Work Plan for Supplemental Hawthorn Group Characterization

Cabot Carbon/Koppers Superfund Site

Prepared for
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1 Introduction

The Hawthorn Group (HG) Investigation on the Cabot portion of the Cabot Carbon/Koppers Superfund Site (Site) has been conducted to-date in two phases with dual objectives: source characterization and plume delineation in the Upper HG formation. Both phases of the investigation have been completed in accordance with work plans submitted to and approved by the US Environmental Protection Agency (US EPA), with input from other stakeholders.

The first phase of the investigation, which was completed in 2013, provided information regarding the subsurface conditions and soil/groundwater quality within and in the vicinity of the former Cabot lagoons. The second phase of the investigation, which was completed in April 2014, defined the lateral and vertical extent of the Upper HG groundwater plume associated with the former Cabot lagoons. The soil/groundwater quality at the Former Processing and Storage Area, located south of the former Cabot lagoons, was also characterized during the second phase of the investigation. Furthermore, due to concerns regarding the integrity of the seal associated with Lower HG monitoring well HG-29D and the validity of groundwater quality data collected from the well, a replacement well, HG-31D, was installed in the Lower HG in close proximity to HG-29D, and sampled.

The analytical results and key findings of the HG investigation were presented to US EPA, FDEP, Alachua County, and local stakeholders at a meeting in Gainesville on July 9, 2014. Based on the investigation findings, the scope of a supplemental HG investigation was discussed and agreed upon during the meeting and subsequent conference calls. The scope of work includes the following activities:

- Supplemental Upper HG investigation in the Former Processing and Storage Area;
- Installation and sampling of permanent monitoring well clusters in the HG formation;
- Installation and sampling of a permanent monitoring well in the Floridan aquifer; and
- Abandonment of monitoring well HG-29D.

Each of these activities is discussed in further detail in this work plan.

2 Scope of Work

The proposed tasks discussed below will be implemented in a manner that allows for flexibility and real time decision-making in the field. These general principles follow the US EPA's Triad approach and are critical to efficiently achieving the overall project/data quality objectives (US EPA, 2004).[1] Further, the proposed work will be conducted in accordance with the updated Quality Assurance Project Plan for the Cabot portion of the Site that will be prepared and submitted for approval prior to the implementation of the field work.

2.1 Supplemental Upper HG Investigation in the Former Processing and Storage Area

Boring SB-31 was advanced immediately downgradient of the Former Storage and Processing Area during the second phase of the HG investigation. Analytical results showed the presence of pine tar constituents in soil and/or groundwater samples collected from the boring, albeit at concentrations that were considerably lower than at the former Cabot lagoon area. Creosote-related constituents (*e.g.*, naphthalene) have also been detected in samples collected from SB-31 and locations upgradient of the former processing and storage area (HG-26S). In order to further investigate the source and extent of pine tar-related contamination potentially associated with the Former Processing and Storage Area, additional soil and groundwater quality data will be collected in this area. The scope of this task includes the advancement of three additional Upper HG soil borings, SB-33, SB-34, and SB-35, in and around the Former Processing and Storage Area. The proposed locations for the Upper HG borings are presented in Figure 1. The rationale for the selected locations of the proposed borings is:

- Boring SB-33 will be advanced within the Former Processing and Storage Area for the purpose of source characterization.
- Boring SB-34 will be used to characterize groundwater quality upgradient of the Former Processing and Storage Area and/or define the spatial extent of potential pine tar-related contamination associated within this area.
- Boring SB-35 will be used to define the downgradient extent of potential pine tar contamination associated with the Former Processing and Storage Area and differentiate it from the plume emanating from the former Cabot lagoons. Prior groundwater sampling results found elevated pine tar related contaminants at boring SB-26, which is located downgradient of SB-31, but relatively low levels at SB-12 and SB-25, which are located cross-gradient to groundwater flow. Groundwater sampling at proposed boring SB-35, which will be advanced along the flow path between the Former Processing and Storage Area and SB-26 (Figure 1), will be used to distinguish the source(s) of contamination at boring SB-26.

The proposed soil borings will be advanced using a Geoprobe mini sonic rig. During advancement of the borings, continuous, 5-foot-long soil cores will be collected for geological characterization, PID/FID screening, hydrophobic dye testing, and visual/olfactory evidence of contamination. The borings will first be advanced to the base of the surficial aquifer. The decision to advance the borings into the Upper HG

[1] US EPA. 2004. "Summary of the Triad Approach." http://www.triadcentral.org/ref/doc/triadsummary.pdf, March.

will be contingent on the absence of any evidence of DNAPL presence (visual observation of DNAPL globules, seeps, and ganglia; visual evidence of DNAPL on drilling equipment; and positive hydrophobic dye tests) within the surficial aquifer. If DNAPL is found within the surficial aquifer, the boring will be abandoned in the surficial aquifer and immediately grouted. A new boring at a nearby location will be advanced. If evidence of DNAPL is not found, the boring will be advanced into the Upper HG and soil cores will continue to be retrieved and examined for lithology, visual evidence of DNAPL presence, and positive hydrophobic dye tests. If evidence of DNAPL is found in the upper half of the Upper HG, the boring will be abandoned and immediately grouted. A step-out location will be selected approximately 40 feet cross-gradient of the proposed location, accounting for field conditions. A maximum of two step-out borings will be attempted as part of this mobilization. If evidence of DNAPL is again encountered at the second step-out location, the boring will be abandoned and immediately grouted, and potential next steps will be discussed with US EPA. If evidence of DNAPL is not found in the upper half of the Upper HG, the boring will be advanced to the top of the Middle Clay. In the event that evidence of DNAPL is found in the lower half of the Upper HG, the boring will be abandoned and grouted, and no borings will be advanced in its place.

Groundwater (SB-33, SB-34, and SB-35) and soil (SB-33) samples will be collected at 3 to 4 depth intervals at each boring location, and submitted for analysis of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) using US EPA Methods 8260 and 8270, respectively. Further, if encountered during the investigation, a sample of DNAPL will be collected, and submitted for laboratory analysis of density, viscosity and interfacial tension. In accordance with previously established protocols (Gradient and Weston, 2012), the depth intervals of the soil and groundwater samples will be based on lithological characterization of soil cores, PID/FID screening results, and visual evidence of contamination (if any).

2.2 Permanent HG Monitoring Well Installation and Sampling

The results of prior HG investigations on the Cabot portion of the Site have delineated the extent of the pine tar related contamination in the Upper HG formation associated with the former Cabot lagoons. These groundwater quality data form the basis for determining the locations for permanent HG monitoring well clusters. As agreed upon with the stakeholder group, a total of four additional HG monitoring well pairs will be installed on the Cabot portion of the Site. Since existing HG monitoring wells (HG-28S/D, HG-29S, HG-30S/D, HG-31D) provide a good understanding of groundwater quality in the HG formation near the former Cabot lagoons, the proposed monitoring wells (HG-36S/D through HG-39S/D) will be installed along the edges of the pine tar related plume with the following objectives:

1. Provide groundwater quality data needed to understand plume stability and potentially serve as sentinel wells; and
2. Provide data to evaluate the effect of the remedy that will be implemented at the former Cabot lagoon area on the edges and/or far field portions of the plume.

The proposed locations for the permanent HG monitoring well pairs are presented in Figure 1. The four proposed HG monitoring well pairs will be installed along the northeastern (HG-36S/D and HG-37S/D), northern (HG-38S/D), and eastern (HG-39S/D) edges of the pine tar related plume footprint. A pair of monitoring wells will be installed at each location, with one well screened in the Upper HG formation and the other screened in the Lower HG formation. The HG monitoring wells will be installed using the same methodology and materials as the other HG well pairs (HG-28S/D and HG-30S/D) installed by Cabot on the Site (Gradient and Weston, 2010).

Figure 2 presents the well installation and construction diagram for a typical HG well pair. The actual well completion depth and well screen interval will be determined in the field based on lithological characterization of soil cores and visual evidence of contamination (if any). If no field evidence of contamination is found, the Upper HG well will be installed so that the well screen is placed in the middle of the Upper HG formation, where the hydraulic conductivity tends to be relatively higher. The Lower HG well will be installed so that the well screen is placed in the upper portion of the Lower HG formation. Additional details regarding well development and sampling are provided below.

2.2.1 Well Development

The proposed HG wells will be developed using a submersible pump to remove fluids introduced during the drilling process and to improve the hydraulic connection between the well and the aquifer. As with prior HG monitoring well installations (Gradient and Weston, 2010), a conservative tracer (sodium bromide at a mixed concentration of 500 mg/l) will be added to water used in the drilling process to evaluate the impact of drilling fluids on the aquifer. Sodium bromide concentrations in the recovered formation water during well development will be monitored to determine when the well has been adequately developed.

During well development, pH, specific conductance, temperature, dissolved oxygen, turbidity, oxidation reduction potential (ORP), and bromide levels will be monitored. Well development will continue until the following criteria are met:

- Development water is relatively clear and sediment free;
- Physical indicator parameters listed above have stabilized; and
- Bromide concentration in the development water has dropped below an approximate value of 30 mg/L or until a bromide concentration asymptote is reached.

2.2.2 Groundwater Sampling and Analysis

Groundwater sampling procedures for the proposed HG wells are described below and are consistent with the requirements of Florida Department of Environmental Protection (FDEP) Standard Operating Procedure FS 2200. Groundwater samples will be collected from new and existing HG wells on the Cabot portion of the Site. The complete list of wells to be included in the sampling event is provided in Table 1.

All wells will be purged and sampled using low flow techniques, in accordance with FDEP standard operating procedure FS 2200. During well purging, pH, specific conductance, temperature, dissolved oxygen, and turbidity will be monitored and recorded. Purging will continue until the measured parameters have stabilized or until four casing volumes of water have been removed.

Groundwater samples will be collected using dedicated Teflon® lined polyethylene tubing attached to either a peristaltic or submersible pump. The groundwater samples will be discharged directly into the laboratory-provided sample containers. Samples will be labeled with the well identification and analysis to be performed, as well as the date and time of sample collection. Sample collection information will be recorded on a chain of custody record that will remain with the samples until receipt by the analytical laboratory. The groundwater samples will be analyzed for the parameters in the sampling and analysis plan presented in Table 1. To reduce the influence of development-related effects on the sampling results, the first round of groundwater samples will be collected from the permanent monitoring wells two weeks after the wells have been developed. A subsequent round of confirmatory groundwater samples will be collected four weeks after the first sampling event.

The groundwater analytical results for the two proposed sampling events will be used to reevaluate the scope and frequency of the long-term monitoring program conducted by Cabot at the Site. Select HG wells will likely be added to the monitoring program, but the number of surficial aquifer wells that are routinely sampled will be reduced. The scope of the proposed long term monitoring plan will be presented in the Focused Feasibility Study, which will be submitted after the investigation activities proposed in this work plan have been completed.

2.3 Permanent Floridan Monitoring Well Installation and Sampling

In addition to the HG monitoring wells, a Floridan monitoring well will be installed to monitor groundwater quality in the Upper Transmissive Zone (UTZ) of the Upper Floridan aquifer on the Cabot portion of the Site. The likelihood of pine tar related contamination having migrated into the Floridan aquifer is low because: a) no residual or pooled pine tar DNAPL has been encountered in the UHG or the LHG deposits at the Site;[2] b) pine tar related concentrations found in the LHG groundwater are consistent with dissolved phase leakage through the Middle Clay unit and not DNAPL migration; and c) concentrations of key pine tar constituents (*e.g.*, phenols) in the LHG are significantly lower than concentrations in the UHG. Nevertheless, since there is a strong downward vertical component to the hydraulic gradient at the Site, one multi-port Floridan monitoring well will be installed to understand groundwater quality in the Floridan aquifer at the Site.

The proposed Floridan monitoring well, CFW-1, will be installed adjacent to a proposed HG monitoring well pair, HG-38S/D, north of the former Cabot lagoons and the pine tar related plume footprint. The proposed location of the Floridan monitoring well, as shown in Figure 1 and agreed upon during a conference call with the stakeholders, was selected based on the understanding that the general direction of groundwater flow in the UTZ of the Upper Floridan aquifer at the Site appears to be mainly toward the north/northwest. However, the location of CFW-1 is contingent on the absence of significant dissolved phase contamination in the adjacent HG wells, HG-38S/D. HG-38S/D will be installed and sampled first, and the laboratory analysis of the samples will be expedited so that the location of CFW-1 can be adjusted, if needed, based on the findings at these HG wells. In case of such an event, it is likely that the location of CFW-1 will be moved further north (*i.e.*, closer to well HG-20S/D); however, discussions will be held with US EPA before an alternate location for CFW-1 is selected.

A Westbay multiport system will be installed in the Floridan monitoring well. The multiport well will extend approximately 100 feet into the Upper Floridan aquifer and will be screened at four intervals across the 100-foot depth interval. Details of the methodology for drilling, installation, and initial testing of the Floridan well are provided in Attachment 1. Upon installation and development of the Floridan well, groundwater samples will be collected in accordance with the procedure presented in Attachment 1. Similar to the HG monitoring wells, two rounds of groundwater samples will be collected after well development. The sampling and analysis plan for the Floridan well is included in Table 1.

[2] Note, based on the observed groundwater concentrations for pine tar related compounds (*e.g.*, phenol, 3&4-methylphenol) in the UHG near the former Cabot lagoon, we have inferred that DNAPL is likely present in the UHG, although none has been observed.

2.4 Abandonment of Monitoring Well HG-29D

Groundwater analytical data collected at the well pair HG-29S/D clearly demonstrate that pine tar related impacts detected at Lower HG well HG-29D are attributable to downward leakage of Upper HG groundwater *via* a compromised well seal and are not representative of groundwater quality in the aquifer. The multiple lines of evidence that support this hypothesis are as follows:

- Concentration temporal trends for pine tar-related constituents at HG-29D track HG-29S, clearly indicating a strong hydraulic connection between the two wells, as shown in Figure 3.
- The concentration of phenols at HG-29D is significantly higher in comparison to other Lower HG monitoring wells located in its vicinity, including HG-31D, HG-28D and HG-30D.
- Further, the concentration of phenols at HG-29D has increased by up to an order of magnitude and is approaching that of HG-29S (Figure 3). This increase is progressive and consistent over 12 sampling events conducted during the past 5 years. In contrast, concentrations of pine tar constituents at other Lower HG wells are consistent with limited impacts in the aquifer unit and have not increased since the wells were installed.

GRU and ACEPD have evaluated the data associated with HG-29D and concluded that well leakage is likely affecting groundwater quality data at the well (GRU and ACEPD, 2014). Since a replacement monitoring well has already been installed in the area (HG-31D), in order to eliminate the potential preferential pathway at the well, and to prevent further deterioration of LHG groundwater quality at and near the well, HG-29D will be plugged and abandoned. The well abandonment procedure is discussed below. Figure 4 presents a schematic of the well abandonment procedure.

HG-29D will be abandoned by over-drilling and removing the 2-inch PVC well casing using sonic drilling techniques. The 5-inch sonic bit and associated tooling will fit over the 2-inch well casing and inside the 6-inch steel isolation casing. The over-drilling will terminate at the bottom of the well (approximately 98 ft. bgs). Once the terminal boring depth is reached, a cement/bentonite grout slurry will be placed in the boring from bottom to top using tremie grouting techniques. The grout level will be filled to approximately 72 feet bgs (i.e., just below the bottom of the 6-inch isolation casing). The grout will be allowed to cure for a minimum of 24 hours.

The 6-inch steel isolation casing and associated grout seal will be over-drilled from ground surface to approximately 72 feet bgs using sonic drilling techniques. The sonic bit and associated tooling will fit over the 6-inch isolation casing and inside the 10-inch steel isolation casing. Once the bottom of the 6-inch casing is reached, the 6-inch isolation casing will be removed from the borehole by lifting and cutting it into manageable sections. A pressure fitting will be placed on the 10-inch isolation casing and a calculated volume of grout slurry will be placed in the boring using tremie grouting techniques sufficient to bring the grout level within 10 to 15 feet of ground surface, followed by enough water to fill the remainder of the boring. The grout will be allowed to cure at 200 to 400 psi of pressure for a minimum of 24 hours before removing the pressure coupling. After the pressure coupling is removed, the boring will be topped off with grout until the grout level remains at ground surface. The investigative derived waste (e.g., drill cuttings, and fluids) will be containerized for disposal.

3 Schedule

Discussions are ongoing with the drilling contractor and suppliers to find an acceptable date for the implementation of this work plan, which will commence after receiving US EPA approval. The anticipated duration of the program is approximately twelve weeks. The investigation results will be shared with the appropriate stakeholders as they become available.

References

Gainesville Regional Utilities (GRU); Alachua County Environmental Protection Department (ACEPD). 2014. "GRU Comments to Cabot Carbon Data Transmittal Titled: Concentration Trends in HG-29S vs. HG-29D." August 12.

GeoTrans, Inc.; Geohazards, Inc. 2006. "Supplemental Upper Floridan Aquifer Monitoring Well Installation – Addendum to the Floridan Aquifer Monitoring Plan, Koppers Inc. Site, Gainesville, Florida." July 26.

Gradient. 2008. "Revised Supplemental Groundwater Quality Characterization Work Plan, Cabot Carbon/Koppers Superfund Site, Gainesville, Florida." May 8.

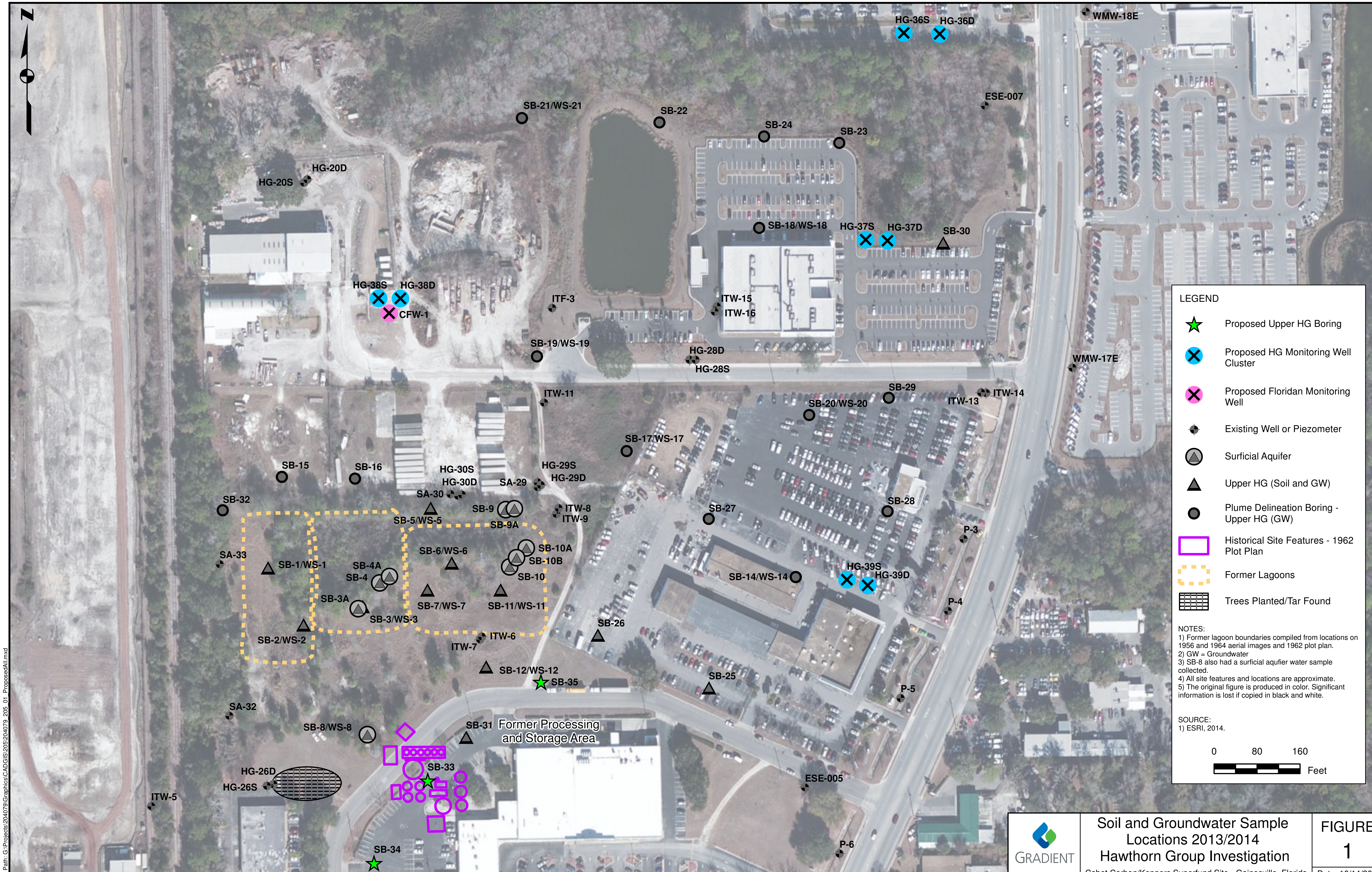
Gradient; Weston Solutions. 2010. "Hawthorn Group Sampling Results Report and Revised Work Plan, Cabot Portion of Cabot Carbon/Koppers Superfund Site, Gainesville, Florida." November 15.

Gradient; Weston Solutions; Geosyntec Consultants, Inc.. 2012. "Hawthorn Group Investigation Work Plan, Cabot Carbon/Koppers Superfund Site." October 31.

Table 1 Groundwater Sampling and Analysis Plan

Existing HG Wells	New Wells	Parameters	Analytical Method
HG-28S/D HG-29S HG-30S/D HG-31D	HG-36S/D HG-37S/D HG-38S/D HG-39S/D CFW-1	VOCs (including BTEX and ketones)	8260B
		SVOCs (including Phenol, 2,4-Dimethylphenol, 2-Methylphenol, 3&4-Methylphenol)	8270C
		Metals (including chromium, iron, lead, magnesium, and sodium)	6010
		Anions (including chloride, bromide, carbonate, bicarbonate, sulfate, nitrate)	300
		Alkalinity, carbonate alkalinity, bicarbonate alkalinity, and free CO_2	SM 2320B
		Ferrous iron	SM 3500-Fe
		Dissolved Gases (including methane and carbon dioxide)	RSK 175
		pH, specific conductance, turbidity, ORP, dissolved oxygen	Field measurements

Figures



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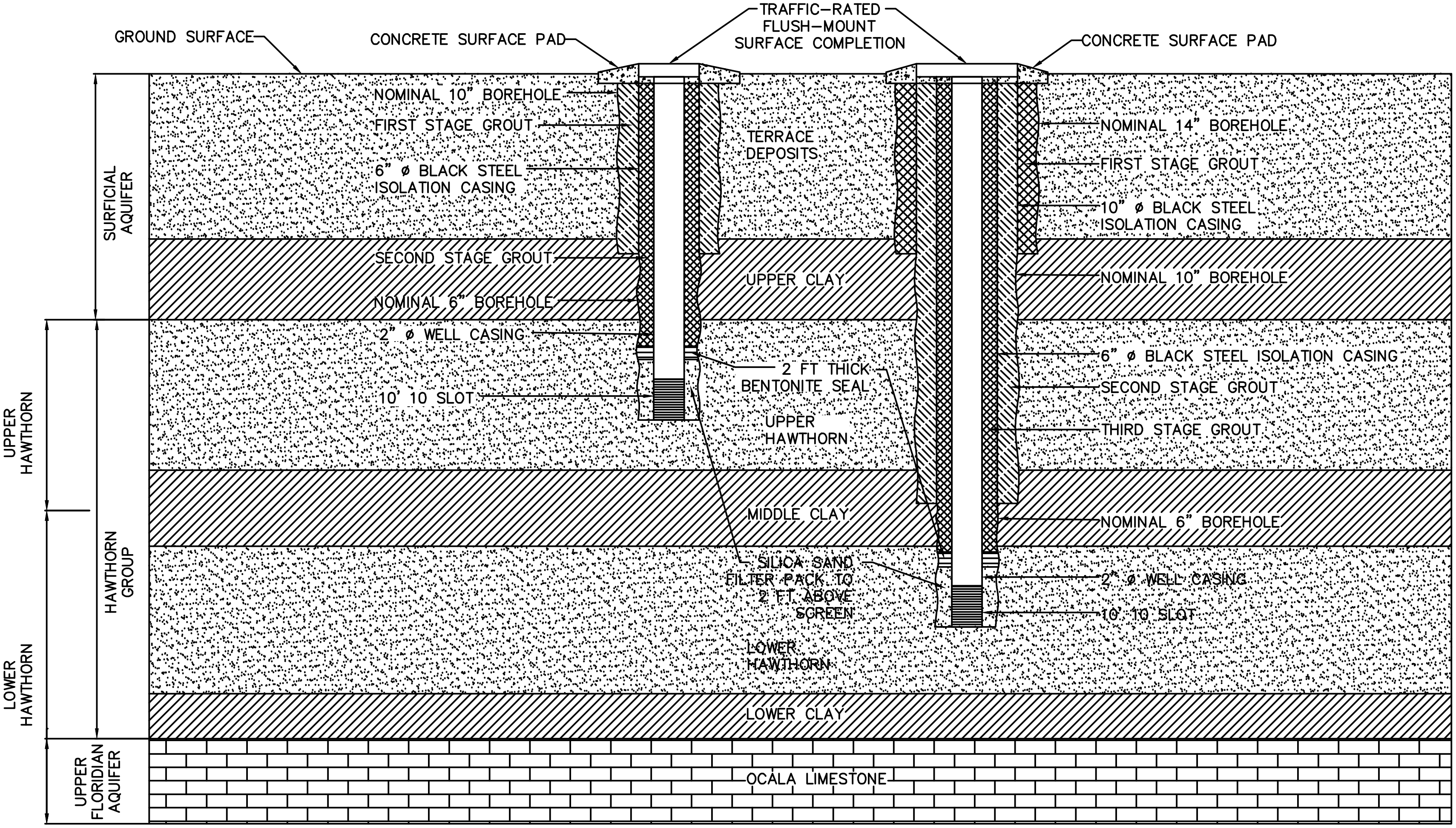

WESTON SOLUTIONS	PROJECT: EASTERN PORTION OF CABOT CARBON/ KOPPERS SUPERFUND SITE, GAINESVILLE, FL	FIGURE 2
		SCALE: NTS
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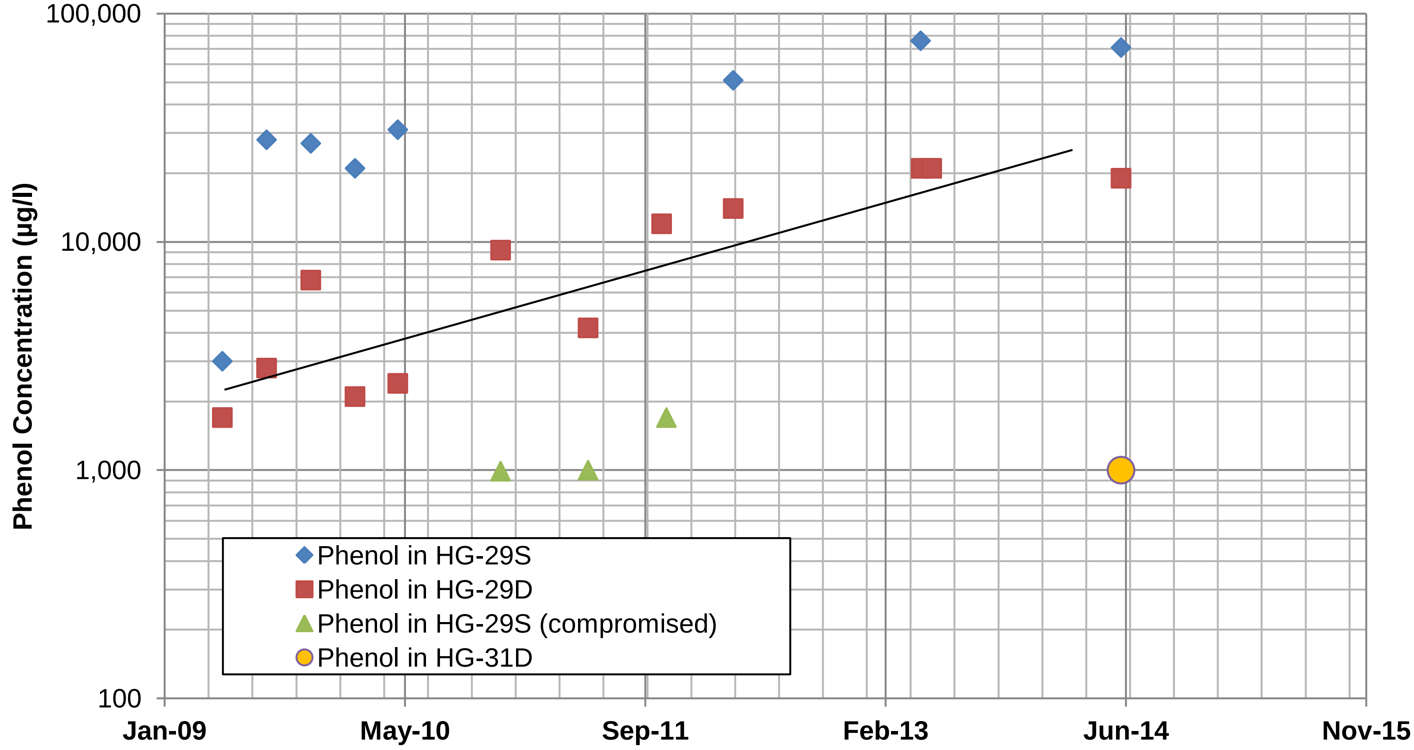
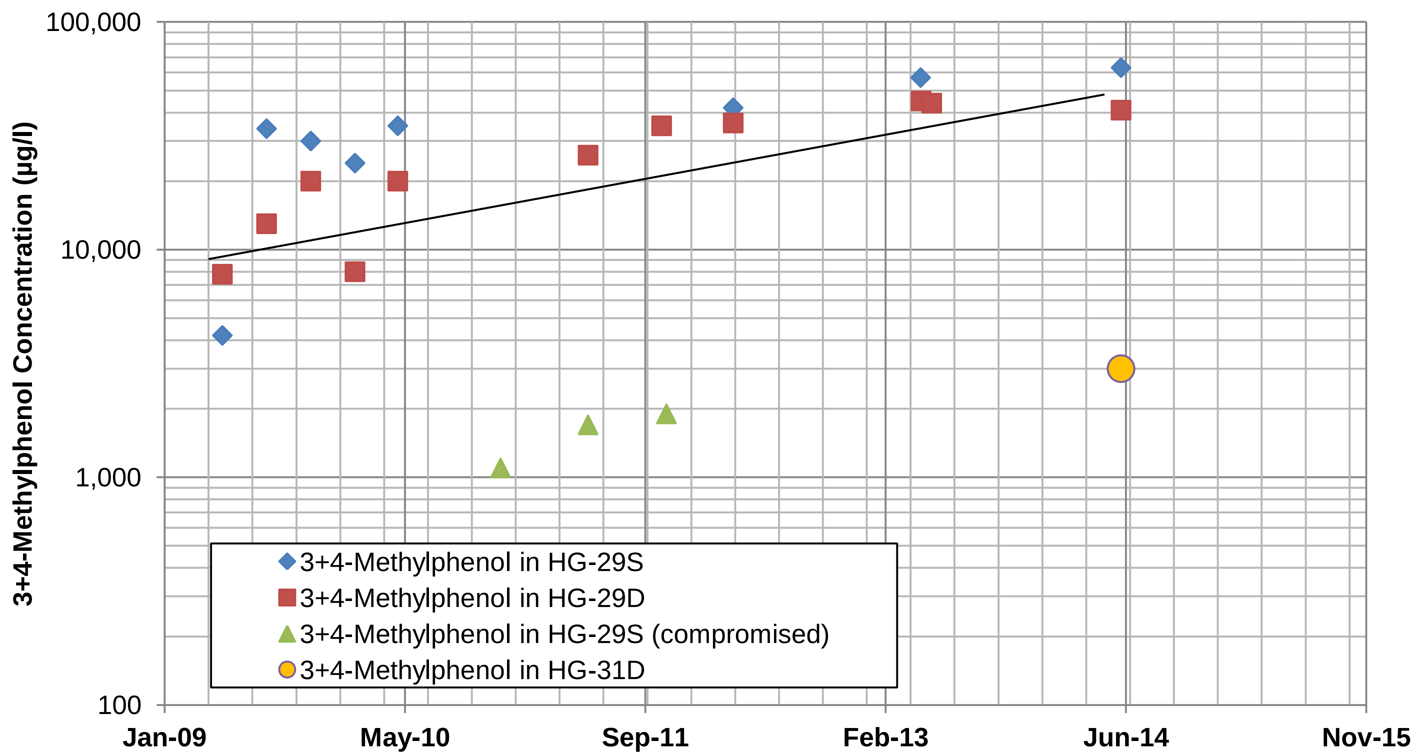
		CHKD BY: TAYLOR · DATE: 9.15.10 · CAD NAME: WELL_DRAWING_R.DWG





LEGEND

▲ Indicates samples were compromised due to surface water infiltration at the well cap.

NOTES:
1) April 2014 sampling results were not included due to issues with the laboratory analysis of the samples.

SOURCES:
1) Beazer, 2009-2013.
2) Weston, 2014.

GRADIENT

Concentration Temporal Trends at HG-29S/HG-29D

Carbon/Koppers Superfund Site – Gainesville, Florida

FIGURE 3

Date: 09/15/14

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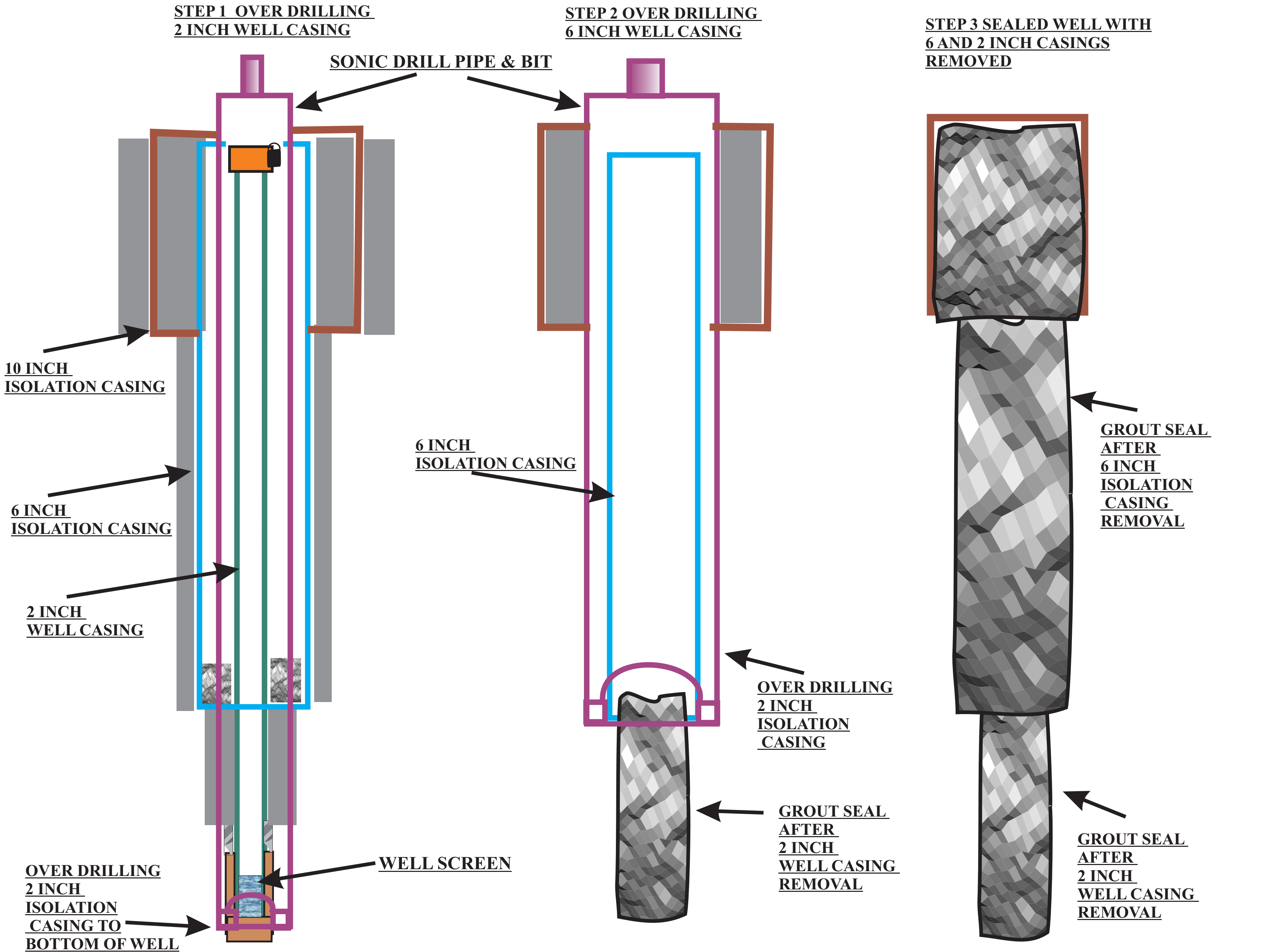


FIGURE 4

No To Scale

HG-29D WELL ABANDONMENT SCHEMATIC

CABOT CARBON/KOPPERS SUPERFUND SITE
GAINESVILLE, FLORIDA

WESTON SOLUTIONS

Attachment 1

Westbay System Installation

A.1 Drilling Procedure

The proposed Floridan monitoring well will be installed using mud rotary and roto-sonic drilling techniques. As has been previously established at the Site, the installation of multi-casing well bores for HG and Floridan wells can be technically challenging due to the strong downward vertical hydraulic gradients. Given these challenges and for the sake of consistency, Cabot will use drilling and well installation procedures that have previously been used to undertake HG investigations at the Site.

The Floridan monitoring well will be installed using three protective casings to isolate the bedrock from the overlying overburden formation. The well and associated isolation casings will be installed so that a minimum 2 inch clearance is maintained between each side of the casing and the adjacent borehole. The actual casing sizes may vary based on the equipment available.

First, the Floridan well will be installed by advancing a 22-inch diameter borehole to the top of the upper clay unit with a mud rotary drill rig. An 18-inch isolation casing will be inserted into the borehole and pushed 1 to 2 feet into the upper clay. The annular space between the isolation casing and the borehole wall will be filled with cement grout from bottom to top, using a tremie pipe. The grout will be allowed to cure for a minimum of 12 hours before drilling continues. If grout subsidence occurs, the remaining annular space will be re-filled with grout to ground surface.

Once the 18-inch isolation casing is secure, a borehole will be advanced through the casing to the top of the middle clay unit. A 14-inch diameter isolation casing will be inserted into the borehole and pushed 1 to 3 feet into the middle clay unit. The annular space between the outside of the isolation casing and the borehole wall will be filled with cement grout from bottom to top, using a tremie pipe. The grout will be allowed to cure for a minimum of 12 hours before drilling continues. If grout subsidence occurs, the remaining annular space will be re-filled with grout to ground surface.

Using a roto-sonic drill rig, a third borehole will be advanced through the 14-inch isolation casing to the top of the lower clay unit. A 9-inch diameter isolation casing will be inserted into the borehole and pushed 1 to 3 feet into the lower clay unit. The annular space between the outside of the isolation casing and the borehole wall will be filled with cement grout using pressure grouting techniques. The grout will be allowed to cure for a minimum of 12 hours before drilling continues. If grout subsidence occurs, the remaining annular space will be re-filled with grout to ground surface.

A fourth borehole will then be advanced through the 9-inch isolation casing to a depth of approximately 100 feet into the Upper Floridan Aquifer, *i.e.*, below the bottom of the lower clay unit. The installation procedure for the Floridan monitoring well is presented in the section below.

A.2 Well Installation

The well will be screened at four intervals with approximate values relative to the bottom of the lower clay layer/top of the Upper Floridan Aquifer Ocala limestone layer given in Table A.2.1. The actual well screening intervals will be determined based on field observations. A four-inch stainless steel well casing with four 10-foot long 0.010 slot size screens separated by 10-foot long blank, stainless-steel casing will be installed in the borehole. A 15-foot long stainless-steel sump will be placed at the bottom of the well to facilitate installation of the Westbay System, which is described further in sections below. Four-inch stainless steel casing will extend from the top of the well casing to the ground surface.

Table A.2.1 Potential Well Screen Intervals – Subject to Field Observations

Well Screening Interval	Approximate depth below top of Ocala limestone (ft)
Screening Interval 1	15-25
Screening Interval 2	40-50
Screening Interval 3	65-75
Screening Interval 4	90-100

A sand filter pack will be placed around each well screen from approximately 2 feet below the bottom of the well screen to approximately 2 feet above the top of the well screen. Bentonite will be placed around the blank casing zones in-between the layers of filter sand. Five feet of fine sand will be placed above the uppermost well screen filter pack to prevent cement grout infiltration into the uppermost screened interval. A 5-foot-thick bentonite seal will be placed on top of the uppermost well screen and the remainder of the borehole annulus will be filled from bottom to top with cement grout. The bentonite seal will be allowed to hydrate for at least 8 hours before placement of the grout. The actual completed well depth will depend upon the elevation of the top of the Ocala limestone. A proposed well construction design is provided in Figure A-1.

A.3 Well Development

Upon installation, the Floridan monitoring well will be developed to remove fluids introduced during the drilling process and to improve the hydraulic connection between the well and the aquifer. The well will be developed prior to the installation of the Westbay system since the pumping port design within the Westbay system limits the rate at which groundwater can be removed. Well development will consist of isolating each screening interval with K-packers, and then pumping from the center of the screened interval using a submersible pump.

US EPA recommends that a tracer be used to evaluate the impacts of drilling fluids on the aquifer. Thus, the potable water used during the installation of the well will be spiked with sodium bromide at a concentration of approximately 500 mg/L.

During well development, physical parameters, including pH, specific conductance, temperature, dissolved oxygen, turbidity, and bromide levels will be monitored. Well development will continue until the following criteria are met:

- Development water is relatively clear and sediment free;
- Physical indicator parameters listed above have stabilized; and
- Bromide concentration in the development water has dropped below an approximate value of 30 mg/L or until a bromide concentration asymptote is reached.

After well development has been completed, the K-packers will be removed from the well, immediately prior to installation of the Westbay system. The time between K-packer removal and Westbay system installation will be minimized to reduce the amount of cross-contamination in the well. Details regarding the installation and initial testing of the Westbay system are provided in the sections below.

A.4 Westbay System Installation and Development

The Westbay multiport system consists of the following key components, as shown in Figure A-2:

- Isolation packer elements set above and below each of the screening intervals;
- A 4-inch screened port in the lower half of each interval for purging;
- A sample port placed 5 feet above the purge port for collecting water samples and pressure readings; and
- A 5-foot sump at the bottom of the system.

Each component will consist of a section of casing and an appropriate coupling component for attachment to neighboring components. Couplings will be attached to the casing section using nylon shear wire. The Westbay system components will be inspected, manually assembled starting with the bottom-most elements, pressure tested, and lowered into the well. The Westbay system may be modified as needed based on site specific conditions and/or recommendations from the manufacturer. A hoist attached to a smeal rig can be used to hold the system in-place above the well during component testing. Once the system is in the well, the sample and purge port openings will be tested to ensure they are functioning properly. The packer elements will then be inflated with traced water, beginning with the bottom-most element. The pressure of each packer will be monitored for several minutes to ensure that there are no leaks and that the packers are properly set.

Additional purging at each of the screened intervals will occur after the Westbay system has been installed to remove any fluids introduced during the installation of the system. Purging will be performed by opening the purge port located below the sampling and pressure measurement ports. A minimum of three casing volumes will be purged. During purging, physical parameters, including pH, specific conductance, temperature, dissolved oxygen, turbidity, and bromide levels will be monitored. Purging will continue until the following criteria are met:

- Purge water is relatively clear and sediment free;
- Physical indicator parameters listed above have stabilized; and
- Bromide concentration in the purge water has dropped below an approximate value of 30 mg/L or until a bromide concentration asymptote is reached.

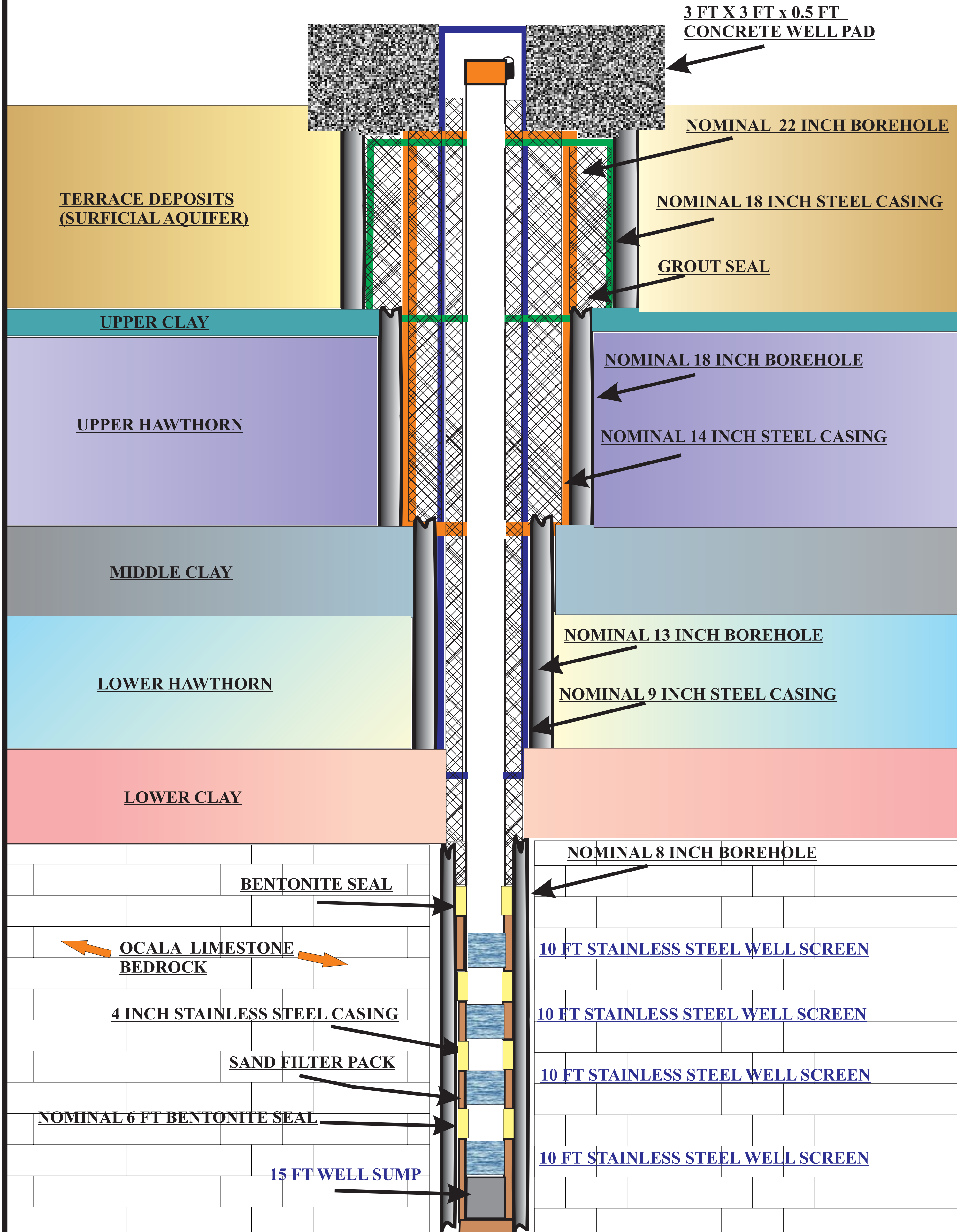
A.5 Pressure Testing and Sampling

A pressure monitoring port will be installed in each of the monitoring zones associated with the four screening intervals. The specialized equipment listed below will be required to record pressure measurements:

- Westbay wire-line cable reel, with counter;
- Westbay MOSDAX Sampler Probe Model 2531; and
- Westbay MOSDAX Automated Groundwater Interface.

To take a pressure reading, a tripod, the wire-line cable reel, and the reel counter will be centered above the well head and used to lower the sampler probe into the well. The sampler probe will be used to take an ambient air pressure reading at depth, then lowered to the desired measurement port depth and placed into an alignment notch. Another pressure reading will be taken inside the casing, and then the sampler probe will engage with the sampling port to record the pressure in the formation. Connection to the formation will be verified by a change in pressure. The probe will be disengaged from the formation and a second pressure reading will be taken inside the well casing for additional quality assurance. The sampler probe will be extracted and decontaminated before proceeding to take a reading in a subsequent monitoring zone.

Groundwater sampling will be performed in a manner similar to the pressure testing. Sample bottles will be placed under vacuum pressure, and then up to four bottles will be attached to the sampler probe, which will be lowered into the well and will engage with the sampling port in the same procedure used for pressure testing. The sampling assembly will be extracted and decontaminated before collecting any subsequent samples. The sampling and analysis plan for the Floridan monitoring well, which is presented in Table 1, is consistent with that for the HG monitoring wells.

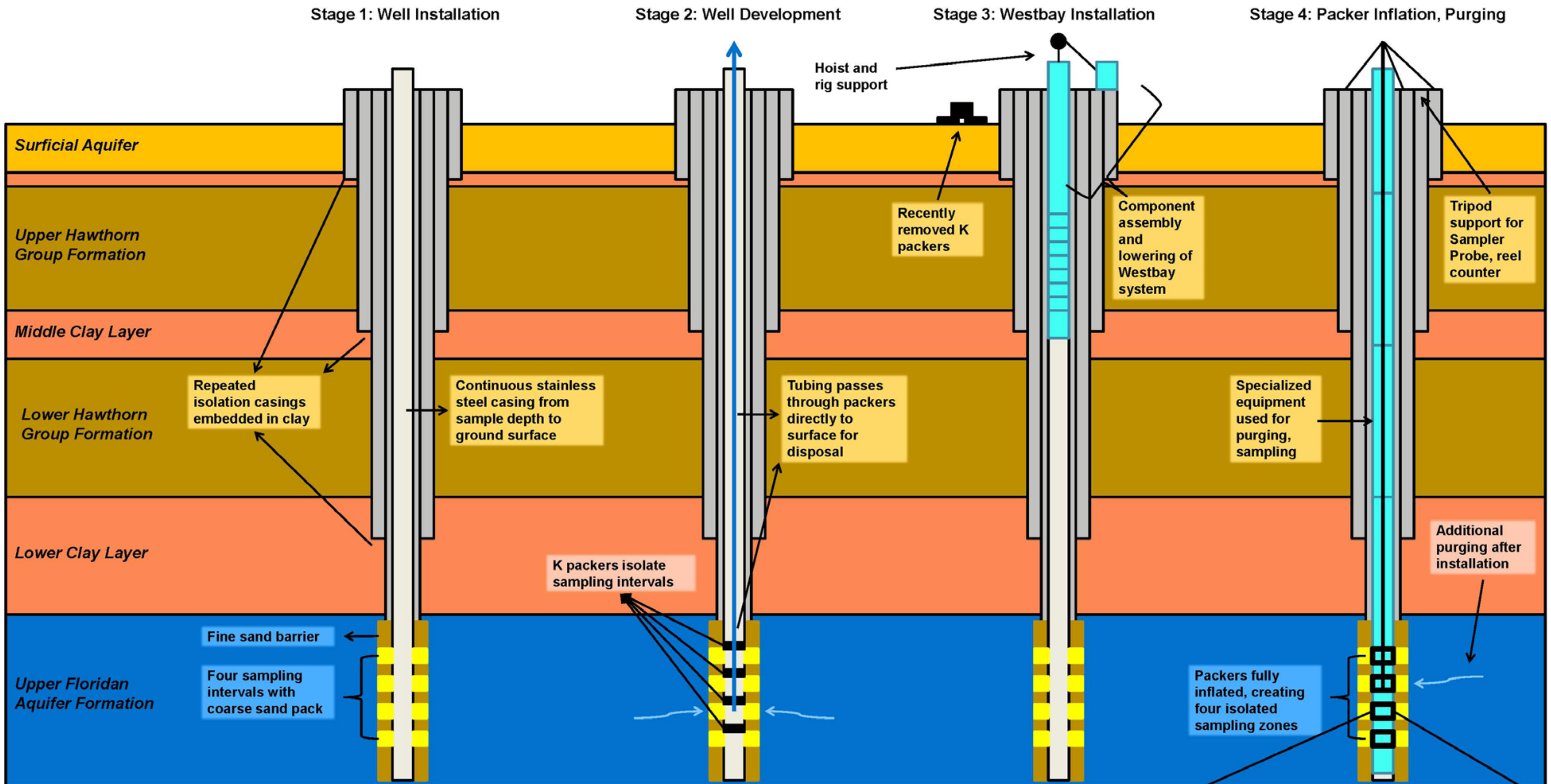


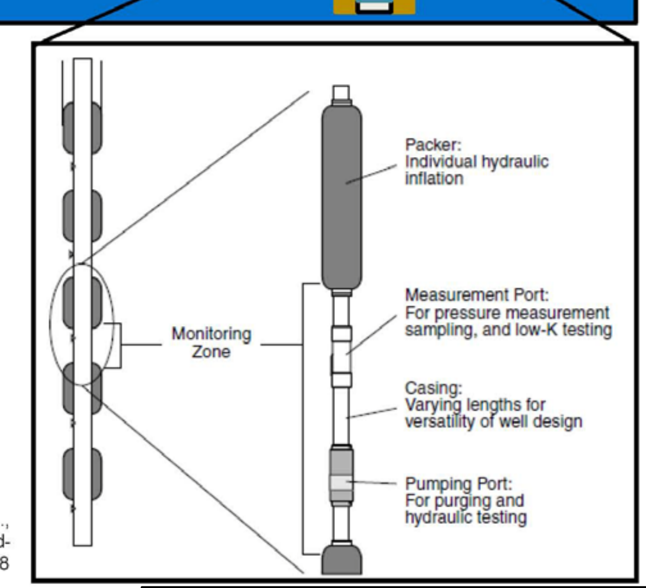
FLORIDAN WELL CONSTRUCTION DIAGRAM

FIGURE A1

CABOT CARBON/KOPPERS SUPERFUND SITE
GAINESVILLE, FLORIDA

WESTON SOLUTIONS





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GRADIENT

Westbay System Installation Approach

Carbon/Koppers Superfund Site – Gainesville, FL

FIGURE A-2

Date: 09/10/14

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