
Operating ranges[1]	Temp: -20-70° C (-4-158° F) Humidity: 95% max. n.c.	Temp: -20-70° C (-4-158° F) Humidity: 95% max. n.c.	Temp: -20-70° C (-4-158° F) Humidity: 95% max. n.c.	Temp: -20-70° C (-4-158° F) Humidity: 95% max. n.c.
Diameter, maximum	Tube: 5 cm (1.97 in.) Top cap: 5.2 cm (2.05 in.)	Tube: 7 cm (2.75 in.) Top cap: 7.5 cm (2.95 in.) (with solar panel)	NA	NA
Dimensions	Length: 48 cm (18.9 in.)	Length: 48 cm (18.9 in.)	20 x 18 x 8.5 cm (7.87 x 7.1 x 3.35 in.)	36 x 24 x 13 cm (14.2 x 9.4 x 5.1 in.)
Weight with battery	1730 g (3.81 lbs)	1670 g (3.68 lbs)	1345 g (2.965 lbs)	3100 g (6.83 lbs)
Materials	Stainless steel	Methacrylate, 5 mm thick	GW PLAST 75	GW PLAST 75
Ratings	IP68 (cannot operate submerged)	IP65	IP65	IP65
Power Internal Battery	Battery Lithium 10.8V / 19000 mAh	Solar panels integrated NiCd 7.2V / 1400 mAh	Battery Lithium 10.8V / 19000 mAh	Solar panels integrated NiCd 7.2V / 1400 mAh
Connectors	1 twist-lock connector	1 twist-lock connector	5 twist-lock connectors	5 twist-lock connectors
Operation Time	Up to 5 years when logging every 10 min. and uploading data 1/day	Solar panel power: Unlimited, depending on sunlight exposure and programmed activities	Up to 5 years when logging every 10 min. and uploading data 1/day	Solar panel power: Unlimited, depending on sunlight exposure and programmed activities
Common Specs				
Sensor compatibility	Aqua TROLL® 100/200 Data Loggers; Aqua TROLL 400 Multiparameter Instrument; BaroTROLL® Data Logger; Level TROLL 400/500/700/700H Data Loggers; TROLL 9500 Multiparameter Instrument; Rugged Troll 200; RDO Pro-X			
Communication Antenna	GSM quad band—850, 900, 1800, 1900 MHz (capable of GPRS, SMS, email, and FTP); 2G available SMA connector with stud antenna or optional external antenna for Tube 300R			
Data access/storage Data access Data storage Data format	Via email or FTP; via cable; and real-time via GSM/GPRS direct call or HydroVu data services SD Flash memory, 512 MB (not replaceable) CSV file			
Programming Programming mode Operation mode	Through ANT tool communication software, via cable, or remotely via landline or GSM modem Through communication software tool via direct connection to a PC or remotely though GSM modem or landline modem. 1. Up to 8 programmable events/day; data transmission; or SMS transmission 2. Automatic data logging (reading interval: 1 minute to 24 hours) 3. Alarm transmission (SMS) 4. Data logging and batch transmission of stored data. Connect up to 5 probes and log all available (includes data from internal barometric pressure sensor).			
Interfaces Serial Interfaces	RS232 or RS485 software selectable (with automatic RS232 switching when a PC connection is detected)			
Alarm capability Capacity Sources SMS limits	The unit can generate an alarm if tilted or disconnected; if exceeds critical temperature values or parameters threshold values; or if battery levels reach critical. Via SMS. 2 recipients Up to 8 alarm sources Can be programmed			
Real-time clock/calendar	Built-in			
Sensors	Built-in barometric pressure sensor included with non-vented systems, which automates barometric pressure compensation for non-vented water level sensors. Built-in temperature sensor			
Warranty	**1 year**			
Notes	* Refer to Alarms section in manual. Alarm sources: reset, temperature, tilt sensor, data send failure, low battery, probe reading out of range, tamper, log memory full or error, and probe reading error Specifications subject to change without notice			

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ATTACHMENT 1
TRANSDUCER INSTALLATION INFORMATION

Transducer Station Locations and Rationale

A network of ten (10) existing monitoring wells was selected for transducer deployment, and transducers were installed into each monitoring well on November 20, 2015. Tables 1 through 3 were included in *Pressure Transducer Technical Memo #1* and *Pressure Transducer Technical Memo #2*, but have been included in this Attachment 1 for ease of reference. Table 1 describes the rationale for the deployment of each transducer into each selected well. Monitoring of groundwater elevations in eight of the wells is associated with the existing barrier wall and capping containment system. These eight wells are represented by Transducer Stations #1 through #4, with each station consisting of two wells. Transducer Station #5 consists of the two remaining monitoring wells (MW01I and MW01S), where the transducers were installed to monitor background groundwater elevations in the intermediate and shallow groundwater aquifers. The transducer stations have cellular capabilities for remote data download, with one cellular unit at each transducer station. Monitoring well details for wells associated with Transducer Stations are presented in Table 2. Transducer deployment is summarized on Table 3. Field records associated with the transducer installations on November 20, 2015 are included as Attachment 1 in *Pressure Transducer Technical Memo #1*.

Table A1:
Transducer Station Location Summary

Transducer Station Location	Monitoring Wells Involved	Location Rationale
Transducer Station #1	Tandem of MW08S (outside barrier wall) and CAP08 (inside barrier wall)	Monitoring groundwater levels inside/outside barrier wall along northwestern boundary.
Transducer Station #2	Tandem of CAP02 (outside barrier wall) and CAP04 (inside barrier wall)	Monitoring of groundwater levels inside/outside barrier wall along eastern boundary.
Transducer Station #3	Tandem of MW04S (outside barrier wall) and CAP05 (inside barrier wall)	Monitoring groundwater levels inside/outside barrier wall along southeastern boundary.
Transducer Station #4	Tandem of CAP03 (outside barrier wall) and CAP06 (inside barrier wall)	Monitoring groundwater levels inside/outside barrier wall along southwestern boundary.
Transducer Station #5	Tandem of MW01I (intermediate) and MW01S (shallow).	Background monitoring of intermediate and shallow aquifer groundwater levels.

Table A2:
Monitoring Well Details

Well ID	Total Depth (ft BTOC)	Approximate Screen Length (ft)	Aquifer	Northing	Easting	Notes
CAP02	19.40	10	Shallow	444439.610	2285610.200	Flush mount outside eastern barrier wall.
CAP03	18.93	10	Shallow	444050.190	2285057.280	Flush mount outside southwestern barrier wall.
CAP04	25.80	10	Shallow	444440.200	2285585.950	Flush mount inside eastern barrier wall.
CAP05	25.38	10	Shallow	444169.900	2285557.320	Flush mount inside southeastern barrier wall.
CAP06	24.34	10	Shallow	444100.130	2285064.410	Flush mount inside southwestern barrier wall.
CAP08	25.53	10	Shallow	444768.340	2285052.420	Flush mount inside northwestern barrier wall.
MW04S	14.75	10	Shallow	444160.997	2285602.486	Flush mount outside southeastern barrier wall.
MW08S	14.48	10	Shallow	444794.061	2285047.342	Flush mount outside northwestern barrier wall.
MW-01I	67	12	Intermediate	444631.566	444631.566	Monument (stickup) west of containment cell; south of recreation center.
MW-01S	20	11	Shallow	444636.045	444636.045	Monument (stickup) west of containment cell; south of recreation center.

Notes:
BTOC = below top of casing
ft. = feet

Table A3:
Transducer Deployment Summary (November 20, 2015)

Monitoring Well	Serial Number of Transducer	Transducer Station Location	Water Level at time of transducer installation (feet BTOC)	Depth of Transducer Sensor (feet BTOC)	Sensor Elevation (NAVD88)	Cube Transmitter Assigned
CAP08	424025	1	16.25	18.83	156.57	15112138
MW08S	431040		0.23	6.67	163.35	
CAP04	428512	2	15.85	19.67	156.48	15081907
CAP02	431207		4.61	13.81	157.88	
MW04S	430855	3	2.21	8.81	161.32	15112140
CAP05	427063		18.82	19.71	157.11	
CAP06	427177	4	18.69	19.77	155.63	15112139
CAP03	431168		2.72	12.71	155.94	
MW01I	423854	5	49.87	60.00	108.90	15081906
MW01S	431265		2.72	15.00	153.82	

Notes:
BTOC = below top of casing
ft. = feet

Transducer Equipment, Installation, and Programming

A summary of the transducer equipment, installation of transducers, and programming are described in detail in the *Pressure Transducer Technical Memo #1*. Each pressure transducer consists of an In Situ® Rugged TROLL 200 in each of the ten monitoring wells, along with a Cube 300R Telemetry Transmitter at each station. Manufacturer's information sheets for the transducers and telemetry units are included in Attachment 2 of *Pressure Transducer Technical Memo #1*. The Cube 300R Telemetry Transmitters also contain barometers and correct all transducer data for barometric pressure prior to transmittal (via cellular).

The pressure transducers are programmed to collect water pressure readings every 30 minutes, which has remained the same since installation of the pressure transducers in November 2015. The transducer data is transmitted (via cellular) every 72 hours, and is subsequently downloaded by Black & Veatch.

The weather station at C.M. Stripling Irrigation Research Park in Camilla has been utilized to track precipitation in the region, and to compare to the transducer data. The precipitation data from the weather station can be found at: http://weather.uga.edu/index.php?variable=HI&site=CAMILLA. The weather station is located approximately 6.5-miles northwest of the Site. Rainfall data has been provided on Figures 2, 3, and 4. In previous Pressure Transducer Memos, the rainfall data for December 31, 2015 was not available. The rainfall data (0.83 inches of rainfall) for December 31, 2015 is now available, and this data is included in this Pressure Transducer Technical Memo.

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Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	CAP08
Date of Transducer Installation:	11/20/15
Installer:	P. Cole
Water Level Data (BTOC):	16.25'
Total Well Depth (BTOC):	25.53'
Depth of Transducer Senor (BTOC):	18.83'
Feet of Water above Transducer Sensor:	2.58'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	424025
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15112138
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	Yes - MW08S
Is the well flushmount or stickup?:	Flushmount

Notes: Temporary PVC stickup of 1.17' added to top of casing of CAP08 to prevent surface water from going down flushmount well. All measurements above are corrected to the true top of casing of CAP08. CUBE300R is setup to transmit data (via cellular) every 72 hours

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	MW08S
Date of Transducer Installation:	11/20/15
Installer:	P. Cole
Water Level Data (BTOC):	0.23'
Total Well Depth (BTOC):	14.48'
Depth of Transducer Senor (BTOC):	6.67'
Feet of Water above Transducer Sensor:	6.64'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	431040
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15112138
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	Yes - CAP08
Is the well flushmount or stickup?:	Flushmount

Notes: Temporary PVC stickup of 1.25' added to top of casing of MW08S to prevent surface water from going down flushmount well. All measurements above are corrected to true top of casing of MW08S. CUBE 300R is setup to transmit (via cellular) every 72 hours.

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	CAP04
Date of Transducer Installation:	11/20/15
Installer:	P. Cole
Water Level Data (BTOC):	15.85'
Total Well Depth (BTOC):	25.80'
Depth of Transducer Senor (BTOC):	19.67'
Feet of Water above Transducer Sensor:	3.82'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	428512
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15081907
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	Yes - CAP02
Is the well flushmount or stickup?:	Flushmount

Notes: Temporary PVC stickup of 1.25' added to top of casing of CAP04 to prevent surface water from going down flushmount well. All measurements above are corrected to the true top of casing of CAP04. CUBE 300R is setup to transmit every 72 hours.

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	CAP02
Date of Transducer Installation:	11/20/15
Installer:	P. Cole
Water Level Data (BTOC):	4.61'
Total Well Depth (BTOC):	19.40'
Depth of Transducer Senor (BTOC):	13.81'
Feet of Water above Transducer Sensor:	9.20'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	431207
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15081907
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	Yes - CAP04
Is the well flushmount or stickup?:	Flushmount

Notes: Temporary PVC stickup of 1.19' added to top of casing of CAP02 to prevent surface water from going down flushmount well. All measurements above are corrected to the true top of casing of CAP02. CUBE 300R setup to transmit every 72 hours.

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	MW04S
Date of Transducer Installation:	11/20/15
Installer:	P.Cole
Water Level Data (BTOC):	2.21'
Total Well Depth (BTOC):	14.75'
Depth of Transducer Senor (BTOC):	8.81'
Feet of Water above Transducer Sensor:	6.60'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	430855
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15112140
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	YES - CAP05
Is the well flushmount or stickup?:	Flushmount

Notes: Temporary PVC stickup of 1.19' added to top of casing of MW04S to prevent surface water from going down flushmount well. All measurements above are corrected to true top of casing of MW04S. CUBE 300R is setup to transmit every 72 hours.

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	CAP05
Date of Transducer Installation:	11/20/15
Installer:	P. Cole
Water Level Data (BTOC):	18.82'
Total Well Depth (BTOC):	25.38'
Depth of Transducer Senor (BTOC):	19.71'
Feet of Water above Transducer Sensor:	0.89'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	427063
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15112140
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	YES - MW04S
Is the well flushmount or stickup?:	Flushmount

Notes: Temporary PVC stickup of 1.29' added to the top of casing of CAP05 to prevent surface water from going down the flushmount well. All measurements above are corrected to true top of casing for CAP05. CUBE 300R is setup to transmit every 72 hours.

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	CAP06
Date of Transducer Installation:	11/20/15
Installer:	P. COL
Water Level Data (BTOC):	18.69'
Total Well Depth (BTOC):	24.34'
Depth of Transducer Senor (BTOC):	19.77'
Feet of Water above Transducer Sensor:	1.08'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	427177
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15112139
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	YES - CAP03
Is the well flushmount or stickup?:	Flushmount

Notes: Temporary PVC stickup of 1.40' added to the top of casing of CAP06. to prevent surface water from going down flushmount well. All measurements above are corrected to the true top of casing of CAP06. CUBE 300R is setup to transmit every 72 hours.

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	CAP03
Date of Transducer Installation:	11/20/15
Installer:	P. Cole
Water Level Data (BTOC):	2.72'
Total Well Depth (BTOC):	18.93'
Depth of Transducer Senor (BTOC):	12.71'
Feet of Water above Transducer Sensor:	9.99'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	431168
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15112139
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	YES - CAP06
Is the well flushmount or stickup?:	Flushmount

Notes: Temporary PVC stickup of 1.29' added to the top of casing of CAP03 to prevent surface water from going down flushmount well. All measurements above are corrected to the true top of casing of CAP03. CUBE 300R is setup to transmit every 72 hours.

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	MW01I
Date of Transducer Installation:	11/20/15
Installer:	P. Cole
Water Level Data (BTOC):	49.87'
Total Well Depth (BTOC):	67'
Depth of Transducer Senor (BTOC):	60.00'
Feet of Water above Transducer Sensor:	10.13'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	423854
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15081906
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	YES- MW01S
Is the well flushmount or stickup?:	Stickup

Notes: CUBE 300R setup to transmit every 72 hours

Transducer Deployment Form

Camilla Wood Preserving Site

Camilla, Mitchell County, Georgia

Well ID:	MW01S
Date of Transducer Installation:	11/20/15
Installer:	P. Cole
Water Level Data (BTOC):	2.72'
Total Well Depth (BTOC):	20'
Depth of Transducer Senor (BTOC):	15.00'
Feet of Water above Transducer Sensor:	12.28'
Transducer Type:	Rugged Troll 200
Transducer Serial Number:	431265
Type of Telemetry Transmitter:	CUBE 300R
Telemetry Transmitter Serial Number:	15081906
Is Telemetry Transmitter shared with another well? If so, identifiy well number:	YES - MW01I
Is the well flushmount or stickup?:	Stickup

Notes: CUBE 300R setup to transmit every 72 hours.

Appendix C. Monitoring Well and Extraction Well Details

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EXTRACTION WELL (EW-01) CONSTRUCTION DETAIL

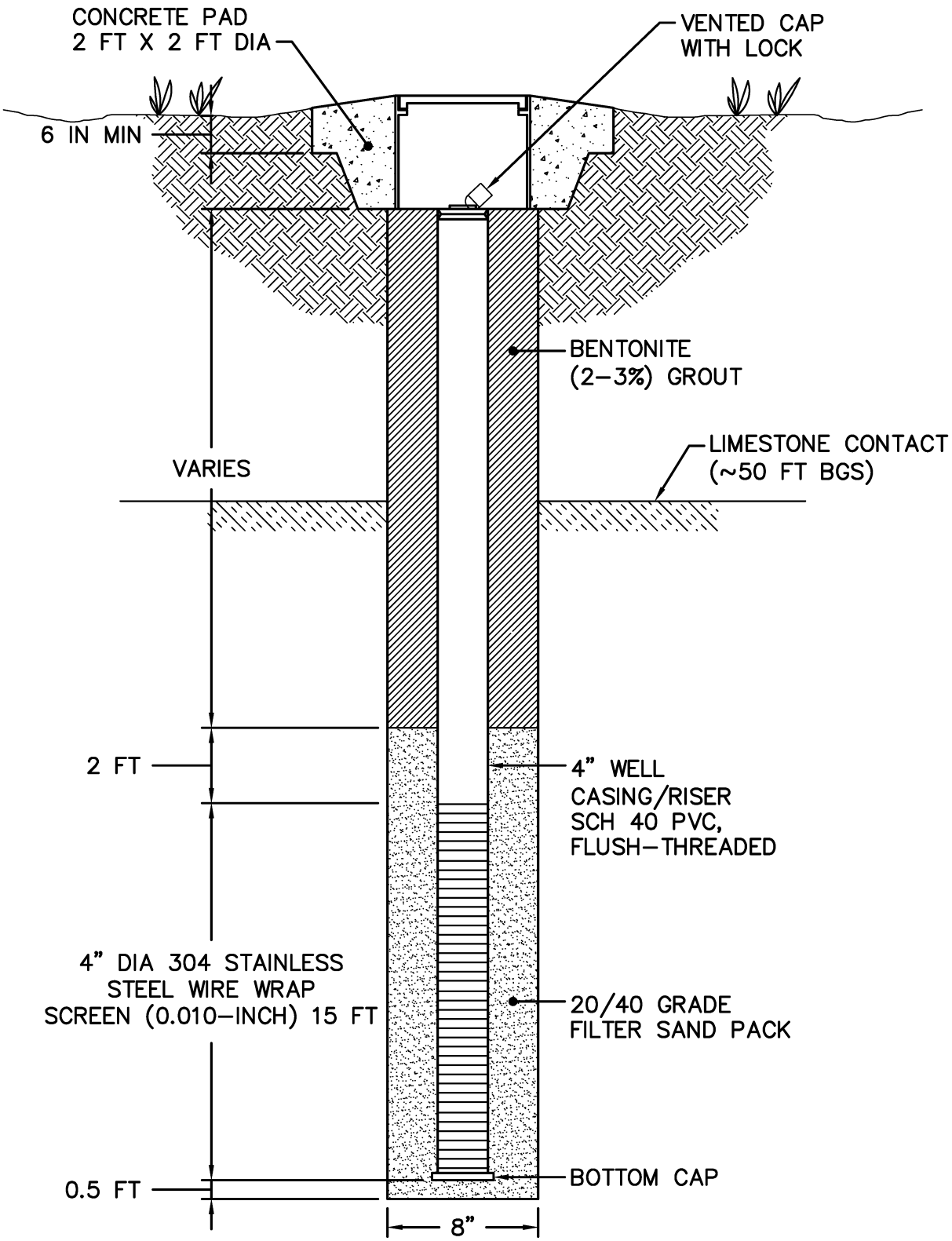


FIGURE 3
CAMILLA WOOD PRESERVING SITE
CAMILLA, MITCHEL COUNTY, GEORGIA

Geosyntec consultants

KENNESAW, GA

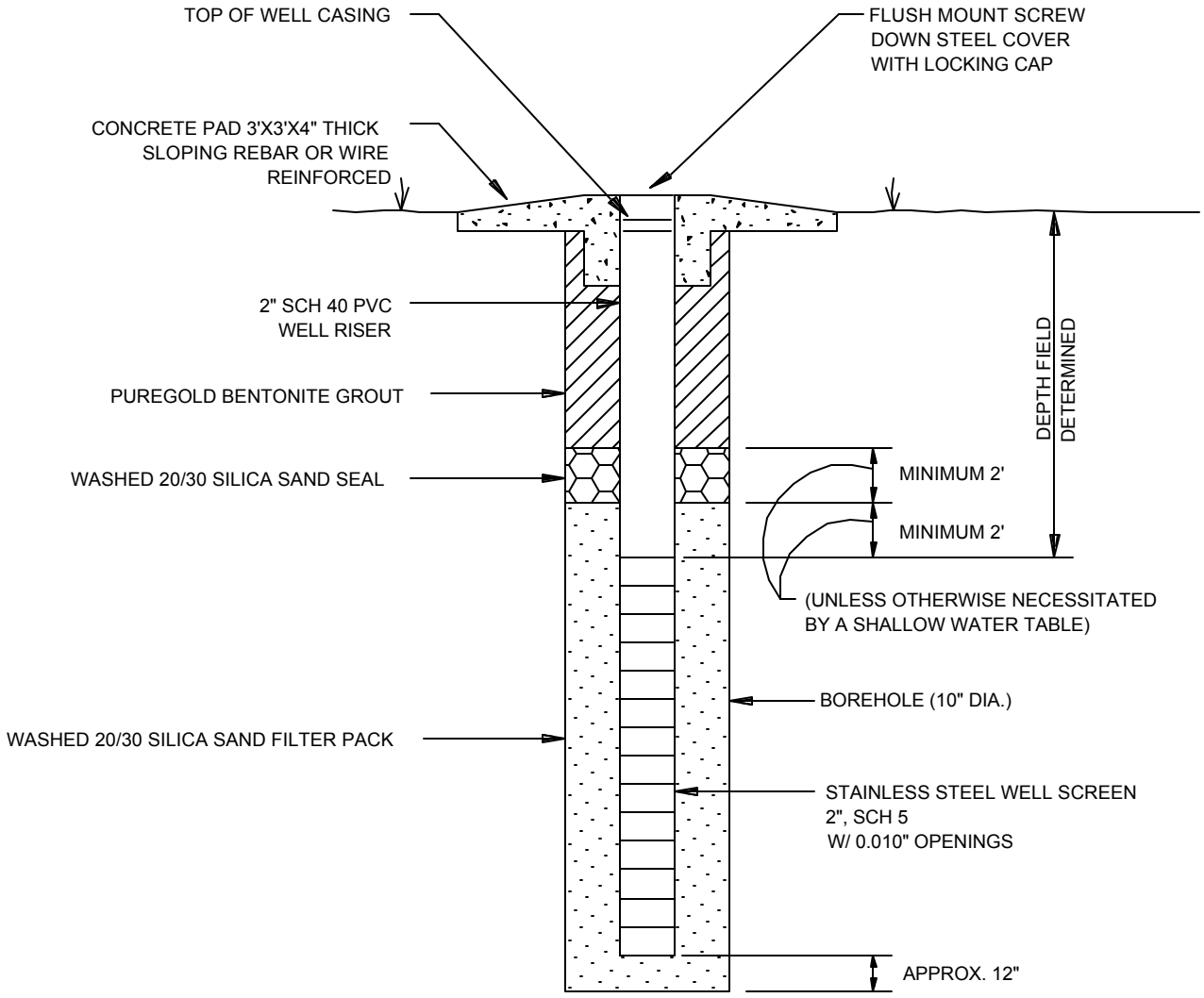
DATE:	Jan–14	SCALE:	NTS
PROJECT NO.	GR4997	FILE NO.	4997F005
DOCUMENT NO.		FIGURE NO.	3

L:\CADD\B\BLACK AND VEATCH\CAMILLA WOOD PRESERVE SITE\GR4997\FIGURES\4997F005

CAD DWG. NO. WELLSPEC
CREATION DATE: 2-13-01
DRAFTERS INITIALS: AG

ORIGINAL DWG SIZE:
8.5 X 11
PLOT SCALE: NTS

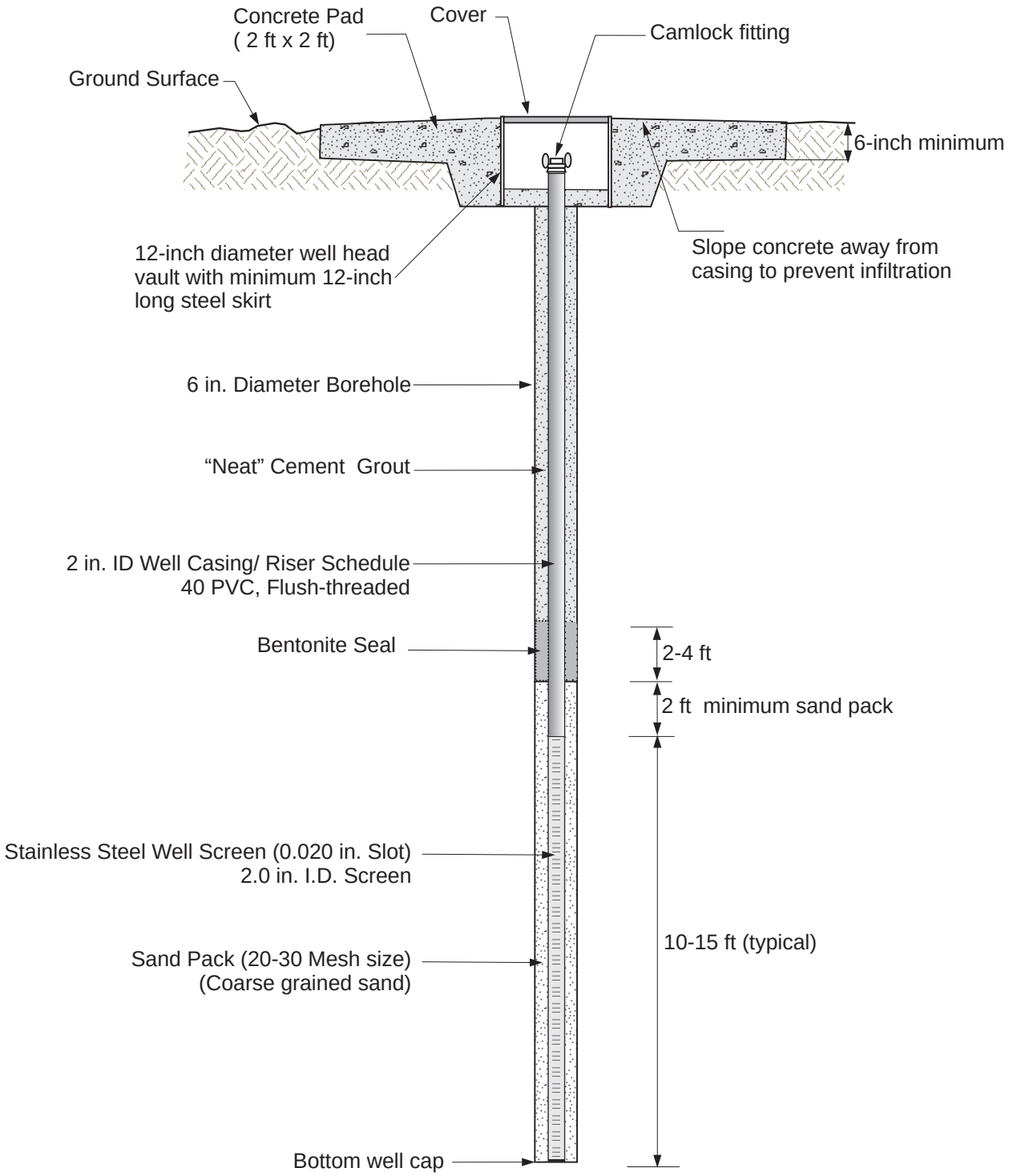
MOST RECENT REVISION:
REVISION DATE: 8-15-03
DRAFTERS INITIALS: DVP



FLUSH MOUNT WELL CONSTRUCTION DETAIL

FIGURE
4

TYPICAL INJECTION WELL CONSTRUCTION



Note:
1. To achieve vertical treatment of the groundwater plume within a proposed radius of treatment, individual injection wells may be installed within a cluster of two or more wells. The constructed depth and screen interval per well would be staggered relative to the other wells within a cluster. To minimize possible short-circuiting within the well cluster, wells will be horizontally spaced 5-8 feet apart, and well screens will be vertically separated a minimum of 5 feet.

Geosyntec consultants
engineers | scientists | innovators

DATE: May 2014	SCALE: NTS
PROJECT NO. GR4997	FILE NAME. Injection Well
DOCUMENT NO GA140333	FIGURE NO. 3

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Appendix D. Grass Seed Fact Sheet

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USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Plant Fact Sheet

BAHIAGRASS

Paspalum notatum Flüggé

Plant Symbol = PANO2

Contributed by: USDA NRCS Plant Materials Center
Golden Meadow, Louisiana

Johanna Pate
USDA NRCS Alexandria, Louisiana

Alternate Names
bahia grass, bahia,

Uses
Erosion control: Bahiagrass is used for the NRCS conservation practices Grassed Waterway and Critical Area Planting. It is planted on critical areas such pond banks, levees, and gullies in agricultural fields.

Turf: This grass is suitable for low-maintenance lawns and public areas, and is recommended for infertile soils and heavy traffic areas. It is more shade tolerant than bermudagrass.

Livestock: Bahiagrass, with proper management, provides fair to good pasture and hay, and can be used in woodland pasture systems (silvopasture). Forage quality depends on soil fertility and grass stage of growth. Bahiagrass hay is leafy, but difficult to make because of bahiagrass' prostrate growth habit.

Caution: Seed heads of the cultivar 'Argentine' are often infected by ergot (Claviceps paspali). Pregnant mares can experience abortion problems if they eat large quantities of infected seed heads. Also, ingestion of infected seeds can produce toxic effects in cattle. The occurrence of toxic seed heads can be managed through mowing or by keeping pregnant horses confined.

Wildlife: Bahiagrass can be grown with other species that are more beneficial for wildlife. Deer, birds and small mammals will utilize the plant—especially the seeds—for food.

Status
Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status (e.g. threatened or endangered species, state noxious status, and wetland indicator values).

Weediness
This plant may become weedy or invasive in some regions or habitats and may displace desirable vegetation if not properly managed. Please consult with your local NRCS Field Office, Cooperative Extension Service office, or state natural resource or agriculture department regarding its status and use. Weed information is also available from the PLANTS Web site at plants.usda.gov. Please consult the Related Web Sites on this species' Plant Profile for further information.

Description and Adaptation
Bahiagrass is a deep-rooted perennial adapted to a wide range of soils. It is low-growing and spreads with stolons and stout, scaly rhizomes. Stolons are pressed firmly to the ground, have short internodes, and root freely from the nodes forming a dense sod. Bahiagrass is a prolific seed-producing plant. The flat, tough-textured leaves are usually hairless; with blades 1/8-1/4 inch wide and 8-20 inches in length. Leaves are flat, folded, and in-rolled, tapering to a fine point. Stems usually reach 8-30 inches tall. The seed head usually consists of a dual racemes with each attached to the top of a slender stem. Occasionally there may be a third seed head present below the terminal ones.

Bahiagrass is most productive on sandy soils with a pH of 5.5 to 6.5. It is more productive on drought prone, sandy soils with relative low fertility than other forages.

Distribution: Bahiagrass is a native to South America. Its current range in Central and South America extends from Mexico to northern Argentina and the West Indies. It was introduced to the southeastern United States primarily for forage, and erosion control and has since become naturalized. It is adapted from east Texas to the Carolinas to as far north as northern Arkansas. Please consult the Plant Profile page for this species on the PLANTS Web site.

Establishment
Bahiagrass can be established from seed or sod. It will grow on soils too poorly-drained for bermudagrass. The best time to establish bahiagrass is during the spring or early summer months when adequate moisture is available. Later plantings in the summer have severe competition from weeds. Fall plantings may be used in southern areas where cold temperatures are not a problem. Proper site preparation before planting is critical to ensure successful establishment. Bahiagrass should not be planted on high-pH soils (> 6.5). For pasture or hay, drill 15 pounds pure live seed (PLS) per acre at 1/4 inch depth or less. For turf, use 5-10 pounds PLS per 1000 square feet. Good seed to soil contact is essential for bahiagrass to germinate. Bahiagrass seed is slow to germinate and may take several months to fully establish. Grazing is not recommended during establishment because seedlings will be trampled and damaged. Crabgrass *(Digitaria* spp.) may become a problem on newly seeded fields. Mowing may be necessary to prevent the crabgrass from shading the bahiagrass seedlings.

Management
Bahiagrass is a relatively low maintenance grass with fewer disease and insect problems than some of the other introduced warm season grasses. Its ability to survive periods of drought makes it adaptable for southern pastures. Bahiagrass will persist in pastures with a low level of management. Though it responds to fertilizer applications, it does not respond to the high rates commonly used on improved bermudagrass. Bahiagrass is well adapted to sandy soils due to its tolerance of drought and low soil fertility. Bahiagrass forage is slightly lower in quality than bermudagrass. Close grazing stimulates new growth and improves forage quality.

The dense, compact sod of bahiagrass inhibits the growth of intercropped legumes. However, white clover (*Trifolium repens*) and winter annuals such as crimson clover (*T. incarnatum*) and arrowleaf clover (*T. vesiculosum*) can be established and grown in bahiagrass pastures and hayfields.

Pests and Potential Problems
Mole crickets (*Scapteriscus* spp.) have been known to cause problems in established stands. The only serious disease of bahiagrass is dollar spot fungus (*Sclerotinia homoeocarpa* F.T. Benn).

Environmental Concerns
Bahiagrass can become a pest in bermudagrass hay fields and home lawns. Use caution when moving livestock that have grazed bahiagrass pastures. Undigested seeds can be transported and deposited in other fields.

Control
Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method.

Cultivars, Improved, and Selected Materials (and area of origin)
Common bahiagrass is a coarse-textured, light-colored bahiagrass. It has an open and sparse growth habit and is very susceptible to cold temperatures.

'Argentine' bahiagrass forms a relatively dense sod and has a dark green color, making it acceptable for lawn use. It has good insect and disease resistance. 'Argentine' winterkills more readily than 'Pensacola'.

'Pensacola' bahiagrass was released in 1944 by the Georgia Soil Conservation Service and the Florida Agriculture Experiment Station (AES). It is the most widely grown variety of bahiagrass. It has an extensive root system giving it excellent drought tolerance. It is tolerant to hot or cold temperatures. It produces an abundance of seed heads which limits its desirability for use as a lawn grass.

'Paraguay' is a short, course, narrow-leaved cultivar that produces less forage than 'Pensacola'.

'Paraguay 22' is a single selection, non-released variety chosen for its improved cold hardiness over the Paraguay types. Both types have lower cold hardiness than 'Pensacola'.

'Tifton 9' was released in 1987 by the University of Georgia and USDA-Agriculture Research Service (ARS) as an improved selection from the 'Pensacola' variety. It was developed for improved forage characteristics. It has more vigorous seedlings, longer leaves, and improved digestibility over Pensacola'.

'TifQuik' was developed to have quick seed germination and reduced hard seed. The variety also exhibits quick growth, excellent seedling vigor, and higher forage yields than 'Tifton 9'.

'UF-Riata' was developed for south Florida by the University of Florida. This variety was selected for improved cold tolerance over 'Pensacola' or 'Argentine'.

'Wilmington' is the most cold-hardy bahiagrass variety known. Released in 1971 by Mississippi AES and NRCS, it has narrow leaves of medium size, but is less productive than 'Pensacola' and 'Paraguay'.

Prepared By
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Species Coordinator
Morris Houck, Plant Materials Specialist, Alexandria, Louisiana

Citation
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Published: October 2009

Edited: 16Sep09 jd, jfh; 16Sep09 mws

For more information about this and other plants, please contact your local NRCS field office or Conservation District <http://www.nrcs.usda.gov/>, and visit the PLANTS Web site <http://plants.usda.gov> or the Plant Materials Program Web site <http://plant-materials.nrcs.usda.gov>

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