INTRODUCTION

Groundwater quality monitoring is required by the Georgia Environmental Protection Division (EPD) to detect and quantify contamination, as well as to measure the effectiveness of engineered disposal systems. A groundwater monitoring network for this site has been designed to provide an early warning of disposal system failure. This plan will define the parameters for analysis, frequency of collection, procedures and techniques for sample collection, sample preservation and shipment, analytical procedures and chain of custody control. This plan conforms to the EPD's Manual for Ground Water Monitoring. Groundwater sampling locations are shown on sheet 47 of 52.

GEOLOGIC CONDITIONS

Geologic conditions for this site are described in the "Site Hydrogeologic Assessment Report for Vertical Expansion of Existing Landfill" prepared by Bunnell-Lammons Engineering, Inc. dated February 11, 2000.

GROUNDWATER MONITORING WELL DESIGN AND CONSTRUCTION

All monitoring wells shall be constructed using the appropriate installation methods as outlined in the "Manual for Groundwater Monitoring, September, 1991", under the supervision of a professional geologist or professional engineer registered in the State of Georgia. Each well will be certified as being constructed according to this plan and the "Manual for Groundwater Monitoring, September, 1991" by the engineer or geologist. Documentation of well construction shall be provided to EPD within 30 days of well completion.

Monitoring wells shall be installed by a driller bonded with the State of Georgia and be constructed as described below.

DRILLING METHODS

A variety of well drilling methods are available for the purpose of installing groundwater monitoring wells. The drilling method shall minimize the disturbance of subsurface materials and shall not cause contamination of the groundwater. Regardless of the drilling method selected, drilling equipment shall be steam cleaned before use and between borehole locations to prevent cross contamination of wells. This site will employ hollow-stem continuous auger drilling methods, mud rotary drilling methods, or sonic methods. In cases where monitor wells are completed in rock, air rotary downhole hammer or sonic methods may be used to complete the drillhole from auger refusal to the total depth of the well.

MONITORING WELL CONSTRUCTION MATERIALS

Well construction materials shall be sufficiently durable to resist chemical and physical degradation and yet not interfere with the quality of groundwater samples. Materials to be used for well casings, well screens, filter packs, and annular seals are covered in this section. The Groundwater Monitoring Well Detail is shown on sheet 36 of 52.

A. WELL CASINGS AND SCREENS

ASTM, NSF rated, Schedule 40, 2-inch PVC with flush threaded connections shall be used for the casing and well screens. It is understood that since PVC pipe is being selected for casing and screening material there may be the possibility that after installation, PVC deteriorating compounds could be present in the groundwater. If these compounds are detected, then EPD must assume that the contaminants are from the landfill and not from the well casing or screen unless identical compounds are found in the upgradient wells and can not be attributed to wastes placed in the site.

B. FILTER PACK AND ANNULAR SEALANT

The materials used to construct the filter pack shall be chemically inert clean quartz sand. The size of the filter pack material should be U.S. Standard Sieve size No. 20–40, unless geologic conditions at the time of drilling dictate a different size. Fabric filters shall not be used as filter pack material.

The materials used to seal the annular space must prevent cross contamination between strata. The materials shall be chemically resistant to ensure seal integrity during the life of the monitoring well and chemically inert so they do not affect the quality of the groundwater samples. A minimum of two feet of certified coarse grit sodium bentonite shall immediately overlie the filter pack. A cement and bentonite mixture shall be used as the annular sealant in the unsaturated zone above the sodium bentonite seal and below the frost line. Extending from a little below the frost line to the surface, the cap should be composed of concrete blending into a mounded cement apron extending outward at least three feet from the edge of the well casing.

The untreated sodium bentonite seal should be placed around the casing either by dropping it directly down the borehole or, if a hollow-stem auger is used, putting the bentonite between the casing and the inside of the auger stem. In shallow monitoring wells, a tamping device should be used to reduce the potential for bridging. In deeper wells, it may be necessary to pour a small amount of formation water down the casing to wash the bentonite down the hole.

The cement-bentonite mixture should be prepared using formation water and placed in the borehole using a tremie pipe if necessary. The tremie method ensures good sealing of the borehole from the bottom.

The remaining annular space should be sealed with expanding cement to provide for security and an adequate surface seal. Locating the interface between the cement and bentonite-cement mixture 1/2 to 1 foot below the frost line serves to protect the well from damage due to frost heaving.

The Groundwater Monitoring Well Detail on sheet 30 illustrates an appropriate protective steel cap around the well casing. A one-quarter inch vent hole provides an avenue for the escape of gas. The protective cap guards the casing from damage and the locking cap serves as a security device to prevent well tampering. Reinforced concrete bollards (4) will be installed around each monitor well which is subject to traffic damage.

The drilling machinery will be cleaned before use. The well casing and screen will be factory-cleaned. Filter sands, well sealant materials, and anything else that may influence sample quality shall be free of contamination.

C. WELL INTAKE DESIGN

The design and construction of the intake of the monitoring wells shall: (1) allow sufficient groundwater flow to the well for sampling; (2) minimize the passage of formation materials (turbidity) into the well; and (3) ensure sufficient structural integrity to prevent the collapse of the intake structure.

For wells completed in unconsolidated materials, the intake of a monitoring well shall consist of a screen or slotted casing with openings sized to ensure that formational material is prohibited from passing through the well during development. Screen size shall be selected to retain 90% of the filter pack and 40% of the formational material. Extraneous fine-grained material (clays and silts) that have been dislodged during drilling may be left on the screen, in the filter pack, and in the well water. These fines shall be removed from the screen and surrounding area during well development. For quality-control purposes, only commercially manufactured screens or slotted casings shall be used. Field slotting of screens is unacceptable.

Screening with 0.010 inch slots shall be used unless geologic conditions observed at the time of installation dictate a different size. The annular space between the face of the formation and the screen or slotted casing shall be filled with a filter pack to minimize passage of formation materials into the well. In order to ensure discrete sample horizons, the filter pack shall extend no more than two feet above the well screen as illustrated in the Groundwater Monitoring Well Detail. Screen length shall not exceed 10 feet without ample justification and written EPD approval. A different filter pack material may have to be considered should geologic conditions at the time of drilling dictate the need for a different size. Sieve analyses of the formation materials shall be used to determine filter pack sizes.

D. WELL DEVELOPMENT

After the construction of groundwater monitoring wells is completed, natural hydraulic conductivity of the formation shall be restored and all foreign sediment removed to ensure turbidity-free groundwater samples.

A variety of techniques are available for developing a well. To be effective, they require reversals or surges in flow to avoid bridging by particles, which is common when flow is continuous in one direction. These reversals or surges can be created by using surge blocks, bailers, or pumps. Only formation water shall be used for surging the well. Should a well be constructed in low yielding water-bearing formations, an outside source of water may be introduced into the well to facilitate development. In these cases, the water shall be chemically analyzed to ensure that it cannot contaminate the aquifer. If compressed air is used in the development of wells there is the possibility that trace contaminants may be introduced. Therefore, sufficient precaution shall be taken to prevent introduction of contaminants which may be cause of concern. All equipment used to develop a groundwater monitoring well shall be steam cleaned prior to its introduction into the well.

E. DOCUMENTATION OF WELL DESIGN AND CONSTRUCTION

The following information will be submitted in report form to EPD by a registered geologist or engineer within 30 days after well development documenting the construction of each well.

- name of driller, identification of drill rig;
- date/time of construction;
- drilling method and drilling fluid * (primarily drilling mud) used;
- well location (+0.5 ft.);
- borehole diameter and well casing diameter;
- well depth (+0.1 ft.);
- drilling and lithologic logs;
- casing materials *;
- screen materials and design;
- casing and screen joint type;
- screen slot size/length;
- filter pack material*/size;
- filter pack volume;
- filter pack placement method;
- sealant materials *;
- sealant volume;
- sealant placement method;
- surface seal design/construction,
- well development procedures;
- type of protective well cap;
- ground surface elevation (+0.01 ft.);
- well cap evaluation (+0.01 ft.);
- top of casing elevation (0.01 ft.); and
- detailed drawing of well (include dimensions).
- copy of driller's bond file with the WATER WELLS ADVISORY COUNCIL at the time of well installation

*Samples of materials, adequate for leaching/sorption tests should be retained.

F. WELL PLUGGING

If it becomes necessary to abandon a monitoring well, the following plugging procedures shall be used. Without proper plugging, the abandoned monitoring well will become an avenue of aquifer contamination. Plugging can also serve to inhibit water loss from artesian aquifers and to eliminate the physical hazard of an open hole. Proper plugging materials and techniques will vary according to the original well construction and the hydrogeology of the site.

The general procedure for plugging shallow monitoring wells completed in water table aquifers involves three steps:

1. Removal of obstructions in the well that could interfere with the plugging operation and thorough flushing of the well to remove any pure residual drilling fluids and other fine detritus,
2. Removal of the well casing (where practical) to ensure placement of an effective seal – as a minimum when the casing is not properly grouted, the upper 20 feet of casing should be removed, and
3. Sealing of the well with an impermeable material such as neat cement.

SEALANT MATERIALS

Well sealants shall be chemically inert and impermeable. Neat portland cement (with or without bentonite clay additives) and bentonite clay are acceptable sealants. General purpose (Type I) neat portland cement is acceptable. The cement slurry is to be mixed with five to six gallons of water for each 94 pound sack of cement. The water of the cement slurry should have a low sulfate content and a total dissolved solids content less than 2,000 parts per million. No

CAPACITIES OF WELL CASINGS

DIAMETER OF HOLE	GALLONS PER LINEAR FOOT	SACKS CEMENT PER LIN. FOOT	LIN. FT. PER SACK CEMENT SET VOL.
2"	0.1632	0.0199	50.2
3"	0.3672	0.0311	32.1
4"	0.6528	0.0791	12.6
5"	1.0200	0.1240	8.0
6"	1.4688	0.1785	5.6
7"	1.9992	0.2430	4.1
8"	2.6112	0.3373	3.2
10"	4.0800	0.4958	2.0
12"	5.8752	0.7140	1.4

Recommended quantities of neat portland cement needed for plugging various diameter wells are shown.

Quantities are based on the set volume, which is somewhat less than the slurry volume. (Taken from "Plugging Abandoned Wells" by Donald K. Keech, Ground Water Age, January, 1973.)

The neat cement slurry shall be piped to the point of application so that the well is filled upward from the bottom. Free falling of the slurry into the well is unacceptable because the cement will become aerated with a resulting increase in permeability.

Bentonite clay additives reduce shrinking (and cracking) of the cement while the slurry is setting. Three to five pounds of bentonite additive and 6-1/2 gallons of water shall be mixed with each 94 pound sack of cement (clay and water are to be mixed together before cement is added to form the slurry).

Bentonite clay can be used separately as a well sealant. The clay can be dropped into the well in the form of granules, chunks, pellets, or balls. Where the potentiometric head of an aquifer causes water to rise in the well high above the level of the plug, consideration must be given to the physical form of the bentonite to be used. If a granular bentonite is added by free falling, a possibility is that the clay will hydrate and expand above the intended point of placement. An ineffective plug will result. Adding the bentonite in chunk or pellet form will prolong the effective period of wetting prior to hydration and allow proper placement of the plug. Bentonite clay cannot be used as a sealant where organic contaminants are present in groundwater unless the bentonite is treated and documentation is presented to show that it is capable of containing organic contaminants.

Shallow monitoring wells installed in unconsolidated sediments or consolidated rocks without fractures or dissolution voids are to be filled with a sealant. Backfilling of the screened or uncased section of the well (up to several feet below the casing) with clean, disinfected sand is permissible. Sand with a diameter of 0.025 inches or less (plaster sand or mortar sand) reduces cement penetration/loss. As a minimum, the upper 50 feet of deep monitoring wells shall be plugged with neat cement or bentonite clay.

Consolidated rocks with a high density of fractures or dissolution voids shall be filled completely with neat cement. Sand and clay fill materials area not suitable because the fine grained sediments can be eroded away by groundwater flow. The use of bridging materials, such as pea gravel or larger rocks (the diameter of the bridging material should be less than 1/3 of the diameter of the well) below the casing or the placement of a plug at the base of the casing, may be necessary to retain the neat portland cement slurry in the well.

Monitoring Parameters and Frequency

The groundwater monitoring wells will be monitored for Georgia EPD's Appendix I and III list of parameters indicated below in accordance with the designated methods. Upon installation, groundwater monitoring wells will be developed to reduce turbidity as outlined in Georgia EPD's "Guidance Document, Turbidity in Ground Water Samples" (attached in Appendix I). Initially, samples will be collected after well installation and development is completed. Subsequently, samples will be collected on a semi-annual basis.

Indicator Parameters:	Method:
pH	Field Test/9040
Specific Conductance	Field Test/2510
Temperature	Field Test
Turbidity	Field Test

*If low-flow procedures are utilized, dissolved oxygen and oxygen reduction potential will also be collected by field test.

APPENDIX I:

The water samples will be tested for the Drinking Water Standard Total Metals by the following SW-846, EPA Methods or the most current approved EPA methods:

METALS	EPA METHOD	METALS	EPA METHOD	METALS	EPA METHOD
Antimony	6010/6020	Chromium	6010	Selenium	6010
Arsenic	6010	Cobalt	6010	Silver	6010
Barium	6010	Copper	6010	Thallium	6010/6020
Beryllium	6010	Lead	6010	Vanadium	6010
Cadmium	6010	Nickel	6010	Zinc	6010

Volatile Organic Analysis:

The unfiltered water samples will be tested for the following volatile organic compounds.

VOLATILES	EPA METHOD	VOLATILES	METHOD
Acetone	8260	trans-1,3-Dichloropropene	8260
Acrylonitrile	8260	Ethylbenzene	8260
Benzene	8260	2-Hexanone;Methyl butyl ketone	8260
Bromochloromethane	8260	Methyl Bromide;Bromomethane	8260
Bromodichloromethane	8260	Methyl Chloride;Chloromethane	8260
Bromoform;Tribromomethane	8260	Methylene Bromide; Dibromomethane	8260
Carbon disulfide	8260	Methylene Chloride; Dichloromethane	8260
Carbon Tetrachloride	8260	Methyl ethyl ketone;MEK; 2-Butanone	8260
Chlorobenzene	8260	Methyl iodide; Iodomethane	8260
Chloroethane;Ethyl Chloride	8260	4-Methyl-2-pentanone; Methyl isobutyl ketone	8260
Chloroform;Trichloromethane	8260	Styrene	8260
Dibromochloromethane; Chlorodibromomethane	8260	1,1,1,2-Tetrachloroethane	8260
1,2-Dibromo-3-chloropropane; DBCP	8260	1,1,2,2-Tetrachloroethane	8260
1,2-Dibromomethane; Ethylene dibromide; EDB	8260	Tetrachloroethylene;Tetrachloroethene; Perchloroethylene	8260
0-Dichlorobezene; 1,2-Dichlorobezene;	8260	Toluene	8260
p-Dichlorobezene; 1,4-Dichlorobezene;	8260	1,1,1-Trichloroethane; Methylchloroform	8260
trans-1,4-Dichloro-2-butene	8260	1,1,2-Trichloroethane	8260
1,1-dichloroethane; Ethylidene chloride	8260	Trichloroethylene;Trichloroethene	8260
1,2-dichloroethane; Ethylene dichloride	8260	Trichloroflouromethane; CFC-11	8260
1,1-dichloroethylene;1,1-Dichloroethene; Vinylidene chloride	8260	1,2,3-Trichloropropane	8260
cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene;	8260	Vinyl acetate	8260
trans-1,2-Dichloroethylene; trans-1,2-Dichloroethene	8260	Vinyl Chloride	8260
1,2-Dichloropropane; Propylene dichloride	8260	Xylenes	8260
cis-1,3-dichloropropene;	8260		

APPENDIX III (Additional):

Appendix III parameters will also be analyzed as follows:

CONSTITUENT	EPA METHOD	CONSTITUENT	EPA METHOD
Boron	6010	Sulfate	300.0/300.1/9056
Calcium	6010	Total Dissolved Solids	2540
Chloride	300.0/300.1/9056	Fluoride	300.0/300.1/9056

In the event assessment monitoring is required, Appendix II and IV parameters will also be analyzed.

Sample Collection

Ground water elevations will be measured during each sampling event to determine if horizontal and vertical flow gradients have changed since initial site characterization. A change in hydrologic conditions may necessitate modification to the design of the groundwater monitoring system. A potentiometric surface map showing both the surficial water table and the uppermost confined aquifer will be prepared and submitted for each sampling event.

Field measurements will include depth to standing water and total depth of the well to the bottom of the intake screen structure. The measurements will be taken to 0.1 foot. Each well will have a referenced point from which its water level measurement is taken. The reference point will be established in relation to a permanent bench mark and the survey will also note the well location.

The water standing in a well prior to sampling may not be representative of in-situ ground water quality. Therefore, the standing water will be removed so that water which is representative of the formation can enter the well.

The procedure for the well evacuation will depend on the yield of the well. When evacuating low yield wells, the wells will be evacuated to dryness once. If a well cannot be bailed dry, then an amount of water equivalent to three or more well volumes will be evacuated.

In order to minimize the introduction of contamination into the well, positive gas displacement Telfon or stainless steel bladder pumps are recommended for purging wells. Teflon or stainless steel bailers may also be used as purging equipment. Where these devices cannot be used, peristaltic pumps, gas-lift pumps, centrifugal pumps, and venturi pumps may be used. Some of these pumps produce volatilization and high pressure differentials, causing varability in the analysis of pH, specific conductance, metals, and volatile organic samples. They are acceptable for purging the wells if sufficient time is allowed to let the water stabilize prior to sampling. Up to twenty four hours is considered a satisfactory interval before sampling. When purging equipment must be reused, it will be decontaminated with a water wash and deionized or distilled water rinse between wells. Should purging equipment become heavily contaminated it will be cleaned with a non-phosphate detergent wash followed by rinsing with isopropanol and deionized or distilled water. Clean gloves will be worn by the sampling personnel. A clean plastic sheet will be placed adjacent to or around the well in order to prevent purging equipment and lines from contacting the ground, which could introduce contaminants to the well. The plastic sheet and gloves will be discarded between wells.

Extraction of well-water samples requires the use of equipment and sample handling in the field that greatly increases the potential for inadvertent sample contamination. Field sampling error greatly exceeds laboratory error. The traces of chemicals being monitored can be lost to the air by agitation or vaporization. They can pass into and out of the water with temperature and pH changes. They decompose when allowed to stand in the sun. Contamination from the ground surface can pass to hands, to the bottle, and then to the sample. Cleanliness and attention to detail will hold these errors to a minimum.

(continued on the next sheet)

GEORGIA
Environmental Protection Division
Solid Waste Management Program

MINOR MODIFICATION APPROVAL

SOLID WASTE PERMIT NO. #133-003D(SL)

APPROVED BY: S. [signature] DATE: 5/19/2017

#	DATE	REVISION DESCRIPTION	DES	CAD	CHK	APR
2	05/19/17	PREPARED BY: GOLDER - RESPONSE TO EPD COMMENTS	RPK	BSD	DYR	RPK
1	02/08/17	PREPARED BY: GOLDER - REVISIONS WQM PLAN	RPK	BSD	DYR	RPK
0	08/22/03	PREPARED BY: HHNT - ORIGINAL WQM PLAN - APPROVED BY GAEPD 07/30/04	HHNT	HHNT	HHNT	HHNT

RACHEL P. KIRKMAN
GEORGIA REGISTERED PROFESSIONAL GEOLOGIST
PG001756
5-19-17

I hereby certify that I am a qualified groundwater scientist, in accordance with the Rules of Solid Waste Management, and 40 CFR Par 258.50(g). A qualified groundwater scientist is a scientist or engineer who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields as may be demonstrated by State registration, professional Certifications, or completion of accredited university programs that enable individuals to make sound professional judgements regarding groundwater monitoring, contaminant fate and transport, and corrective action.

Signature: [signature]
Date: 5-19-17

CLIENT
WASTE INDUSTRIES USA, INC.
WI - TAYLOR COUNTY DISPOSAL, LLC

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-05-19
PREPARED	BSD
DESIGN	RPK
REVIEW	DYR
APPROVED	RPK

PROJECT
TAYLOR COUNTY LANDFILL
PERMIT NO. 133-003D(SL)
MAUK, GEORGIA

RECEIVED
MAY 19 2017
SOLID WASTE MANAGEMENT PROGRAM

TITLE
VERTICAL EXPANSION NO. 2
WATER QUALITY MONITORING PLAN

PROJECT No. 130350816 | PHASE 503 | Rev. 2 | SHEET 48 OF 52

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Once a sampling technique has been established it will be repeated for all subsequent sampling. Sampling equipment that may be used at this facility is as follows:

1. Teflon or stainless steel (316) sampling bailers. Care should be taken to see that bailer rope does not touch the sample water.
2. If possible, dedicated samplers or pumps will be used for each well. This eliminates the potential of cross-contamination, and allows thorough, cleaning in the laboratory before the project. If a dedicated sampler is not available, the device must be cleaned between wells. This means thoroughly rinsing in distilled water, followed by a thorough rinse in isopropanol and followed by a final rinse in distilled water. If a bailer shows insoluble contamination, field cleaning is not recommended.
3. Positive gas displacement Telfon or stainless steel bladder pumps may also be used to extract samples.

Sampling equipment will be constructed of inert material. Equipment with neoprene fittings, PVC bailers, Tygon tubing, silicone rubber bladders, neoprene impellers, and Viton are not acceptable.

A detailed description of the monitoring well and surface water sampling procedures is contained in Appendix I.

Sample Handling and Preservation

1. Metals – Laboratory analysis will be performed on unfiltered representative water samples. When there is a sediment problem, the metals sample only may be collected after waiting a maximum of 24 hours for settling.
2. Sample bottles will be filled to the top, capped with a Teflon seal, and placed on ice immediately after sampling. On arrival at the laboratory they will be transferred to a refrigerator. Samples for volatile organic analysis will be filled to the top without headspace. Special vials with septum caps will be used for this purpose. Table 1, located in Appendix I, is a list of preservatives and holding times.
3. Specific conductance and pH measurements will be performed immediately after collection, if possible. The calibration and sampling procedures will be recorded and continued at each sampling project. If a sample is returned to the laboratory, it will be tested immediately on arrival and this alternate procedure will be recorded and repeated at each sampling project.
4. Sample delivery to the laboratory will be in the shortest possible time after collection. If delay is incurred this will be entered in the field log book along with the time increment.
5. Blanks – A deionized water blank (trip blank) will be carried to the field and put through the entire sampling procedure. This will be done a minimum of one time for each sampling event. If positives are found, this will alert the collector to field sampling error. (See Field and Laboratory / Quality Control).

Chain of Custody

Custody and protection of samples is an important legal consideration. As few people as possible should handle the samples. The sampler is personally responsible for collected samples, and will be able to attest to the integrity of samples until transfer. If the samples are placed in a vehicle, it will be kept locked. Any ice chest will be locked or located in a place which is locked, and accessible only to responsible officials.

A Chain-of-Custody form will be used to document the handling of samples from the moment of collection until testing. The identification (ID) number of each sampling point will be entered along with a word description of the sample. Note that several bottles collected for different parameters will have the same ID number if they come from one sampling point.

The Chain-of-Custody form will contain the facility name, date of sampling, and name of the collector. Each transfer of custody is recorded with an appropriate signature, date, and time.

If the samples are to be shipped they will be sealed and a bill of lading will be secured.

Analytical Procedures

The laboratory performing the analysis will specify a method (EPA Manual SW-846, EPA 600/4-79-020, or EPA approved method).

Records of ground water analysis will include the methods used (by number), the extraction date, and date of actual analysis. Data from samples that are not analyzed within recommended holding times will be considered suspect. Any deviation from an EPA approved method will be adequately tested to ensure that the quality of the results meets the performance specifications (e.g., detection limit, sensitivity, precision, accuracy) of the reference method. A planned deviation from an approved analytical procedure will be justified and submitted for approval by the Georgia EPD prior to use.

Field and Laboratory Quality Assurance/Quality Control

It is the responsibility of the Operator to insure the reliability of the analytical data gathered during the monitoring program.

A field blank will be part of each sampling event. Deionized water will be taken to the site, and handled like a samples. It will be poured into a bailer, or extracted using the same pumping equipment, and sample bottles will be filled using the identical technique. Analysis of the blank alerts the sampler to technical error. The blank test results are not used to correct the sample results, but are reported as-is. If the contaminant levels in the blank are within an order of magnitude of the ground water sample results, the wells may require re-sampling.

In selecting a laboratory to conduct analyses of ground water samples it will be the Operator's responsibility to ensure that the laboratory of choice is exercising a proper Quality Assurance/Quality Control (QA/QC) program. The approved EPA test methods contain within them the requirement to run a spiked sample to determine percent recovery. This will be apart of the laboratory report. Additional quality control such as method blanks and duplicates are also described in the test method and will be included in the laboratory work agreement. The laboratory QA/QC program will be a part of this Plan. Quality assurance procedures are time consuming and increase the cost of testing, but the facility will be regulated based on the results and it is Operator's advantage to employ the best qualified laboratory.

Field instruments that the Operator uses will be calibrated prior to field use and recalibrated in the field each day. The calibration will be recorded in a field log book along with appropriate documentation of the other field activities.

Analysis of Results

In order to determine whether the groundwater is receiving contamination from the site it is necessary to compare the test results with the background test results. Several inherent variabilities can affect the laboratory results and must be considered:

a. The sampling technique will vary somewhat from event to event even under ideal conditions;
b. The aquifer will contain a certain quantity of elements;
c. The laboratory test itself can vary slightly;
d. Seasonal variations can result in slightly different chemical constituents in the water samples.

A method must be used to identify significant deviation beyond the inherent deviation. A statistical analysis of the water quality data using a method approved by the EPA for this purpose will be used at this site. Sufficient sampling events and replicate samples will be obtained for a valid statistical analysis.

If, during the detection phase, it is found that potentially harmful constituents are being released to the environment, an assessment of the extent of contamination will be conducted.

Reporting Results

All results shall be submitted to:

Georgia EPD
Land Protection Branch
4244 International Parkway, Suite 104
Atlanta, GA 30354-3902

APPENDIX I

A. MONITORING WELL SAMPLING PROCEDURE

The greatest source of inadvertent sample contamination is through incorrect handling by field personnel. The levels of concern are minute, and therefore extreme care is needed to provide sample integrity. This will usually lengthen the time required for sample collection, but the reliability of the test results will be increased proportionally. If bailers are to be utilized they should be disposable Teflon™/Teflon™-lined.

Water standing in a well may not be a true representation of water quality in the aquifer. Changes in temperature and pressure, contact with air, and prolonged contact with well casing materials can all affect the chemical quality of the water. Therefore, prior to sampling, the well must be evacuated (purged). If low flow purging and sampling is used, refer to Sheet 50 of 52.

1. Well Evacuation Procedure

Any item coming in contact with the inside of the well casing or the well water will be kept in a clean container and handled only with gloved hands. If possible, always start with the upgradient wells.

For wells with rapid recovery, which cannot be evacuated to dryness, a minimum of 3 well volumes will be removed. This reflects the present technology in which the goal is to clean standing water without diluting any potential plume by drawing in formation water. The field procedure will be as follows:

a. Assemble Equipment
   1. Place a plastic sheet, such as a painter's drop cloth, around the well as a work area. Unlock protective well casing.
   2. Bring electronic water level meter to the plastic sheet. The sounder probe and tape will be pre-cleaned in the laboratory and wrapped in foil. Unwrap without touching them.
   3. Don new nitrile gloves. Remove well cap. Place well cap top-down on a corner of the plastic sheet.

b. Calculate the volume of the water to be evacuated:
   1. Use the electronic water level meter to measure the distance from known elevation to top of water.
   2. Use the water level meter to measure the distance from top of casing to the bottom of the well or use total depth data provided on monitoring well construction logs.
   3. Subtract #1 from #2 to obtain the height (h) of the column of water in the well.
   4. Multiply (h) times the appropriate conversion factor to obtain the volume of water in the well in gallons.
      4.a. For a 2-inch inside diameter well,
      h x 0.1623 = Volume (gal)
      4.b. For a 4-inch inside diameter well,
      h x 0.6528 = Volume (gal)
   5. Evacuate 3 x Volume (gal) to obtain a representative sample.
   6. Clean the steel measuring tape and electric sounder probe by rinsing with isopropanol, allowing to air dry and following with distilled water rinse. Wrap in foil for use on the next well. If acetone is used, be sure to allow apparatus to dry thoroughly before proceeding to the next well.

c. Evacuate the Well:
   1. Bring 2 dishpans and a measuring container to the plastic sheet and line one dishpan with aluminum foil.
   2. Bring the Teflon™/Teflon™-lined disposable bailer to the plastic sheet. Unwrap it without touching the Teflon™/Teflon™-lined disposable bailer.
   3. Bring the roll of bailer rope to the sheet. This roll has also been covered with foil to keep it clean. Place it in the unlined dishpan and unwrap it without handling the rope.
   4. At this point both bailer-handler and helper should don new nitrile gloves.
   5. The end of the bailer rope is tied to the top of the Teflon™/Teflon™-lined disposable bailer. Use foil where needed to assure that the rope does not touch any item while in use.
   6. The Teflon™/Teflon™-lined disposable bailer is lifted and lowered carefully into the well until it is submerged.
   7. The Teflon™/Teflon™-lined disposable bailer is raised in a hand over hand manner and the rope is allowed to fall into the polyethylene dishpan lined with foil.
   8. Pour groundwater from the Teflon™/Teflon™-lined disposable bailer into the measuring container. Repeat bailing procedure until a 3 x volume (gal) (see section B, 4, and 5 above) has been evacuated. If the Teflon™/Teflon™-lined disposable bailer touches the container, line the lip with aluminum foil.
   9. If the well goes dry before 3 volumes are obtained, then sample when the well has recovered sufficiently to provide a sample volume. Some wells require up to 24 hours for recovery and settling.
   10. The rope is untied from the Teflon™/Teflon™-lined disposable bailer and the portion used is cut off for discard.
   11. The used gloves, the used rope, dishpan foil, and the plastic sheet are rolled up and discarded in an appropriate manner.

2. Sampling Procedure

d. Proceed with sampling procedure or if well requires a recovery period before sampling, replace well cap and lock protective casing. In general, allow up to 24 hours for well water stabilization. Where well recovery is rapid and water is clear of sediment, this waiting period may be shortened. However, samples will be collected within 24 hours of well evacuation.

i. Bailed Samples:
   1. Place a plastic sheet such as a painter's drop cloth, around the well as a work area, to prevent sample bottle contact with the ground.
   2. Bring 2 dishpans to the sheet and line one with aluminum foil.
   3. Arrange sample bottles on the sheet.
   4. Bring the Teflon™/Teflon™-lined disposable bailer to the plastic sheet. Unwrap it without touching the Teflon™/Teflon™-lined disposable bailer.
   5. Bring the roll of the bailer cord to the sheet. This spool has also been covered generously with foil to keep it clean. Place it in the unlined dishpan and unwrap it without handling the rope. Selection of inert rope is important. New nylon rope is available from several manufacturers. Where organic contaminants are of interest it may be advisable to use Teflon rope for the first 10 feet of cord and discard after each well is sampled. However, the value of this may be offset by the additional handling required.
   6. Don new pair of nitrile gloves, unlock protective well casing and remove well-cap. Place the well-cap top-down on a corner of the plastic.
   7. At this point both bailer-handler and helper should don new pair of latex gloves.
   8. The end of the bailer rope is tied to the top of the Teflon™/Teflon™-lined disposable bailer. The rope must not touch anything but the clean aluminum foil. Use foil where needed.
   9. The Teflon™/Teflon™-lined disposable bailer is lifted and lowered carefully into the well until it is submerged.
   10. The helper will unscrew the appropriate sample caps and place them top-down on the plastic sheet without touching the interiors or dislodging any Teflon™ discs inside the caps.
   11. The Teflon™/Teflon™-lined disposable bailer is raised in a hand over hand manner and the rope is allowed to fall into the polyethylene dishpan lined with foil. The first Teflon™/Teflon™-lined disposable bailer-full is discarded.
   12. The samples are poured into the bottles without bubbles, and are filled to the top without headspace. The helper can hold the bottle and be responsible for recapping without touching the interior of the cap, and screwing down tightly. It is not good practice to leave samples in the sun. They should be removed to the ice chest as soon as possible.
   13. The organic samples are the most delicate and should be collected first. A sample for volatile analysis must be filled so that the vial has a meniscus. A Teflon™-lined cap will be used to close the vial so that no bubble can be seen when the sample vial is inverted. The volatile samples are always collected in pairs. The other organic samples usually require two or three 1-liter bottles without preservative and these should be collected next, also without headspace. If a sample is to be collected for dissolved metals, it will be collected next. If there is a sediment problem, this sample should be collected immediately following the volatile samples in order to minimize sample turbidity. The dissolved metal samples will be either field filtered or filtered in the laboratory and preserved with HNO3. Finally, preserved samples should be collected, taking great care that the acids and salts in the bottles do not contact the helper's gloves and thus pass to other caps and bottles. Do not allow the bailer to touch sample bottles, or allow rope ends or gloved fingers to contact the sample well water while pouring.
   14. The remaining sample bottles should now be carried to the ice chest to be labeled, placed in zip-lock bags, and chilled with ice.
   15. The labels can be pre-filled, leaving less work and time delay at the site. The label must have:
       Name of facility
       Date of sampling and time
       Sample description (monitoring well ID and "up" or "down")
       Sampler's name
       Additionally, mark each sample bottle with an ID number using a glass-marking crayon which is resistant to water. Bottle caps are good places to add an ID. This is a precaution in case labels get wet or come off during transport.
   16. The well cap is replaced and the protective well casing is locked.
   17. The rope is untied from the bailer and used rope is discarded.
   18. The used gloves, the used rope, the bailer foil, dishpan foil and the plastic sheet are folded up and discarded in an appropriate manner.
   19. Proceed to the next well. Repeat.

   Note: It is good practice to take an extra set of sample bottles to the field in case of breakage or accidental contamination.

C. SPLIT SAMPLES

In order to keep sample handling to a minimum the parallel splitting procedure may be used.

1. Parallel Split

a. The 2 sample bottles for a given test are lined up and caps removed.
b. One Teflon™/Teflon™-lined disposable bailer-full is poured into one bottle, and the next bailer-full is poured into the other bottle, alternating until the 2 sample bottles are full. They are then capped as usual.
c. The 2 sample bottles for another test are then lined up, and filled as in b.
d. This procedure is continued until all test bottles for a given well are filled for both parties.

D. POTENTIOMETRIC MAP

Each time a complete groundwater sampling event is completed, the owner or operator must determine the rate and direction of groundwater flow. A potentiometric map will be developed. A copy of this map will be forwarded to Georgia EPD with the statistical analysis for each sampling event.

TABLE 1

Preservation Procedures and Holding Times

Parameter	EPA Method for Groundwater or Wastewater	Recommended Container	Preservative Indicators of Groundwater Contamination	Holding Time	Volume Required for One Analysis
pH	Field Test/9040	P, G	N/A	Field/ 15 Minutes	25 mL
Specific Conductance	Field Test/2510	P, G	N/A	Field/ 28 Days	100 mL
TOC	415.1/9060	G, Amber, Teflon lined cap	HCL/H_2SO_4	28 Days	1000 mL
Chloride	300.0/300.1/9056	P, G	N/A	28 Days	200 mL
Antimony	6010/6020	P	HNO_3	6 Months	500 mL
Arsenic	6010	P	HNO_3	6 Months	500 mL
Barium	6010	P	HNO_3	6 Months	500 mL
Beryllium	6010	P	HNO_3	6 Months	500 mL
Boron	6010	P	HNO_3	6 Months	500 mL
Cadmium	6010	P	HNO_3	6 Months	500 mL
Calcium	6010	P	HNO_3	6 Months	500 mL
Chromium	6010	P	HNO_3	6 Months	500 mL
Cobalt	6010	P	HNO_3	6 Months	500 mL
Copper	6010	P	HNO_3	6 Months	500 mL
Lead	6010	P	HNO_3	6 Months	500 mL
Lithium	6010	P	HNO_3	6 Months	500 mL
Mercury	7470	P	HNO_3	6 Months	500 mL
Molybdenum	6010	P	HNO_3	6 Months	500 mL
Nickel	6010	P	HNO_3	6 Months	500 mL
Selenium	6010	P	HNO_3	6 Months	500 mL
Silver	6010	P	HNO_3	6 Months	500 mL
Thallium	6010/6020	P	HNO_3	6 Months	500 mL
Vanadium	6010	P	HNO_3	6 Months	500 mL
Zinc	6010	P	HNO_3	6 Months	500 mL
Dissolved Metals	Same as Above	P	Only Preserve Filtrate	24 Hours if not field filtered	500 mL
Fluoride	300.0/300.1/9056	P	N/A	28 Days	300 mL
Nitrate/Nitrite	300.0/353.2/9056	P, G	H_2SO_4	28 Days	200 mL
Sulfate	300.0/300.1/9056	P	N/A	28 Days	200 mL
Total Dissolved Solids	2540	P	N/A	7 Days	100 mL
Chemical Oxygen Demand	410.4	P	H_2SO_4	28 Days	250 mL
Sulfide	4500SD	P	ZnOAc/NaOH	7 Days	250 mL
Radium 226-228	9320/9315	P	N/A	180 Days	1/2 Gallon
Volatile Organics	8260	G, Teflon lined cap	HCL	14 Days	4-40 mL
Pesticides	8081	G, Teflon lined cap	N/A	7 Days	2-1,000 mL
Herbicides	8151	G, Teflon lined cap	N/A	7 Days	2-1,000 mL
PCB(s)	8082	G, Teflon lined cap	N/A	7 Days	2-1,000 mL
SVOC(s)	8270	G, Teflon lined cap	N/A	7 Days	2-1,000 mL
Cyanide	335.4	P, G	NaOH	14 Days*	500 mL
Oil & Grease	1664	G	H_2SO_4	28 Days	2-1,000 mL
Phenols	8270/9065	G	H_2SO_4	7 Days/ 28 Days	2-1,000 mL

*Unless sulfide is present, – then 24 hours (see lab method)
P = polyethylene
G = glass

APRIL 27, 1994

GUIDANCE DOCUMENT
TURBIDITY IN GROUND WATER SAMPLES

Legal Authority: Rules of Solid Waste Management 391-3-4-.14(12)

References: a. Paragraph 6.7, Chapter 6, RCRA Groundwater Monitoring: Draft Technical Guidance, November 1992
b. Paragraph 11.4.3(c), Chapter 11, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 3rd Edition

GENERAL: Recent sampling and analytical reports received by the Georgia EPD contain reports that document field observation of turbid ground water samples. Measurement of the turbidity in these samples have confirmed high level of turbidity in the range of 500-999 NTU. Ground water samples containing turbidity concentrations at these levels exceed the established standard for turbidity and are not representative of the in-situ ground water quality in the uppermost aquifer. Further, samples containing greater than five (5) Nethelometric Turbidity Units (NTU) are not acceptable for analysis when the analytical method is sensitive to turbidity (such as the analysis for metals).

BACKGROUND: The Third Edition of the Glossary of Geology published by the American Geological Institute defines:

turbid – Stirred up or disturbed, such as by sediments; not clear or translucent being opaque with suspended matter, such as of a sediment-laden stream flowing into a lake; cloudy or muddy in physical appearance, such as of a feldspar containing minute inclusions.

turbidity – (a) The state, condition, or quality of opaqueness or reduced clarity of a fluid, due to the presence of suspended matter. (b) A measure of the ability of suspended material to disturb or diminish the penetration of light through a fluid.

Driscoll and Johnson's Groundwater and Wells, 2nd Edition reports that:

Turbidity is measured by how much light is transmitted or scattered when a beam of light is passed through a water sample. An early type of analysis, called the Jackson Turbidity Unit (JTU), is based on measurements made with a transmitted light beam using a standard candle. This method is not sensitive enough, however, for measuring the turbidity of well water, filtered water, and clarified effluent samples. A light-scattering method is used for these low-turbidity waters. The light is measured in NTUs, which indicate the light scattered at 90-degree of 270-degree angles to the incident beam.

Turbidity refers to solids and organic matter that do not settle out of water. Ground water is rarely turbid, unlike surface water which often contains suspended solids and colloidal or soluble organic matter.

REGULATORY REQUIREMENTS AND STANDARDS: The Rules for Solid Waste Management, Chapter 391-3-4-.14(12), effective June 27, 1993 require representative ground water samples be collected and analyzed to determine if a release to the uppermost aquifer has occurred that exceeds established standards. One physical characteristic that defines a representative ground water sample is turbidity. The standard for turbidity is defined in paragraph 11.4.3(c) Chapter Eleven of Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, as:

(continued on the next sheet)

GEORGIA
Environmental Protection Division
Solid Waste Management Program
MINOR MODIFICATION APPROVAL
SOLID WASTE PERMIT NO. #133-003D(SL)
APPROVED BY: S. Rhie DATE: 5/..

RACHEL P. KIRKMAN
GEORGIA REGISTERED PROFESSIONAL GEOLOGIST
PG001756
5-19-17

	DATE	REVISION DESCRIPTION	DES	CAD	CHK	APR
	05/19/17	PREPARED BY: GOLDER - RESPONSE TO EPD COMMENTS	RPK	BSD	DYR	RPK
	02/08/17	PREPARED BY: GOLDER - REVISIONS WQM PLAN	RPK	BSD	DYR	RPK
	08/22/03	PREPARED BY: HHNT - ORIGINAL WQM PLAN - APPROVED BY GAEPD 07/30/04	HHNT	HHNT	HHNT	HHNT

I hereby certify that I am a qualified groundwater scientist, in accordance with the Rules of Solid Waste Management, and 40 CFR Par 258.50(g). A qualified groundwater scientist is a scientist or engineer who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields as may be demonstrated by State registration, professional Certifications, or completion of accredited university programs that enable individuals to make sound professional judgements regarding groundwater monitoring, contaminant fate and transport, and corrective action.

Signature: Rachel P. Kirkman
Date: 5-19-17

CLIENT
WASTE INDUSTRIES USA, INC.
WI - TAYLOR COUNTY DISPOSAL, LLC

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-05-19
PREPARED	BSD
DESIGN	RPK
REVIEW	DYR
APPROVED	RPK

PROJECT
TAYLOR COUNTY LANDFILL
PERMIT NO. 133-003D(SL)
MAUK, GEORGIA

TITLE
VERTICAL EXPANSION NO. 2
WATER QUALITY MONITORING PLAN

PROJECT No.	PHASE	Rev.	SHEET
130350816	503	2	49 OF 52

Samples containing less than 5 NTU turbidity are acceptable for analysis when the analytic method is sensitive to turbidity (such as the analysis of metals). Samples containing greater than 5 NTU are only acceptable when well development is certified by a qualified hydrogeologist as the best obtainable.

Conditions: Turbidity evaluation must accompany all potentially affected values.

Samples collected and analyzed for inorganic chemicals (Total Metals) that do not meet this turbidity standard are not representative of the in-situ water quality of the uppermost aquifer, and are not valid for the evaluation of the in-situ water quality. Further, the presence of turbid ground water samples indicate that a proper field sampling protocol was not followed in the collection of the samples for analysis, or that the wells were not properly developed and completed, or both.

RECOMMENDED CORRECTIVE MEASURES: The Permittee should review the following:

a. Well purging procedures and the time-interval between purging and sample collection. Additional time may be required after purging to permit any disturbed particulate matter to settle out prior to collecting samples.

b. Check the appearance of the ground water sample and if the sample appears to be turbid, conduct turbidity tests prior to collecting samples for analysis to insure that the sample meets the turbidity standard of five (5) NTUs.

c. If the well(s) continues to produce turbid samples, the well may have to be redeveloped. The procedures for well development are contained in Paragraph 6.7, Chapter 6, RCRA Ground water Monitoring: Draft Technical Guidance, November 1992. A copy of this is shown below.

SUMMARY: Upon completion of the foregoing, if a well is not producing low-turbidity ground water samples, the Permittee must demonstrate to the satisfaction of the Georgia EPD that proper well completion and development measures were employed and that the turbidity is an artifact of the geologic materials in which the well is screened. This demonstration must be certified by a professional geologist, hydrogeologist or geotechnical engineer. Failure to make this demonstration could result in a determination by the Georgia EPD that the well must be reinstalled. Further, requests to collect and analyze field-filtered samples for metal analysis due to naturally occurring high turbidity levels must be accompanied by the certification statement of the registered professional.

ADDITIONAL INFORMATION: Additional information may be obtained by contacting a staff geologist of the Land Protection Compliance Program, Georgia EPD at (404) 362-2696.

6.7 Well Development

All monitoring wells should be developed to create an effective filter pack around the well screen, to rectify damage to the formation caused by drilling, to remove fine particles from the formation near the borehole, and to assist in restoring the natural water quality of the aquifer in the vicinity of the well. Development stresses the formation around the screen, as well as the filter pack, so that mobile fines, silts, and clays are pulled into the well and removed. The process of developing a well creates a graded filter pack around the well screen. Development is also used to remove any foreign materials (drilling water, muds, etc.) that may have been introduced into the well borehole during drilling and well installation, and to aid in the equilibration that will occur between the filter pack, well casing, and the formation water.

The development of a well is extremely important to ensuring the collection of representative ground water samples. If the well has been properly completed, then adequate development should remove fines that may enter the well either from the filter pack or the formation. This improves the yield, but more importantly it creates a monitoring well capable of producing samples of acceptably low turbidity. Turbid samples from an improperly constructed and developed well may interfere with subsequent analyses.

When development is initiated, a wide range of grain sizes of the natural material is drawn into the well, and the well typically produces very turbid water. However, as pumping continues and the natural materials are drawn into the filter pack, an effective filter will form through a sorting process. Inducing movement of ground water into the well (i.e., in one direction) generally results in bridging of the particles. A means of inducing flow reversal is necessary to break down bridges and produce a stable filter.

The common methods for developing wells are described by Aller et al. (1989) and Driscoll (1986) and include:

Pumping and overpumping;
Backwashing;
Surging with a surge block;
Bailing;
Jetting;
Airlift pumping; and
Air surging.

Aller et al. (1989) provide a detailed overview of well development and should be consulted when evaluating well development methods. Overall, the most effective and efficient method available for inducing flow reversal during well development is the careful use of a properly-constructed surge block. To be effective, the surge block may need to be lifted and lowered throughout the well screened interval for several hours, with periodic pumping or bailing of the fines. Bailers and pumps also have been used successfully to develop wells; however, depending on the depth of the water, the hydraulic conductivity of the aquifer, and the diameter of the well, pumping may effectively achieve well development.

The following is a general procedure for developing a well by surging and pumping of fines:

1. Record the static water level and total well depth.
2. Set the pump and record the pumping rate. Pump until turbidity reaches the desired level as measured using a turbidity meter.
3. Discontinue pumping and begin surging using a properly designed surge block and proper surging technique.
4. Measure and record well depth to determine the amount of fines, and repeat Step 2. If the well has been properly designed, the amount of pumping required to achieve the desired turbidity level will be substantially less than the amount of pumping required during the first pumping cycle.
5. Repeat surging and pumping until the well yields water of acceptable turbidity at the beginning of a pumping cycle. A good way to ensure that development is complete is to shut the pump off during the last anticipated pumping cycle, leaving the pump in place, and re-start it at a later time. The turbidity of the discharge water should remain low.

Effective and efficient well development is possible only with adequate flow rate during water withdrawal. Additionally, any fines that have been drawn into the well should be removed to the greatest degree possible. Therefore, the Agency recommends that one of the following pumping methods, listed in the order of preference, be used in conjunction with a properly designed surge.

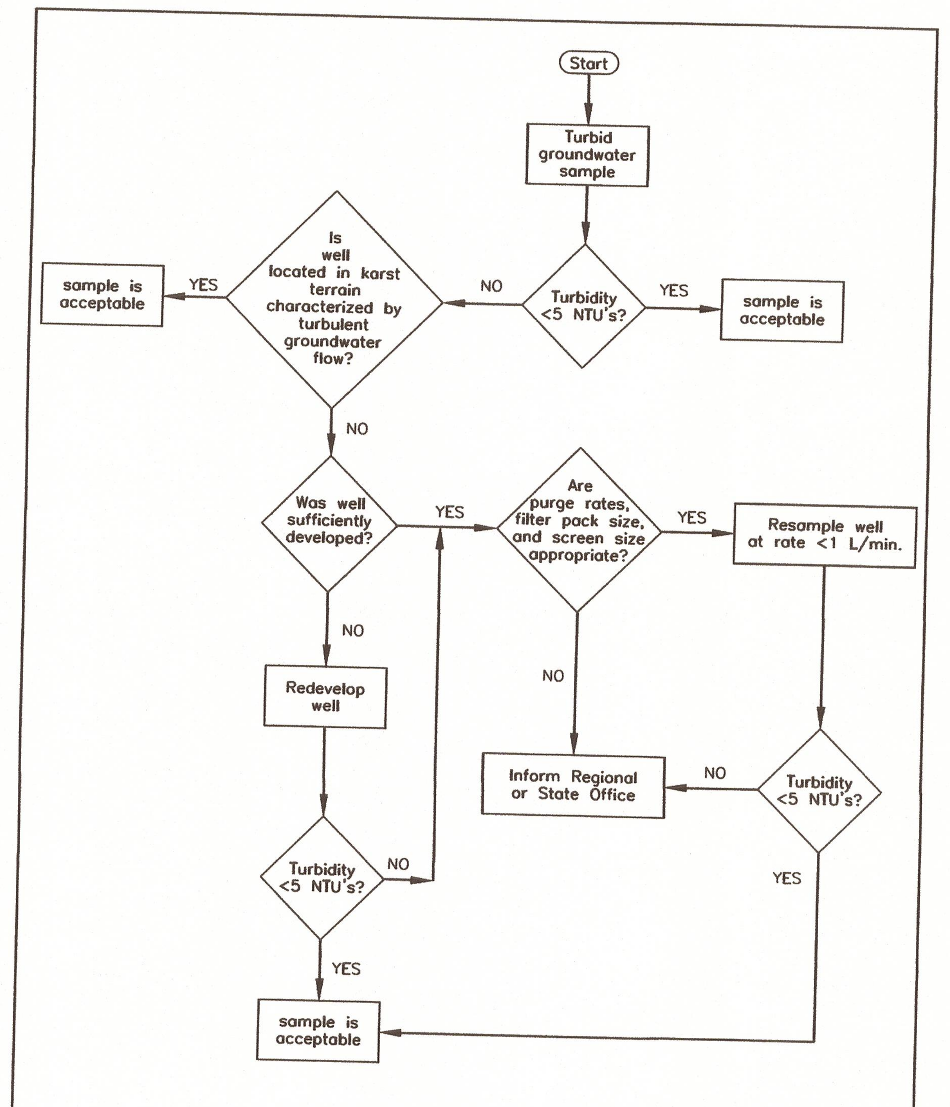
1. Centrifugal pump capable of removing fines if the water level is within suction-lift distance.
2. Electric submersible pump capable of pumping fines.
3. Properly designed and operated air-lift system (requires prior approval of the Regional Administrator).

Well development methods and equipment that alter the chemical composition of the ground water should not be used. Development methods that involve adding water (including water pumped from the well) or other fluids to the well or borehole, or that use air to accomplish well development, are rarely permissible. Consequently, methods that are unsuitable in most cases for monitoring well development include backwashing, jetting, airlift pumping, and air surging. Approval should be obtained from the Regional Administrator prior to introducing air, water, or other fluids into the well for the purpose of well development. Any water introduced into the well during well development should be chemically analyzed to determine its potential impact on water quality. The well development methods that will generally be approved by EPA are bailing, surging with a surge block, pumping, overpumping, or combinations of these methods. Airlift pumping may be approved if the owner/operator can demonstrate to the satisfaction of the Regional Administrator that appropriate measures will be taken to prevent air contact with the formation, and to prevent the entry of compressor oils into the well. Monitoring wells should not be developed before well sealant materials have set or cured.

Ground water should be collected and measured for turbidity periodically during well development and at the completion of well development. The final turbidity measurement should be recorded on the well construction log. If a well yields turbid samples (turbidity greater than or equal to 5 NTUs) after development, the procedures shown in Figure 14 should be followed. A well that cannot be developed to the point of producing low turbidity water (e.g., <5 NTUs) may be considered by the Agency to have been improperly completed (e.g., mismatched formation materials/filter pack/screen slot size) depending on the geologic materials in which the well is screened. If a well is not producing low turbidity ground water samples, the owner/operator should demonstrate to the satisfaction of the appropriate regulatory agency that proper well completion and development measures have been employed, and that the turbidity is an artifact of the geologic materials in which the well is screened, and not the result of improper well construction or development. Failure to make such a demonstration could result in a determination by the Agency that the well must be re-drilled.

The Agency emphasizes that proper well construction and development procedures, as well as proper sampling procedures (e.g., selection of appropriate well purging and sampling rates), are necessary to yield ground water samples that are representative of ambient water quality. The Agency recognizes that ground water in some wells (both high and low yield) in fractured rock or karst aquifers may become muddy after periods of rainfall, even though during fair weather the water is free of turbidity. Careful attention to proper well installation and development should be exercised with wells completed in very silty geologic units. Information obtained from any aquifer tests conducted on the well should be used to establish the initial yield of the well, and these data can be used for periodic redevelopment and maintenance assessments.

If well drilling, installation, or completion have altered ground water quality chemically in the vicinity of the well, well development should aid in restoring ground water quality within the well to natural ground water quality. The ability of a well development method to remove clays from the sides of the borehole should be considered, because clays retained in the borehole may alter the chemical composition of ground water in the well. The Agency recommends periodically monitoring ground water during well development for water quality parameters such as specific conductance and pH. The reproducibility of water quality results provides some indication that ground water chemistry in the well has been restored to natural quality. In general, the Agency also recommends that the volume of water introduced into the well during well drilling, installation, and completion be withdrawn from the well during well development. The volume of water withdrawn from a well during development should recorded.



DECISION CHART FOR TURBID GROUNDWATER SAMPLES
(FIGURE 14)

LOW-FLOW PURGING AND SAMPLING

Low-flow purging and sampling techniques will be the preferred method used to collect ground water samples at the site at any time. When turbidity levels cannot be reduced to below 5 NTUs in a well, low-flow purging and sampling methods are not optional and must be employed. This technique recovers representative samples of ground water in the formation adjacent to the well screen, minimizing purge water and collecting representative formation water adjacent to the pump. Ideally, the flow rate of water from the pump will approximate or be less than that entering the well from the surrounding formation.

A pneumatic bladder pump or electric submersible pump will be slowly lowered into place within the screened section of the well and all water pumped will be monitored for a number of chemical and physical parameters using a flow cell and field instrumentation. Measurements of indicator parameters specific conductance, pH, temperature, and turbidity will be taken at intervals equal to the time necessary to fill the flow-through cell and frequently enough to provide a sufficient number of measurements to evaluate stability. Water levels will also be checked to ensure that draw down is kept to a minimum. The drawdown should not exceed 0.33 feet where possible. The tubing used for purging and sampling will be made of Teflon™ or as an alternative, Teflon-lined polyethylene.

Water level monitoring will be used to ensure that the water level in the well remains as close to the static level as possible during purging and sampling. Sampling will commence when the measured parameters have stabilized and turbidity is at an acceptable and constant level. The static water in the pump and delivery tubing will first be removed, then pumping and monitoring continues until the chemical parameters have stabilized. All instrumentation used will be pre-calibrated and re-checked before field use. Measurement intervals will begin after at least one flow cell volume has been removed. The following criteria will be measured to define stabilization for at least 3 consecutive measurements:

pH:	+/-	0.1 pH units
Conductivity:	+/-	5% of pior reading
Dissolved Oxygen:	+/-	10% of pior reading or +/- 0.2 mg/L, whichever is greater
Turbidity:	+/-	10% of pior reading or < 5 NTU

*Temperature and ORP should not be used for stabilization but should be collected and recorded.

Samples will be collected directly from the well pump outlet and not from the flow cell outlet. The pump rate used for purging may also be used fro sample collection or it can be reduced to ease filling of small containers or vials. Samples for analysis of the most sensitive parameters will be collected first and any samples that require filtration last.

For a Low-Flow purging and sampling event the following data will be recorded:

- Equipment Calibration
- Equipment Decontamination
- Equipment Configuration for Purging and Sampling
- Pump Placement
- Initial Static Water Level
- Initial Pump Rate
- Drawdown Measurements
- Stabilized Pumping Water Level
- Final Pump Rate
- Water Quality and Turbidity Measurements, with Time
- Final Sampling Flow Rate

PERMIT CONDITIONS
FOR
SURFACE-WATER MONITORING

Surface water monitoring at the sight will fully comply with the applicable Georgia regulations as stated below:

Legal Authority: Rules of Solid Waste Management 391-3-4-.07(3)(j)

A. Surface-Water Requirements:
1. The Permittee shall not allow this facility to:
   a. Cause a discharge of pollutants into waters of the State or the United States, including wetlands as defined by the U. S. Army Corp of Engineers Section 404 Permit process, that violates any requirements of the Clean Water Act, including, but not limited to, the National Pollutant Discharge Elimination System (NPDES) requirements pursuant to section 402.
   b. Cause the discharge of a non-point source of pollution to waters of the State or the United States, including wetlands, that violates any requirement of an area-wide or state-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.
2. The Permittee shall operate and maintain this facility in compliance with the Georgia Water Quality Control Act, as amended. The Permittee shall apply for and obtain a National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from the Division if not already covered. The Permittee shall conduct monitoring and sampling at surface-water control structures as outlined in said permit.
3. The Permittee shall implement an approved surface-water monitoring plan which will determine the impact of this facility on all adjacent surface-water bodies. The Surface-Water Monitoring Plan shall be incorporated in the approved Ground-Water Monitoring Plan.
4. The Permittee shall conduct surface-water hydrology studies to describe site drainage systems, flow characteristics, water quality of the streams and water bodies upgradient, adjacent to, and downgradient of the facility. A survey of all springs and seeps, on and adjacent to the site, will be conducted and these points mapped on the plan. This information must document baseline conditions on and adjacent to this facility and form the basis for assessing current and future environmental impacts of this facility on surface-water quality.
5. A minimum of one surface-water monitoring point shall be established upgradient, adjacent to this site, at any point where drainage leaves this site, at spring and seep locations, and downgradient of this facility. All surface-water monitoring point markers shall be installed and maintained on land adjacent to the sampling location, and indicated on the Ground-Water Monitoring Plan.

B. Surface-Water Monitoring Program (SWMP)

1. The Permittee shall implement a Surface-Water Monitoring Program (SWMP) for this facility to comply with the following:
   a. Rule 391-3-4-.07 which requires all surface-water monitoring points be sampled in accordance with applicable rules and regulations, and
   b. The Georgia Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised July 6, 1999, establishing the water-quality standards for waters of the State. Specifically, Rule 391-3-6-.3 lists the criteria for water-quality standards and instream concentrations of chemical constituents that are to be met to maintain the water quality of State waters and protect human health and the environment.
2. If this facility is located adjacent to or near surface waters that may be impacted by a release from this facility, the Permittee shall monitor the constituents contained in TABLE I below.

TABLE I

INDICATOR PARAMETERS	METHODS, SW846
Dissolved Oxygen (DO)	field test
Temperature (T)	Digital Thermometer
pH	field test/9040
Specific Conductance	field test/2510
Chloride	300.0/300.1/9056
Total Organic Carbon (TOC)	415.1/9060
Chemical Oxygen Demand (COD)	410.4/5220
Total Dissolved Solids (TDS)	2540
Fluoride	300.0/300.1/9056
Sulfate	300.0/300.1/9056
Inorganic Constituents	
Arsenic (Total)	6010
Barium (Total)	6010
Boron (Total)	6010
Cadmium (Total)	6010
Calcium (Total)	6010
Chromium (Total)	6010
Cyanide (Total)	335.2
Lead (Total)	6010
Nickel (Total)	6010
Mercury (Total)	7470
Selenium (Total)	6010
Silver (Total)	6010
Zinc (Total)	6010

3. The established standards for the above Table I constituents are contained in Rule 391-3-6-.03., with the exception of the following three parameters:

   Chemical Oxygen Demand (COD)
   Specific Conductivity
   Total Organic Carbon (TOC)

The background concentration will be the established standard for these parameters.

B. SURFACE WATER SAMPLING PROCEDURE

4. Additional constituents may be required based on the contaminants likely to be present in the waste stream and criteria established in Rule 391-3-6-.03. The Permittee shall identify any additional constituents to be monitored for and provide the rationale for their selection. This list of additional constituents will be prepared and forwarded to the Georgia EPD for technical review and approval. If approved, the Permittee will be notified. Within 14 days of notification of approval, the Permittee will incorporate this list into Table I and make the Table I, as incorporated, a permanent part of the Facility Operating Record.
5. The minimum sampling frequency for all constituents listed shall be semi-annual. Sampling events will not be conducted when stream flow conditions are below the 7-day, 10-year minimum flow (7Q10) condition. Negative reports will be submitted to the appropriate Georgia EPD Regional Compliance Officer documenting when a scheduled sampling event is impacted by this condition and an alternate schedule established to complete the required semiannual sampling event.
6. Surface water will be considered as potentially being impacted by a release of leachate from the facility if the downstream results are consistently higher than the background surface-water quality upstream. In the event that an impact is confirmed, the Department shall be notified and additional monitoring parameters including Appendix IV constituents may be required.
7. Within forty-five (45) days of documenting that a release of leachate has occurred from the facility, the Permittee shall initiate sampling and analysis at all surface-water monitoring points specified in the Plan for the chemical constituents listed in Rule 391-3-6-.03. The Permittee shall compare the results obtained to the instream concentrations of chemical constituents listed in this Rule and certify compliance or noncompliance. In the event an exceedance of an instream concentration of a chemical constituent is detected, the Permittee shall develop a corrective action plan and compliance schedule to eliminate further surface-water contamination and bring the facility back into compliance. Copies of the corrective action plan and proposed compliance schedule will be provided to the Georgia EPD Regional Compliance Officer within ninety (90) days of the documented exceedance.

The greatest source of inadvertent sample contamination is through incorrect handling by field personnel. The lev of concern are minute, and therefore, extreme care is needed to provide sample integrity. This will usually length the time required for sampling but the reliability of the test results will be increased proportionally. Genera automated or semi-automated samplers or other manual devices accessible from the banks of a stream surface-water body should be used whenever possible. If naturally occurring conditions inhibit this method of sam collection, the sample may be obtained by wading up-current (and down stream) of the sampling station. T sample should be collected in an area representative of minimal turbulence and aeration. Because sam containers may be dipped by hand into the stream, extreme care must be employed in avoiding contamination i the mouth of the container. The following procedures are recommended for extraction and subsequent collection suface-water samples.

A. Dipping Using A Sample Container:

1. Hold the bottle near the base with one hand, and with the other, remove the cap. Rinse the sample contai with the water to be sampled prior to filling the container.
2. One exception to this is the coliform sample bottle. This bottle may have a pre-measured amount of sodi thiosulfate to neutralize any chlorine present in the water, therefore, this container should not be rinsed pr to sampling.
3. Push the sample container rapidly into the water (mouth down) and tilt-up towards the current to fill. depth of about six inches is satisfactory. Great care should be taken to avoid breaching the surface wh filling the container.
4. During times of little current movement move the container slowly through the water laterally.
5. During times of extreme drought when stream depths are too shallow to allow submersion of the sam container, a pool may be scooped-out of the channel bottom and allowed to clear prior to sampling.
6. Lift the container from the water and, leaving one-half inch of air space, place the uncontaminated cap bc on the container.
7. Sample labels or tags will be attached to the sample container and should at a minimum include: Sam Number, Name of Collector, Date and Time of Collection, and Place/Point of Collection.
8. Place the samples in an ice chest on ice for courier or hand delivery to the laboratory. WARNING – T potential for cross contamination from volatiles in ground-water samples may be significant, therefo surface-water samples should not be placed in the same container with volatile samples.
9. A complete Chain-of-Custody Form and the appropriate Request for Analysis Form must be submitted alc with the samples to the appropriate certified laboratory performing the analysis.

GEORGIA
Environmental Protection Division
Solid Waste Management Program
MINOR MODIFICATION APPROVAL
SOLID WASTE PERMIT NO. #133-003D(SL)
APPROVED BY: S. Pelkins DATE: 5/19/2017

RACHEL P. KIRKMAN
PG001756
GEORGIA REGISTERED PROFESSIONAL GEOLOGIST

I hereby certify that I am a qualified groundwater scientist, in accordance with the Rules of Solid Waste Management, and 40 CFR Par 258.50(g). A qualified groundwater scientist is a scientist or engineer who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields as may be demonstrated by State registration, professional Certifications, or completion of accredited university programs that enable individuals to make sound professional judgements regarding groundwater monitoring, contaminant fate and transport, and corrective action.

Signature: [signature]
Date: 5-19-17

	DATE	REVISION DESCRIPTION	DES	CAD	CHK	APR
2	05/19/17	PREPARED BY: GOLDER - RESPONSE TO EPD COMMENTS	RPK	BSD	DYR	RPK
1	02/08/17	PREPARED BY: GOLDER - REVISIONS WQM PLAN	RPK	BSD	DYR	RPK
0	08/22/03	PREPARED BY: HHNT - ORIGINAL WQM PLAN - APPROVED BY GAEPD 07/30/04	HHNT	HHNT	HHNT	HHNT

CLIENT
WASTE INDUSTRIES USA, INC.
WI - TAYLOR COUNTY DISPOSAL, LLC

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-05-19
PREPARED	BSD
DESIGN	RPK
REVIEW	DYR
APPROVED	RPK

PROJECT
TAYLOR COUNTY LANDFILL
PERMIT NO. 133-003D(SL)
MAUK, GEORGIA

TITLE
VERICAL EXPANSION NO. 2
WATER QUALITY MONITORING PLAN

PROJECT No.	PHASE	Rev.	SHEET
130350816	503	2	50 OF 52

CCR MANAGEMENT PLAN

IN ACCORDANCE WITH GEORGIA RULES FOR SOLID WASTE MANAGEMENT, 391-3-4-.07 (5) CCR MANAGEMENT PLAN:

OWNERS OR OPERATORS OF MSWLS AND COMMERCIAL INDUSTRIAL LANDFILLS MUST INCORPORATE A CCR MANAGEMENT PLAN INTO THE FACILITY'S DESIGN AND OPERATIONAL PLAN BEFORE THE INITIAL RECEIPT OF CCR. MSWLS AND COMMERCIAL INDUSTRIAL LANDFILLS THAT ACCEPTED CCR BEFORE THE EFFECTIVE DATE OF THE RULE AND WILL CONTINUE TO ACCEPT CCR AFTER THE EFFECTIVE DATE MUST INCORPORATE A CCR MANAGEMENT PLAN INTO THE FACILITY'S DESIGN AND OPERATIONAL PLAN BY MINOR MODIFICATION 180 DAYS FROM THE EFFECTIVE DATE OF THE RULE (*NOVEMBER 22, 2016*).

GEORGIA DEPARTMENT OF NATURAL RESOURCES, ENVIRONMENTAL PROTECTION DIVISION (GaEPD) PROVIDED A GUIDANCE DOCUMENT FOR THE DEVELOPMENT OF THIS PLAN, DATED DECEMBER 22, 2016.

For clarity, it should be noted that the Taylor County Landfill facility also has an approved Design and Operations Plan for a separate CCR monofill. The CCR Disposal Area plans consist of 34 Sheets, approved by Georgia EPD in October 2010. Management of the CCR monofill cells requires a separate plan for the CCR monofill area, to be shown on Sheet 34A of 34. The following plan is only for the MSW Facility, and amends the approved Design and Operations plan shown on Sheets 52 of 52.

1. VOLUME AND DAILY CCR RECEIPT

Estimated Total MSW, Annually	635,000 TONS*
Estimated Total CCR, Annually	155,000 TONS
Estimated CCR, Daily**	554 TONS
Estimated Maximum CCR, Daily**	748 TONS

The facility may dispose of CCR, or CCR mixed as a leachate solidification agent. The ratio expected for comingled disposal after the date of this plan in MSW landfill cells is 1:3, or approximately 25% CCR and 75% MSW. This is based on the approximate historical average ratio for the past several years. However, the design consistency report assumes a maximum of up to 33% CCR, in order to allow future flexibility at the site during the remainder of the capacity of the constructed Cells 1–14. If CCR tonnage increase to volumes that significantly changes the annual tonnage or ratio of CCR to MSW, and prior to certification of any new disposal areas for Cells 15 through 25, an updated CCR Management Plan will be submitted to Georgia EPD for review and approval.

Of the estimated 155,000 tons of CCR expected annually, the majority will be mixed as a leachate solidification agent, about 95%. The remaining 5% disposed at the working face will be blended with MSW during the day's disposal activities.

*This is an estimate of expected waste receipt, but the site is not limited to this tonnage.
**This assumes 280 operational days per year. Facility may operate additional days per year.

2. PROCEDURES FOR WASTE PLACEMENT, COVER, AND RECOVERY.

a) Working Face Management.
Solid waste unloading shall be restricted to the working face of each cell in such a manner that waste may be easily incorporated into the municipal waste landfill with available equipment. Including CCR waste in the disposal stream shall not restrict proper operations at the working face. The operator should temporarily halt disposal of CCR if any comingling of CCR waste with MSW impacts operations until disposal operations can be modified to accommodate comingling properly.

b) Waste Placement Procedures.
Solid waste shall be spread in uniform layers approximately 2 feet thick, and compacted to its smallest practical volume. Trucks brings waste to the active area will dump loads directly or using the tipper at the working face. Dozers and compactors will be used to spread, compact and blend the waste. Comingled CCR and MSW will not be included in the first "fluff" lift when opening a new cell certified for disposal, so that comingled CCR and MSW is not placed directly on the protective cover and leachate collection system. Most of the CCR material will be used for solidification agent and used on interior slopes as alternate daily cover. Any CCR material disposed directly at the active working face will be blended in with MSW waste during the day's regular disposal activities. Since large isolated blocks of CCR will not be disposed during typical daily operations, CCR disposal will not restrict proper operations at the working face. The disposal practices are intended to not create layers of compacted coal ash, and therefore prevent the increased occurrence of leachate outbreaks due to reduced infiltration rates. In addition, since CCR or solidified CCR as ADC will be used on interior slopes, and leachate breakouts that do occur will be contained within the lined area.

c) Daily Cover.
A uniform 6" thick layer of clean earth shall be spread over all waste at the end of the day's operations. Alternate daily cover, to include fabric tarps or sprayed applications such as Posi–Shell, may be used if they meet the following standards:
- must be capable of preventing attraction of disease vectors, minimizing production of odors, and preventing blowing litter
- must be capable of completely covering the solid waste without change in the cover's properties by rain, heat, cold and other climatic conditions
- must be substantially free of rock fragments that are greater than 6" in diameter

Alternate daily cover (ADC) generated from the solidification operations may only be used on interior slopes. Solidified CCR used for ADC is typically blended with soil as the daily cover is placed by dumping the material on interior slopes along with cover soil, and spreading with dozers. If Posi–Shell is used as ADC, it will be restricted to use on interior slopes. The Posi–Shell will be broken and blended prior to commencing a new day's disposal operation to promote drainage of the waste.

d) Working Face Size.
The working face must be maintained at a size that is compatible with the facility's available equipment for spreading and compacting waste, and for suppressing dust. The typical working face area will be 200 feet by 200 feet. However, occasionally the working face size may be adjusted on occasion to support unusual weather activity, temporary volume adjustments to the waste stream, to safely stage different waste loads to accommodate truck traffic and allow blending of waste loads during daily operations. The working face size may increase to a maximum of 350 feet by 350 feet. This maximum size will not persist for more than a day. If a larger working face is needed on a regular basis, this plan will be revised and submitted to the Division for approval. Miminum equipment will include a dozer, compactor, and water wagon.

e) Inspection and Documentation.
The Operator will inspect the operations of the CCR disposal each day CCR is disposed at the working face. Details of the inspection, such as a checklist or notes, will be maintained in the Operating Record. The checklist will include confirmation of compliance with this approved Plan, and any recommended corrective action or changes to the plan will be documented.

f) Solidification.
This facility maintains an approved waste solidification plan. If CCR waste is utilized in solidification, it will be done in accordance with the approved plan. (See sheet 45 of 52.)

g) Beneficial reuse.
Since CCR disposed in the facility is comingled with MSW material or used as alternate daily cover, there are currently no plans to recover the material for beneficial reuse. If these plans change, EPD must be notified prior to disturbing and excavating previously disposed CCR for beneficial reuse.

3. FUGITIVE DUST CONTROL
Potential CCR fugitive dust emissions originating from CCR disposal units, roads, conditioning areas, and other CCR management and material handling activities must be minimized. The following measures should be implemented to minimize CCR from becoming airborne at the facility:

a) Performance Standard.
The percent opacity from CCR and any other fugitive dust source listed in Air Quality Rule 391–3–1–.02(2)(n)1 shall not exceed the limits set therein. Percent opacity shall not equal or exceed 20 percent. The Operator will ensure that personnel are trained to properly recognize these limits, and will employ personnel with "Smoke School" training.

b) Control Measures.
The Operator will utilize measure to minimize the CCR from becoming airborne. These measures may be adjusted, daily if necessary, to compensate for changing weather and disposal conditions. At a minimum, the Operator will specifically:
- ensure all trucks transporting CCR will be covered
- reduce or halt operations during high wind events
- operate a water spray system, to include passes with a water wagon, supplemented with impact sprinkler heads, supplied by the existing irrigation well when additional control is needed
- apply more frequent cover as needed

In addition, the Operator may also add the following:
- add a water fogging system
- locate CCR inside an enclosure/partial enclosure
- reduce fall distances at material drop points
- use wind barriers, compaction, or vegetative covers
- establish vehicle speed limits
- pave and sweep roads

c) Site Conditions.
The Operator will keep a rain gauge and anemometer on site, and a log of weather conditions. Operations will be adjusted to reflect the impact of weather conditions, volume of incoming waste, composition of incoming waste, changes in vehicular traffic patterns, and active working face locations.

Based on weather observations, the Operator may reduce or increase the use of water trucks and sprinklers accordingly to adjust to daily rainfall. If the Operator observes increase in wind speed or unusual gusting, hauling or disposal of CCR may be temporarily suspended to reduce fugitive dust. Other MSW may be blended with CCR immediately or the Operator may adjust the dump sites at the active working face to maintain continuity and safe disposal. During extreme weather events, the Operator may temporarily cease operations until it is safe to resume activity.

An observation record will be maintained when fugitive dust emissions are observed. In addition, a daily observation report will be recorded and placed in the operating record. (*A sample form, FDC1, is shown at the end of this plan.*)

d) Moisture Content.
If the moisture content of the CCR material disposed at the working face is not sufficient for proper dust control during emplacement, the Operator will amend the material with water spray or other suppressants to minimize dust. Typically, a water truck will be used for conditioning for CCR material disposed at the working face, and will be performed within the active area. If the Operator observes fugitive emissions which exceed the performance standard listed in section 3.a, or based upon prior experience with the CCR material, the moisture content will be amended.

e) Citizen Complaints.
The Operator will keep a log at the landfill office to record citizen complaints. Personnel who answer the phones will be trained on how to properly record the complaint on previously prepared forms. At a minimum, the form will contain spaces to enter the date, time, name of the caller, and nature of the complaint. Copies of the logs will be added to the Operating Record on a regular basis. Corrective actions taken to resolve the complaint will be noted on the form in the space provided. Exact actions will depend on the nature of the complaint. (*A sample form, FDC2, is shown at the end of this plan.*)

f) Annual Report.
An "Annual Fugitive Dust Control Report" will be submitted one year following the approval date of this plan, and on the same date on a yearly basis thereafter. The report shall include a description of the actions taken to control fugitive dust, a record of all citizen complaints, a summary of any corrective measures taken and, if applicable, recommendations to improve the dust control measures in the future. Observation records will be included in the Report.

4. DESIGN CONSISTENCY

I) Design Considerations.
The following landfill design considerations, analyzing the impact of comingling CCR with MSW, are included under separate cover in the design calculations that support this Plan. The attached document, "Report – Design Consistency; Waste Industries – Taylor County MSW Landfill; Mauk, Georgia" by Smith + Gardner, Dated May 9, 2017 is a part of this CCR Management Plan:

a) Design Grade Stability.
The demonstration in the supporting design analysis evaluates the currently constructed Cells 1 through 14, and addresses Cap Stability, Base Liner Stability, and Slope Stability. The analysis shows that the influence of the comingled CCR on the previously assumed MSW waste properties is negligible. Consequently, the previous conclusions (that the landfill will be stable and provide appropriate factors of safety) still apply.

b) Chemical Resistivity of Liner.
Cells 1 through 14 have been constructed with a composite liner consisting of the following: 24 inches of on–site soils required to have a tested, in–place hydraulic conductivity of not more than 1×10^{-5} cm/sec, which is then overlain by a 60–mil HDPE Geomembrane, or there is a "reinforced" Geosynthetic Clay Liner (GCL) between the soil and the Geomembrane. The most susceptible component of the liner system to degradation from exposure to CCR leachate is the GCL. Based on the supporting evaluation, the leachate quality at the site will have no impact on the performance of the HDPE or GCL's previously installed at the site.

c) Effects Of Cell Floor Settlement and Leachate Pipe Strength.
Similar to the stability demonstration presented in Item 4.a above, the supporting demonstration addresses the currently constructed Cells 1 through 14. The analysis by inspection shows that with an actual waste/cover density value that is lower than was assumed in the original analyses, these analyses are not only still valid, but are also somewhat conservative.

d) Functionality Of Leachate Collection and Removal System.
The demonstration in the supporting design analysis concludes that the LCRS is functioning as designed, and has had no impact due to receipt/disposal of CCR. The impact on the LCRS system would be expected to be low due to:

1. The co–mingling of the CCR with MSW;
2. The solidification of the CCR which would tend to demobilize the finer fraction of the CCR that could cause some clogging;
3. The vertical distance between the LCRS and the disposed; and,
4. The relatively small quantity of CCR accepted and disposed at the site (about 6.7%).

e) Effects On Gas Collection System.
In general, the gas collection system includes a series of vertical extraction wells that are connected to buried collection piping that conveys the LFG from the well field to a blowerlflare station. The supporting demonstration shows that the system is experiencing little or no impact due to CCR disposed at the Taylor County Landfill site.

f) Construction Operation and Maintenance.
Construction, operation, and maintenance of waste units to be used for CCR disposal shall remain consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR to be disposed.

The disposal cells at this facility have been and will be constructed by contractors with previous landfill construction experience. The cells have been and will be constructed in accordance with approved CQA standards for MSW landfill construction, and certified by professional engineers registered to practice in Georgia. The facility is operated by a licensed solid waste corporation with properly trained personnel supervised by an Operator who maintains Georgia Landfill Certified Operator status. The facility maintains the necessary equipment for continuous operations, properly operating under the approved permit conditions.

g) Safety Emergencies
The facility maintains a safety plan to cover operational procedures at the site. Personnel are trained to understand safety protocols. Types of emergencies which may be reported by site personnel are:
MEDICAL
FIRE
SEVERE WEATHER
EXPLOSIVE DEVICE THREAT
CHEMICAL SPILL
SLOPE FAILURE
EXTENDED POWER LOSS

Equipment operators and supervisors working on site have access to communication devices, including but not limited to, mobile phones and radios, which allow immediate notification of any emergency. Once a safety emergency is identified, proper steps will be taken to ensure the impact is minimized and the continued threat is eliminated as quickly as possible.

h) Leachate And Contact Water Management
Comingled CCR and MSW will be disposed within lined areas, such that leachate produced within the area is collected through the leachate collection system. Any CCR waste, or CCR waste comingled with MSW, which is disposed in the MSW landfill, will not be placed on exterior slopes which are allowed to shed rainfall contact water into the stormwater management system. Exterior slopes constructed at final design grades will be covered with 12" of intermediate soil cover. Alternate daily cover is not permitted on final exterior slopes. Any leachate breakouts discovered on exterior slopes will be excavated and recompacted to prevent future breakouts. The permitted design is intended to keep leachate generated prior to installation of final closure grades within the leachate collection system. (*See detail included on this sheet.*)

i) Professional Engineer Certification.
The report attached under separate cover, which details the calculations in sections a–e of Item 4.I) shall be signed and sealed by a professional engineer registered to practice in the State of Georgia.

II) CCR shall not be placed in any previously constructed cell, either comingled or as a monofill, without a demonstration that the cell, as constructed, was designed or can be retrofitted to accommodate CCR disposal. The demonstration for constructed cells is found in the report attached under separate cover. Placement of CCR as a monofill has not been addressed in this plan or the attached report.

5. WASTE COMPATIBILITY ANALYSIS
The CCR waste is compatible (non–reactive) with MSW or industrial waste streams received at the facility, and different CCR waste streams received are compatible with one another. Prior to disposal at the facility, the source of the CCR waste will be required to demonstrate the material is non–hazardous and passes a paint filter test, and provide TCLP test results.

a) Source(s) of CCR waste streams

The sources of CCR waste are coal–fired electric generating facilities, such as those operated by Georgia Power Company, Alabama Power Company, Gulf Power, Jacksonville Electrical Authority (JEA), Duke Energy and The Tennessee Valley Authority. Any additional sources which generate CCR proposed for disposal will be submitted to EPD for approval prior to disposal.

b) Chemical analyses of CCR waste streams

The CCR wastes acceptable for disposal at this facility consist of coal combustion residuals from U.S. coal–fired generating facilities which burn bituminous coal, sub–bituminous coal, or lignite. CCRs result from unburned carbon and inorganic materials in coals that do not burn, such as oxides of silicon, aluminum, iron, and calcium. CCR primarily consists of Fly Ash, Bottom Ash, Flue Gas Desulfurization (FGD) Residue [Gypsum], and Boiler Slag. Fly ash is the unburned material from coal combustion that is light enough to be entrained in the flue gas stream, carried out of the process, and collected as a dry material. Bottom ash is the unburned material that is too heavy to be entrained in the flue gas stream and drops out in the furnace. FGD Gypsum (Calcium Sulfate) has the same chemical properties as naturally occuring gypsym or hydrated calcium sulfate. Boiler slag is unburned carbon or inorganic material that does not burn, falls to the bottom of the furnace and melts. The chemical and physical properties may vary depending on process used to improve air pollution control. Those CCRs, such as gypsum and some fly ash are in high demand for beneficial reuse and are not intended for disposal at this facility. However, excess or off–spec Gypsum not suitable for beneficial reuse may be disposed at this facility.

c) Documentation of compatibility analyses for use in a solidification process

Material produced by JEA has been previously approved for use in solidification, including documentation of compatibility. The process will follow the approved procedures and plan shown on Sheet 45 of 52. CCR received from other sources will be not used for solidification without prior approval from EPD.

If a new type of CCR is proposed for disposal, a plan modification application must be submitted if acceptance of the new CCR material necessitates changes to the facility's design or operations.

6. CLOSURE AND POST–CLOSURE IMPACTS.
The closure and post–closure costs have been revised to reflect changes to the estimates. The original costs shown on Sheet 52 of 52 have been updated regularly, and the updated current cost tables are shown below.

7. GROUNDWATER MONITORING.
The groundwater monitoring plan includes Appendix III and IV constituents (including boron) in accordance with 391–3–4–.14(21)(c) and 391–3–4–.14(25). The plan is shown on Sheets 48, 49, and 50 of 52, submitted to EPD for review on February 1, 2017.

8. Modification Procedures.
This CCR Management Plan must be modified and submitted for EPD's approval if changes in either operating procedures or the facility design are necessary to comply with the requirements for CCR management.

9. Documentation of Notification to Local Governments.
The owner or operator shall notify the local governing authorities of the county, and any city within the county, in which the landfill is located upon the initial submittal of a CCR Management Plan or upon submittal of an amended Plan to EPD. Copies of the correspondence to local governing authorities were attached to the submittal for this plan.

CLOSURE COSTS

COST LEGEND
The following items were considered in the cost of closure for the site. The unit price of each item includes labor, materials, equipment, overhead, and profit.

Item No.	Item	Quantity	Unit	Unit Price ($)	Cost ($)
1.	6" Topsoil	82,298	C.Y.	3.75	308,617.50
2.	18" Cover Soil	246,893	C.Y.	3.75	925,848.75
3.	18" 1x10^{-5} cm/s Cover Soil	246,893	C.Y.	6.50	1,604,804.50
4.	Drainage Layer				
	Material	4,444,075	S.F.	0.35	1,555,426.25
	Labor	4,444,075	S.F.	0.17	755,492.75
5.	40 mil PP				
	Material & Installation	4,444,075	S.F.	0.38	1,688,748.50
6.	Seed	6,120	Lbs.	3.50	21,420.00
7.	Fertilizer	102	Tons	225.00	22,950.00
8.	Lime	102	Tons	38.00	3,876.00
9.	Mulch	102	Acre	90.00	9,180.00
10.	Labor for Seeding, Fertilizing, Lime & Mulching	102	Acre	500.00	51,000.00
11.	Silt Fence	2,000	L.F.	3.00	6,000.00
12.	Drainage Structure Construction	1	L.S.	8,000.00	8,000.00
13.	Final Disposal of Waste & Cleanup	500	Tons	32.00	16,000.00
14.	Downdrain Construction	4,610	L.F.	35.00	161,350.00
15.	Sediment Basin Cleanout	6,000	C.Y.	2.50	15,000.00
16.	Methane Gas Extraction Wells	55	Ea.	3,500.00	192,500.00
17.	Engineering & Closure Certification	102	Acre	9,000.00	918,000.00
18.	Refuse Limits Survey	1	L.S.	6,000.00	6,000.00
19.	Methane Gas Analysis	1	Ea.	3,000.00	3,000.00
20.	Construction Management	1	L.S.	65,000.00	65,000.00
21.	Contingency (5%)	1	L.S.	416,910.71	416,910.71
				Total	$8,755,124.96

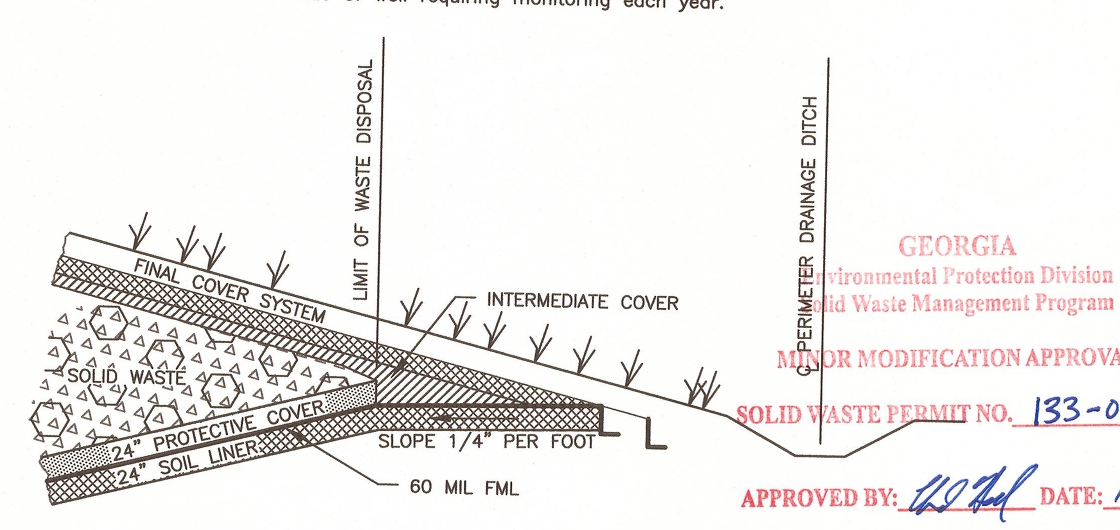
Notes:
a) All costs shown are based on actual 2017 costs for in–place quantities and include labor, materials, and equipment.
b) The cost estimate equals the cost of closing the largest area of all MSWLF unit ever requiring final cover at any time during the active life when the extent and manner of its operation would make closure the most expensive, as indicated by its closure plan.
c) The site will be filled from Cell No. 1–4, 8, 9, 5, 7, 6, 10–25. When an area (either one(1) or more cells) reaches final grade, and that area is a minimum of eight (8) acres in size, the final cap shall be placed over that area. Based on this sequencing, the worst case situation (maximum area unclosed at any time) will be Cells No. 1–11.
d) During the active life of the MSWLF unit, the owner and/or operator must annually adjust the closure cost estimate for inflation.
e) The number of methane gas vents can be reduced if gas generation and flow data can be submitted to EPD to substantiate less.
f) Construction and Operation of the Landfill Gas Collection and Control Systems shall be in accordance with 40 CFR Subpart WWW 60.753.

POST–CLOSURE CARE COSTS

COST LEGEND
The annual cost for Post–Closure Care of this site is approximately $139,098.75. This figure shall be updated on an annual basis, by January 1, and submitted to EPD. The cost should be adjusted annually using the Annual Implicit Price Deflator for the Gross National Product (GNP) published by the U.S. Department of Commerce.

Item No.	Item	Quantity	Unit	Price ($)	Yearly Cost ($)
1.	Water Monitoring Schedule				
	Groundwater	29	Ea./Yr.	1,500.00	43,500.00
	Surface Water	8	Ea./Yr.	1,200.00	9,600.00
2.	Methane Gas Monitoring	Total Site	Quarterly	1,250.00	5,000.00
3.	Erosion & Sedimentation Controls including repair of final cap and slope failures	27	Acre	950.00	25,650.00
4.	Sediment Basin Maintenance / Cleanout	1,000	C.Y.	2.85	2,850.00
5.	Ditch Maintenance and Rip-rap Cleaning	800	L.F.	2.00	1,600.00
6.	Engineering Inspections	4	Quarterly	1,400.00	5,600.00
7.	Leachate Collection, Treatment & Analysis	1	Annually	1,200.00	1,200.00
8.	Gas Extraction System Operation and Maintenance				
	NSPS quarterly monitoring	4	Quarterly	1,700.00	6,800.00
	Monthly well field monitoring	12	Monthly	800.00	9,600.00
	Certification reports	1	Annually	1,800.00	1,800.00
	Power usage	1	Annually	1,500.00	1,500.00
	Miscellaneous repairs	1	Annually	2,500.00	2,500.00
9.	Assessment Monitoring	9	Ea./Yr.	850.00	7,650.00
10.	Site / Construction Management	1	Ea./Yr.	6,000.00	6,000.00
11.	Monitoring Well Abandonment (1/30 of one-time cost)	65	Ea.	25.00	1,625.00
12.	Contingency (5%)	1	L.S.	6,623.75	6,623.75
				Total	$139,098.75

Notes:
a) This post–closure cost is based on 2017 costs.
b) All costs shown include labor, materials, and equipment.
c) Cost of water & gas monitoring is based on current costs for these services.
d) Methane Gas Monitoring includes sampling and analysis of gas from one (1) methane gas vent as described on the plans.
e) During the active life of the MSWLF unit and during the post–closure care period, the owner and/or operator will annually adjust the post–closure cost estimate for inflation.
f) Item No. 3 above is based on a cost to replace soil and regrass twenty seven (27) acres per year. This area is based on 10% replacement per year. The cost for engineering is included in the unit price.
g) During post–closure, less than 1000 gallons per year of leachate will be produced. This can be disposed at a commercial treatment facility for $0.06 per gallon or $60.00 per year. Operation and maintenance of the leachate collection system, including pumps will cost $5,800.00 per year.
h) Item No. 9 above assumes assessment monitoring is needed for 10% of the wells plus adjacent wells either side of well requiring monitoring each year.



DISPOSAL LIMITS

GEORGIA
Environmental Protection Division
Solid Waste Management Program
MINOR MODIFICATION APPROVAL
SOLID WASTE PERMIT NO. 133-003D(SL)
APPROVED BY: [signature] DATE: May 19, 2017

SAMPLE FORMS

Form FDC1 — Observation Report — **SITE CONDITIONS** — Taylor County Landfill

Intent: Potential fugitive dust emissions originating from CCR disposal activities, roads, conditioning areas, and other CCR management & material handling activities must be minimized. This form is used as a part of the CCR Management Plan.

1. Reason for use: Routine Daily Observation ☐ Emissions Observed ☐

If emissions were observed, complete the following information. Otherwise, continue to number 8.

2. **Date** and **Time** emissions were observed:

3. Person observing emission: | 4. Person completing this form:

5. Description of emission:

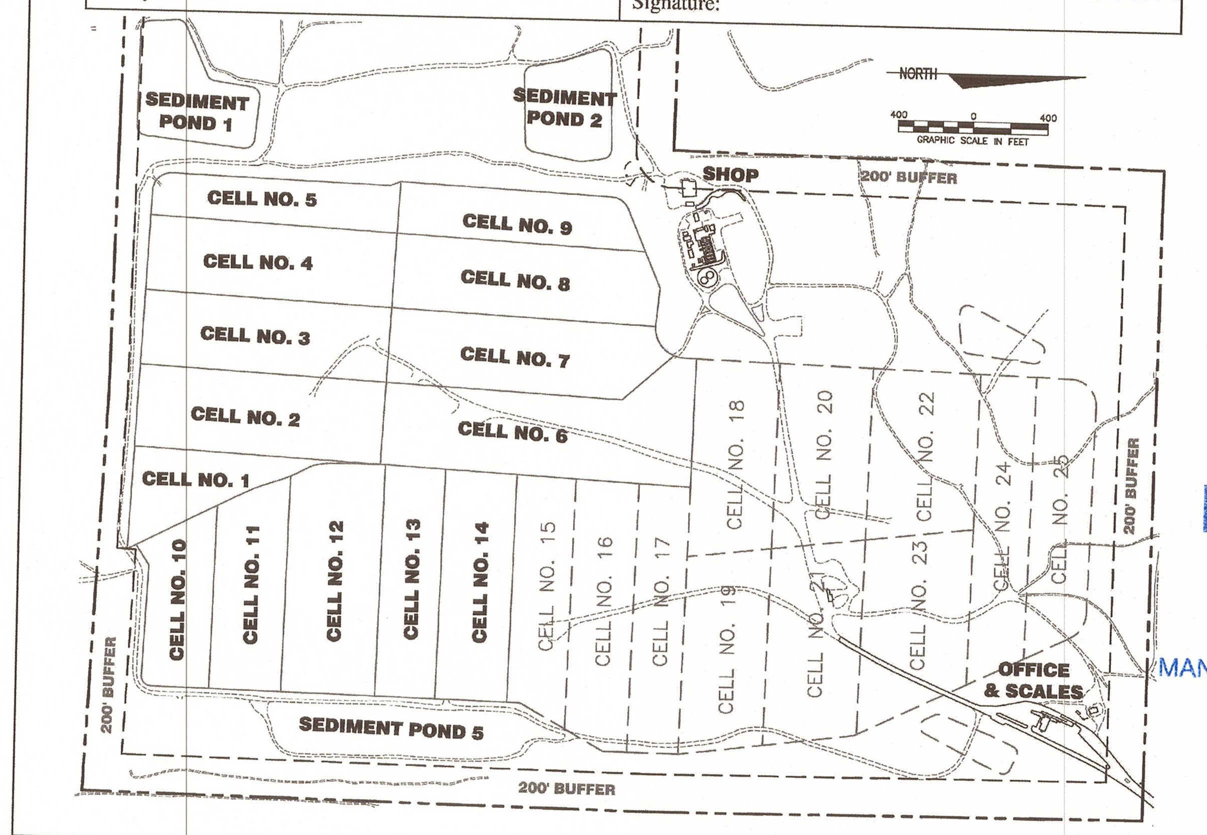
6. Area of site where emissions occurred: (*Mark an X on the figure below*)

7. Describe corrective actions taken or planned to be taken:

8. *Weather conditions* | Rain: | Wind: | Hot ☐ Mild ☐ Cool ☐ Cold ☐

9. Note any actions recommended for changes to operations to reduce emissions:

Today's Date: | Signature:



RECEIVED
MAY 19 2017
SOLID WASTE MANAGEMENT PROGRAM

Form FDC2 — Fugitive Dust Emissions — **CITIZEN COMPLAINTS** — Taylor County Landfill

Intent: Potential fugitive dust emissions originating from CCR disposal activities, roads, conditioning areas, and other CCR management & material handling activities must be minimized. This form is used as a part of the CCR Management Plan.

1. Reason for use: Phone Call ☐ Site Visit ☐ *First Complaint from this Person?* Yes ☐ No ☐

2. **Date** and **Time** complaint received:

3. Person receiving complaint: | 4. Person making complaint:

5. Description of complaint:

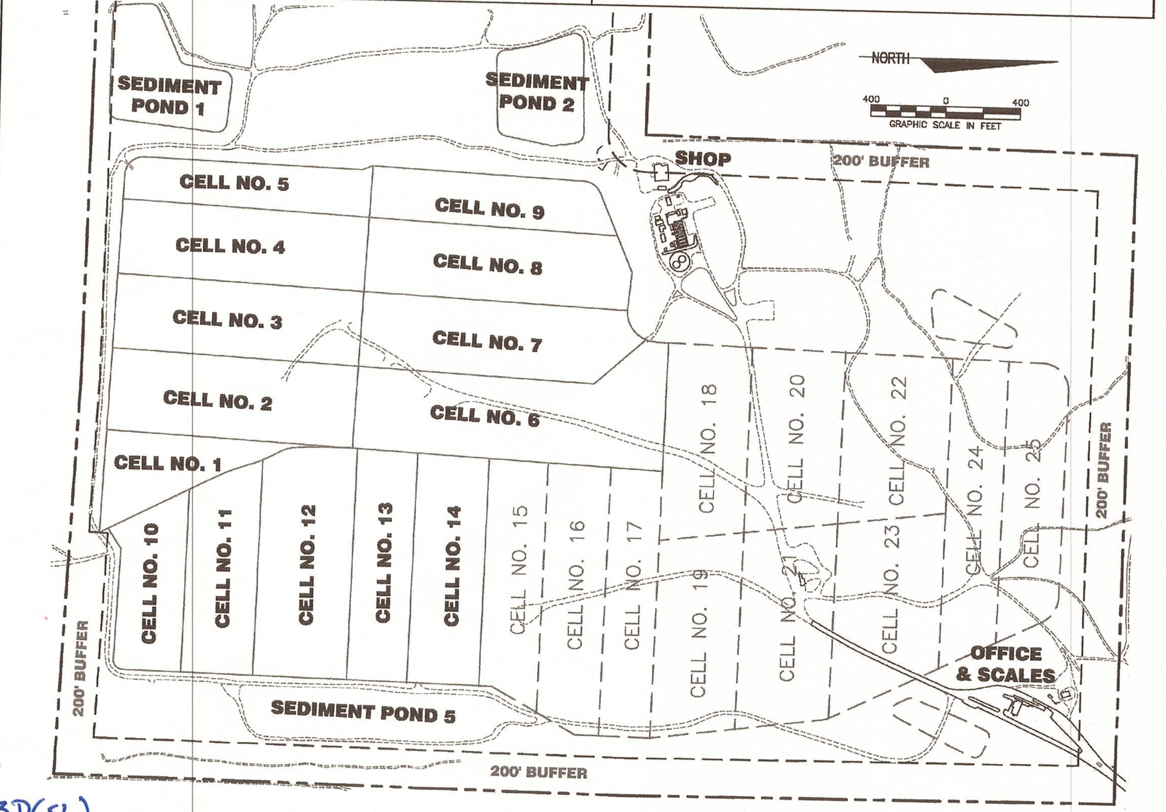
6. Area of site described in complaint: (*Mark an X on the figure below*)

7. Describe corrective actions taken or planned to be taken:

8. *Weather conditions* | Rain: | Wind: | Hot ☐ Mild ☐ Cool ☐ Cold ☐

9. Note any follow-up actions to be taken:

Today's Date: | Signature:



Note: These are sample forms. Alternate or updated forms may be used, provided the forms contain the information required by this plan.

WASTE INDUSTRIES USA, INC.
TAYLOR COUNTY LANDFILL

GEORGIA REGISTERED PROFESSIONAL ENGINEER NO. 23707 JEFFREY M. BROWNE 5-18-17

VERTICAL EXPANSION NO. 2
FOR THE
WI TAYLOR COUNTY LANDFILL
PERMIT NO. 133–003D(SL)
CHARING, GEORGIA

BROWNE AND COMPANY, LLC
2719 Sheraton Drive • Building C, Suite 210
Macon, Georgia 31204 Ph/Fx: 478-743-4843

SCALE	AS SHOWN
DATES	
ORIGINAL	MAR 2017
REV. NO. 1	MAY 2017
REV. NO. 2	MAY 2017
REV. NO. 3	–
REV. NO. 4	–
REV. NO. 5	–
EDIT DATE	MAY 18, 2017
PROJECT NUMBER	840–23–0104
SHEET NAME	CCR MANAGEMENT PLAN