APPENDIX C

DOEE Soil Boring Permits
and
DDOT Occupancy Permit

DEPARTMENT OF ENERGY & ENVIRONMENT

The following stamp was applied electronically.

The electronic signature was applied at the indicated time.

Well Permit Application Cover Page

Permit number: SB2100374

Address: 4615 14th Street NW, Washington, DC 20011

SSL, if applicable: 2811 0802

Applicant Name: Justin Donnelly

Applicant Email: justin.donnelly@interagency.biz

Applicant Phone: 202-255-7656

Applicant Title: Managing Director

Applicant Organization: InterAgency, Inc.

Applicant Address:

Instructions

1. Fill out the right side of this page with your project information. Do not move/alter the text box in any way.
2. Save this page as a PDF.
3. Insert this page (in PDF format) as the first page in your application package.
4. Email your application package to your DOEE reviewer.
5. DOEE will electronically stamp/approve the application and provide the approved package to you via email.
   a. This page will have a watermark, stamp, and reviewer signature
   b. Each subsequent page will have a watermark
6. Save the approved package for your records. Do not modify the package in any way following DOEE's approval.

GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Energy and Environment
Natural Resources Administration
Regulatory Review Division

WELL AND SOIL BORING PERMIT CONDITIONS
(Conditions must be attached to each permit at all times)

LOCATION: 4615 14th Street NW, Washington, DC 20011 (SB2100374)

1) All drill cuttings and investigation derived wastes from potentially contaminated sites or known contaminated sites **shall be containerized and laboratory tested for offsite disposal**.

2) In addition to standard disposal testing, soils with **suspected petroleum contamination** shall be tested using USEPA Method 8015M and shall **not be used as backfill or placed on the ground** if the concentrations exceed standards for soil quality stated in 20 DCMR 6208.1. Non-hazardous soils with Total Petroleum Hydrocarbons concentrations less than 100 ppm may be used as backfill or placed on the site. Soils shall **not be stockpiled** but spread in a manner consistent with DC Erosion and Sediment Control Standards.

3) **Ground water** and/or any liquid **wastes generated by the boring or well drilling and testing** activities (such as decontamination water, purge water, well development water, dewatering effluent and mud slurries) **shall be laboratory tested** for chemical analytes known or suspected to be at the site and the results compared to the DC Ground Water Standards (21 DCMR 11) and the DC Underground Storage Tank Regulation for Total Petroleum Hydrocarbons in ground water [20 DCMR 6209.1(b)]. If these values are not exceeded, the water may be slowly placed on the ground surface in such a manner as to **not produce ponding or a discharge** onto adjacent properties or into nearby surface water bodies or into a storm drain or stormwater catchment basin. For discharges to the storm sewer system, contact The Department of Energy and Environment, Regulatory Review Division (DOEE RRD) at (202) 671-3033.

4) A well shall be grouted as soon as possible but not later than twenty-four (24) hours after the well casing has been set in place unless otherwise permitted in writing from DOEE RRD. If construction activities halt before the well is grouted, the open annular space shall be covered and protected from contamination from any source, including surface water drainage, and the well casing capped.

5) In accordance with DC Law § 8-103.13a, **wells or borings shall be drilled/installed, maintained and abandoned in a manner to prevent contamination of ground water resources and cross-contamination of ground water aquifers** (also see DOEE's **Well Construction Requirements). Five (5) days** of advanced notice of drilling activities shall be given to DOEE. **Within 60 days** of installation, well owner(s) contact information, the horizontal locations of the wells or borings using either the Maryland State Plane Coordinate System or latitude and longitude, vertical elevations including the reference datum used, well construction details and lithologic boring **logs shall submitted to DOEE RRD, 1200 First St. NE, 5th Floor, Washington, DC 20002.**

6) **Prior to sealing a well**, the owner shall ensure that all obstructions which may interfere with the effective sealing operations are removed. Appurtenant structures, including terminal structures and any well casing shall be removed. If removal of the casing is not possible, the casing shall be ripped or perforated.

7) **Abandoned wells and boreholes shall be filled using bentonite slurry (two pounds bentonite powder to one gallon water).** Sealing materials must be introduced at the bottom of the well or borehole and placed progressively upward. The owner shall **report any abandoned wells within 60 days of abandonment to the DOEE RRD, 1200 First St. NE, 5th Floor, Washington, DC 20002.**

8) **Vertical, closed-loop ground source heat pump wells shall be constructed** using **high density polyethylene pipes (HDPE)**, an **anti-freeze solution,** preferably < 20% propylene glycol and, inert **bentonite or thermally-enhanced low permeability grout** that would not allow groundwater flow through the grout to exceed $1x10^{-7}$ cm/s. Geothermal systems shall not be abandoned without first obtaining approval from DOEE RRD.

Note: granting of well permit does not constitute approval of workplan for regulatory groundwater sampling requirements. For more information please contact the Regulatory Review Division of the DOEE.

09/24/21
Ki Don Cho, DOEE RRD

Rev. 09-22-15

DEPARTMENT OF ENERGY & ENVIRONMENT

ENVIRONMENTAL SOIL BORING AND WELL INSTALLATION WORK PLAN
(SB/Wells within Building Interior)

For
WMATA NORTHERN BUS STATION
4615 14th Street NW
WASHINGTON, D.C. 20011

Prepared behalf of
CLARK CONSTRUCTION GROUP, LLC
7500 OLD GEORGETOWN RD
BETHESDA, MD 20814

For submittal to
DEPARTMENT OF ENERGY & ENVIRONMENT
REGULATORY REVIEW DIVISION (RRD)
1200 FIRST STREET, NE, 5TH FLOOR
WASHINGTON, DC 20002

Prepared by
PROFESSIONAL SERVICE INDUSTRIES, INC.
2930 ESKRIDGE ROAD
FAIRFAX, VIRGINIA 22030

September 15, 2021

PSI Project Number: 04481517

intertek psi

Andy Acosta, P.G.
Project Manager

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1 INTRODUCTION

This work plan has been developed in support of drilling borings and well installations for the collection of soil and groundwater samples proposed for the property located at 4615 14th Street NW, DC 20011 (Subject Property).

The subject property is located in a mixed-use neighborhood surrounded by residential housing and commercial properties. The site is improved with an approximately 270,000 square foot building with the initial portion of the building constructed in the early 1900s. The subject property is owned by the Washington Metropolitan Area Transit Authority (WMATA) and consists of an administrative building, parking deck, and a garage capacity of 175 buses. The site location is illustrated on **Figure 1**. The proposed boring and well locations are illustrated on **Figure 2**. Note that **Figure 2** highlights only those borings/wells outlined per the approved Comprehensive Site Assessment work plan outlined in **Section 2.2.**

The site is located on Square 2811/2815 and Property ID 2811 0802 of the Washington DC Real Estate Map. The owner of the parcel of land is WMATA.

1.1 PURPOSE AND OBJECTIVES

The scope of work proposed in this work plan includes soil boring and well installation for environmental testing. This Work Plan has been prepared in accordance with the District of Columbia Department of the Energy and the Environment (DOEE) Well Regulations 21 DCMR chapter 18.

A list of potential concerns at the site include: Bus maintenance/repair facility(ies), historic on- site service station, historic off-site service station and other sites with documented impacts, bus wash bays, bus painting facility(ies), underground storage tanks, aboveground storage tanks, and oil/water separator(s). Professional Service Industries, Inc., an Intertek company (PSI)'s Client requested that soil and/or groundwater samples be collected to determine if any residual contamination is still present at the site from previous site operations prior to the proposed redevelopment of the subject property.

The environmental services that are being proposed are associated with the installation of soil borings at the site. Copies of the DC Well-Boring Construction Application and DDOE Environmental Questionnaire are included in **Appendix A**.

1.2 SITE LOCATION AND PHYSICAL CHARACTERISTICS

The site is currently inactive and not occupied – preexisting infrastructure is present, but WMATA has committed to removing up to approximately 95% of their on-site assets. The site is bounded by residential and commercial properties to the north and east along Iowa Ave NW and Arkansas Ave NW, to the west by 14th St NW, and to the south by Buchanan St NW. The site location is illustrated on **Figure 1**. The proposed boring and well locations are illustrated on **Figure 2**.

The site is situated at an approximate average elevation of 199 feet above mean sea level (AMSL) to the north, with a gradual topographic slope to 177 feet AMSL to the south.

The USDA 1976 Soil Survey for the District of Columbia and the current USDA Web Soil Survey listing identify site soils primarily as Urban Land. Urban Land is used to designate areas where natural soils have been disturbed by development or are covered by impervious surface or structures.

Based on the 1994 USGS Geologic map of the Washington West quadrangle (District of Columbia, Montgomery and Prince George's Counties, Maryland, and Arlington and Fairfax Counties, Virginia) the Site is situated in the Laurel Formation, a sedimentary mélange of conglomerate units that are partially metamorphosed. The mélange is underlain by coastal plain sandstone litho-facies. Natural overburden at the site is mostly reported as primarily sandy loam down to 7 feet below ground surface (bgs), however Urban Land and associated fill material is generally anticipated. Competent bedrock is reported to be approximately 30 to 40 feet bgs in published studies adjacent to the Site area.

Approximate groundwater elevation and potentiometric flow are currently not known, although shallow groundwater potentiometric flow in the Site vicinity would be expected to follow the general topographic gradient to the south.

The site is fully serviced by public utilities including water and sewer. Groundwater is not used as a source of potable water on or in the vicinity of the site.

The District of Columbia Department of Energy and Environment (DOEE) Underground Storage Tank (UST) Database lists the property address as the site of a closed Leaking Underground Storage Tank (LUST) case (#89018). The incident occurred on February 3, 1989 and was listed as closed on September 28, 2017.

2 FIELD ACTIVITIES

2.1 HEALTH AND SAFETY

A site specific Health and Safety Plan (HSP) will be developed for the environmental work proposed for the site. Based on existing site soil and groundwater data, low levels of contaminants are anticipated to be encountered.

Miss utility clearance(s) will be obtained for public utilities prior to each phase of intrusive work. Utility clearances will be supplemented by a private utility locating service.

2.2 DIRECT GROUNDWATER SAMPLING

Groundwater samples will be collected at seven (7) locations located within the on-site building footprint. At each of the seven (7) locations, two (2) soil borings will be advanced, which will be converted to temporary groundwater monitoring wells (for a total of 14 soil borings [SB/TMW-001S THROUGH SB/TMW-007S and SB/TMW-001D through SB/TMW-007D], and 14 temporary monitoring wells [TMW-001S through TMW-007S, and TMW-001D through TMW-0017D]). Within each of the soil borings advanced at each of the seven (7) locations, temporary groundwater monitoring wells will be installed to two (2) depths; the soil/groundwater interface and at the top of bedrock utilizing low-flow methodologies. Following reaching the desired sampling depth, a 1.25-inch diameter PVC well casing with pre-packed well screen will be installed and purged to clear the direct groundwater sampling point of suspended silts and/or sediment. Upon completion of purging and following a stabilization period (>24 hours), PSI personnel will then collect groundwater samples for laboratory analysis by EPA Method 8260 for VOCs and EPA Method 8270 for SVOCs from the temporary monitoring wells.

Additionally, soil samples will be collected at continuous 2-foot intervals to depths extending to two-feet into the groundwater table, or refusal, whichever is encountered first at three (3) locations. Each soil sample will be visually classified, and field screened for organic vapors utilizing a organic vapor analyzer equipped with a photoionization detector (OVA-PID). Based on field observation and OVA-PID screening responses, personnel will collect up to two (2) soil samples from each borehole. One soil sample will be collected from the soil/groundwater interface and one soil sample will be collected from the soil interval exhibiting the highest OVA-PID response. The soil samples will be submitted for laboratory analysis by EPA Method 8260 for VOCs, EPA Method 8270 for SVOCs, TPH-GRO/DRO/ORO, and 4 RCRA metals.

Refer to Figure 2 for the locations of the proposed temporary groundwater monitoring well locations.

2.2.1 MONITORING WELL INSTALLATION

Four (4) permanent monitoring wells will be installed within the eastern portion of the on-site building (MW-001, MW-002, MW-003, MW-004). Initially a soil boring (SB/MW-001, SB/MW-002, SB/MW-003, SB/MW-004) will be performed at the proposed location of each of the permanent monitoring wells. Soil samples will be collected at continuous 2-foot intervals to depths extending to a maximum of 35 feet BLS, bedrock, or refusal, whichever is encountered first. Soil samples will be visually classified, and field screened for organic vapors utilizing a OVA-PID.

Following performance of the soil borings, and upon reaching the depth of termination, a shallow (soil) permanent monitoring well will be installed within three (3) of the soil borings (to a depth of 20 feet BLS), and one (1) deep permanent monitoring well will be installed within the remaining borehole (to a depth of 30 feet BLS). The deep monitoring well will be installed in the vicinity of one of the shallow monitoring wells to determine vertical contaminant migration; however, the wells will not be installed as nested pairs. The shallow wells will be installed utilizing hand auger and hollow stem auger (HSA) methodologies to top of rock and will be constructed of 2-inch diameter schedule 40 polyvinyl chloride (PVC) 0.010-inch pre-packed well screen coupled with a 2-inch diameter solid PVC riser. The shallow well screen will be placed so that it brackets the water table and a filter pack will be placed around the screen interval followed by a bentonite seal and grout to surface. The deep monitoring well will be similarly installed/constructed; however, the deep monitoring well will be installed with the bottom of the screen interval placed at the top of the bedrock.

2.2.2 MONITORING WELL DEVELOPMENT

Upon the completion of each newly installed monitoring well, personnel will allow at least 24 hours to pass before development commences. A stainless-steel submersible pump in conjunction with a surge block as a means of removing fine sediment from the well will be used to develop/purge the wells. Once visual observations indicate a reduction in sediments, a submersible pump will be used in conjunction with a multi-parameter water meter and flow cell to collect field measurements. Measurements for pH, specific conductance, and temperature will be periodically taken until at least three consecutive measurements show temperature and specific conductance within 10 percent, and pH within 0.2 units. A separate turbidity meter will be used to take turbidity readings until stabilization is achieved.

2.2.3 DECONTAMINATION PROCEDURES

Decontamination of drilling rods equipment will be performed following advancement of each soil and installation of each temporary/permanent monitoring well. The drilling equipment (including the drive rods, Geoprobe macro-core sampling tube, and hollow-stem augers) will be washed with a non-phosphate detergent followed by a distilled water rinse and allowed to dry. Decontamination water and drilling spoils generated from direct-push and hollow-stem drilling activities will be containerized and stored on-site for later disposal.

2.2.4 GROUNDWATER MONITORING/ANALYSIS

Following a period of stabilization (>24-hours after well development), groundwater samples will be collected from the permanent monitoring wells and submitted for laboratory analysis. Parameters will include:

- EPA Method 8260 for VOCs
- EPA Method 8270 for SVOCs
- TPH – DRO/GRO
- 4 RCRA Metals

At the time of sample collection, field readings for pH, specific conductance, temperature, dissolved oxygen, and turbidity will be collected to ensure the samples collected are representative of groundwater in the aquifer.

The monitoring well installation and baseline sampling event will be documented in the initial CSA report. The report(s) will include a description of the field activities, analytical results, and provide conclusions and recommendations applicable to the planned site development. Groundwater analytical results will be compared to the DOEE Tier 1 Screenings Levels and applicable Federal regulatory limits for the test parameters identified in the applicable media.

2.3 CONFIRMATORY SAMPLING

During demolition and construction activities, soils in the vicinity of the structures being removed or installed will entail the removal of soils and bedrock from the work areas. Historic environmental assessments performed on the subject property have identified petroleum-related soil impacts along the eastern portion of the subject property. Based on a discussion with DOEE, confirmatory soil samples will be collected from the subgrade of all major structure excavations prior to installation of new project underground features; however, the extent of soil excavation will be determined based on the presence of impacted soils above DOEE Tier 1 soil screening levels. All testing initially will be performed following removal of existing structures/soils associated with the demolition/installation of existing/planned site improvements. Below is a general outline of the sampling and analytical methodologies that will be employed for the confirmatory sampling activities.

2.3.1 SOIL SAMPLE COLLECTION

Soil sampling procedures will be performed in general accordance with the EPA Soil Sampling Operating Procedures, dated June 11, 2020, and Chapter 20 Sections 6100 and 6205 of the District of Columbia Municipal Regulations, where applicable.

At locations where site improvements will be removed/installed and/or soils removed from the ground, soils will be screened visually and with an OVA or PID of the bottoms of the excavations to identify any petroleum-related staining and/or odors. Soil samples will be collected from the bottom of the excavation approximately every 50 linear feet for large structures and linear trenches. The bottom of smaller excavations will be sampled approximately every 10 linear feet. At locations where existing USTs are present two (2) soil samples will be collected beneath each UST.

2.3.2 SOIL SAMPLE ANALYSIS

Based on previous environmental site assessments performed at the site, detected soil impacts, and usage of diesel, diesel exhaust fluid, and automotive oils, collected soil samples will be submitted for laboratory analysis for the following analysis/compounds:

- EPA Method 8260 for BTEX.
- EPA Method 8015 for ethanol
- EPA Method 8270 for PAHs
- TPH-GRO/DRO/ORO

Refer to Figures 2 for the planned soil sample locations.

2.4 INVESTIGATIVE DERIVED WASTE

Due to the presence of contaminated soils at the site, it is anticipated that decontamination of the drilling equipment between boring locations will be required using a decontamination pad. Borings will be backfilled with grout. Boring cuttings, decontamination/development/purge water and disposable sampling equipment will be collected into clean, clearly labeled 55-gallon drums. The drums will be sealed and temporarily stored in designated areas established by WMATA at the site for management pending receipt of analytical results. A designated temporary storage area for up to 8 drums as well as space to work will be identified. Drums will remain on site until completion of logging, characterization, and disposal facility acceptance.

Based on the presence and nature of contamination, the most cost effective option to dispose of IDW containerized within drums at the subject property will be to assume all drums contain some level of impacted material, perform composite sampling for additional analytical characterization required for disposal, and to dispose of all IDW at a licensed facility based on their acceptance of the composite sampling and environmental assessment analytical results.

To facilitate this necessary documentation, up to two (2) composite samples will be collected from the drums and submit the sample to a licensed laboratory following standard chain-of-custody and shipping procedures. The composite sample will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) including Resource Conservation and Recovery Act (RCRA)-8 Metals via EPA Method 1311, VOCs via EPA Method 8260, and SVOCs via EPA Method 8270. Upon the licensed disposal facility's receipt and acceptance of the analytical results, IDW drums to be shipped to the licensed disposal facility for processing.

2.5 TEMPORARY MONITORING WELL ABANDONMENT

The proposed fourteen (14) temporary monitoring wells at the site will be abandoned within 30 days of construction in accordance with requirements of the DOEE Well Regulations 1802.7. Timing for the abandonment of the permanent monitoring wells will be determined following several sampling events and based on discussions/approval with DOEE.

The procedures for abandonment of the wells will consist of the preparation of a DC DOEE Well Abandonment Work Plan, field procedures to accomplish the abandonment, and completion of a well abandonment report (including the DC Well Abandonment Form).

Upon completion of the boreholes, the bedrock well casings will be removed from the bedrock (i.e. consolidated formation) portion of the borings and will be tremie grouted with bentonite-cement grout with a mix ratio of no greater than 6 gallons of water per 94 pounds of Portland cement with an additional 5 pounds of sodium-based bentonite per 21 District of Columbia Municipal Regulations (DCMR) §1818.14 Upon completion of the bedrock grouting, all borings will be tremie grouted with bentonite-cement grout with a mix ratio of 94 pounds Portland cement, 150 pounds bentonite and 82 gallons potable water from the bottom up to at least 5-feet above the bottom depth of the bedrock temporary casing to maintain positive pressure head in the borehole. The well casing will then be removed while tremie- grouting from bottom to surface of the borehole. No instrumentation is planned for these boreholes.

A completion/abandonment report will be submitted to DOEE within 60 days of well installation in accordance with 21 DCMR § 1826 to include:

1. Lithologic Soil boring log(s) with any groundwater level readings;
2. D.C. Well Construction Completion and Abandonment Form;
3. Final boring location plan; and
4. Photographs showing entire abandonment procedures.

2.6 PERMANENT MONITORING WELL ABANDONMENT

At this time, it is unknown how long the permanent monitoring wells will be need for groundwater monitoring purposes; however, multiple monitoring events are expected. Therefore, a separate well abandonment permit will be applied for at the time it is determined the permanent wells are no longer needed.

2.7 SCHEDULE

PSI will provide DDOE with a minimum of 5 day's notice prior to the initiation of work.

2.8 SUBCONTRACTORS

PSI has identified E2CR, Inc. (E2CR) as the qualified environmental drilling subcontractor for this project. Copies of E2CR's District of Columbia Business Licenses and state drilling certification information are included in **Appendix C**. Proof of business licensure and state drilling certifications shall be provided to the DDOE RRD for any additional drillers that may be selected prior to starting their respective phase of work on the site.

3 QUALITY ASSURANCE AND QUALITY CONTROL

Field and laboratory tasks will generally follow industry standards for Quality Assurance/Quality Control (QA/QC) as well as corporate QA/QC guidelines established by PSI for field activities and HC for laboratory tasks.

QA/QC samples will include trip and equipment blanks to be submitted for laboratory analysis of VOCs per EPA Method 8260.

Complete copies of PSI Data Validation Guidelines (2000) and PSI Field Methods Technical Guidance (2001) are maintained in PSI's files in Fairfax, VA.

A complete copy of HC's Comprehensive Quality Assurance Plan is also maintained in PSI's files.

Copies of these QA/QC documents are available for review upon request.

4 REFERENCES

District of Columbia Well Construction Application Form: DDOE Well Construction Application Process and Well Construction Requirements.

United States Environmental Protection Agency: Low Flow Groundwater Sampling Procedures, April 1996.

5 STATEMENT OF LIMITATIONS

The information provided in this Work Plan, prepared by Professional Service Industries, Inc. (PSI), is intended exclusively for submittal to the District of Columbia Department of the Environment (DDOE) on behalf of Clark Construction Group, LLC as it pertains to as it pertains to environmental investigations to be conducted at the site located at 4615 14th Street NW, Washington, D.C. 20011. It is not provided for the benefit or use of any third party. PSI does not and cannot warrant that the plan provided herein will eliminate exposure pathways or prevent impact to human health or the environment. All work conducted on the site will be done in accordance with local, state, and federal laws and regulations.

The professional services will be provided in accordance with practices generally accepted by other appropriate environmental and geotechnical professionals, geologists, hydrologists, hydrogeologists, engineers, and scientists practicing in this field. No other warranty, either expressed or implied, is made. PSI is not an insurer and makes no guarantee or warranty that the services supplied will avert or mitigate occurrences, or the consequences of occurrences, that the services are designed to prevent or ameliorate. As with all surface and subsurface soil investigations, there is no guarantee that the work conducted will identify all sources or locations of hazardous substances or chemicals that may be present at the site.

FIGURES

Legend:

Subject Property

NORTH

SITE LOCATION MAP
4615 14th Street NW,
Washington, DC. 20011
Prepared For SVT, Inc.

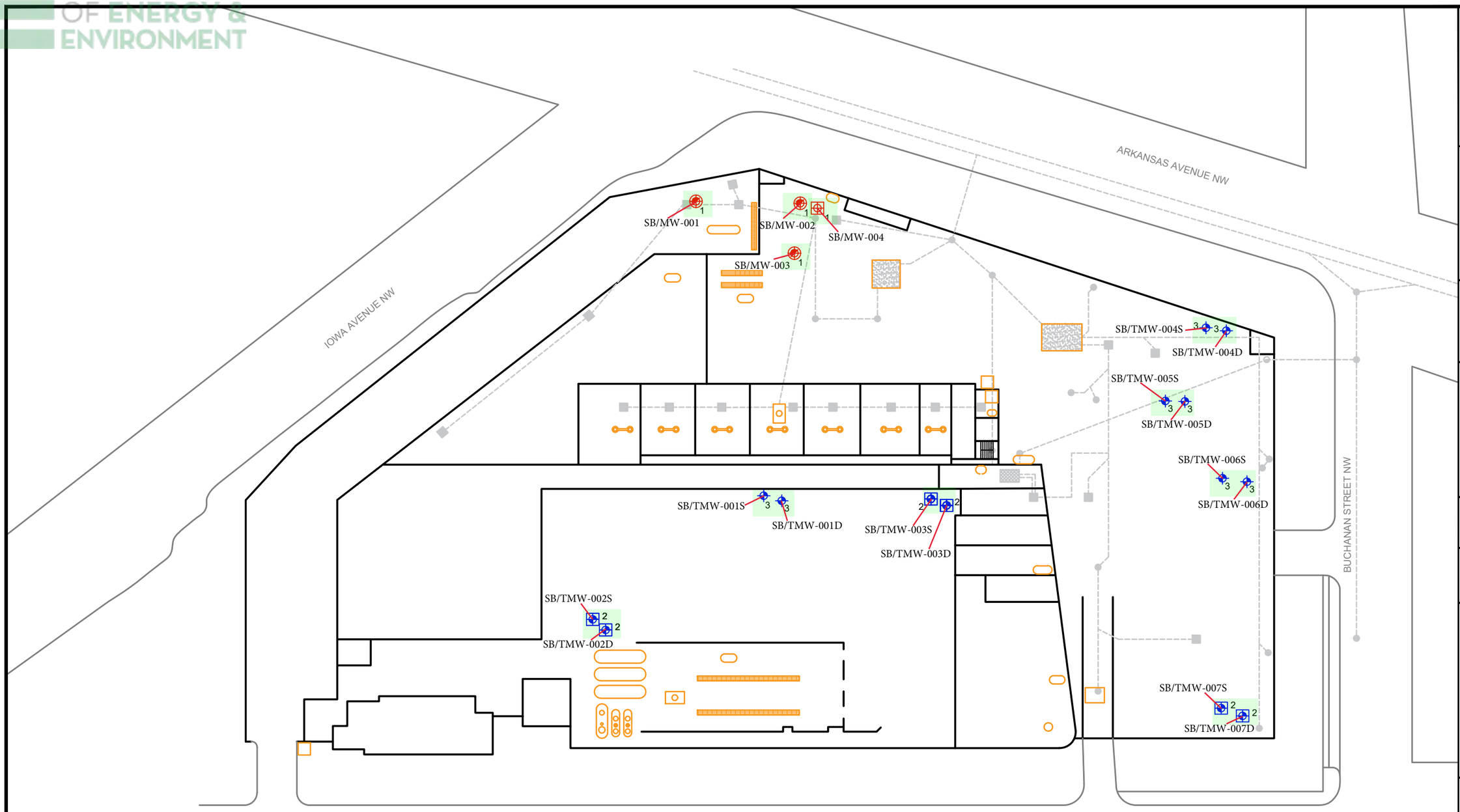
Figure No.: **1**

intertek psi
2930 Eskridge Road - Fairfax, VA 22031
(703) 698-9300 - FAX (703) 698-4414

Project Manager: **Andres Acosta**

Drawn By: **Rinzo Renthlei**

Project No.: **0444100**



LEGEND:

- PROPOSED MONITORING WELL DIRECT WATER SAMPLING LOCATION; WITH VADOSE SOIL SAMPLING
- PROPOSED MONITORING WELL DIRECT WATER SAMPLING LOCATION; GROUNDWATER INTERFACE AND BEDROCK INTERFACE
- PROPOSED PERMANENT SHALLOW MONITORING WELL LOCATION; 2"; MAX 15' BLS
- PROPOSED PERMANENT DEEP MONITORING WELL LOCATION; 2"; MAX 30' BLS

SUPERSCRIPT:

1 - GROUNDWATER SAMPLE FOR LABORATORY ANALYSIS BY EPA METHOD 8260 FOR VOCs, METHOD 8270 FOR SVOCs, TPH-GRO/DRO, AND 13 PRIORITY POLLUTANT METALS

2 - SOIL AND GROUNDWATER SAMPLE FOR LABORATORY ANALYSIS BY EPA METHOD 8260 FOR VOC's, METHOD 8270 FOR SVOCs, TPH-GRO/DRO, AND 13 PRIORITY POLLUTANT METALS

3 - GROUNDWATER SAMPLE FOR LABORATORY ANALYSIS BY EPA METHOD 8260 FOR VOCs AND METHOD 8270 FOR SVOCs

intertek psi

Environmental Services

2930 Eskridge Road,
Fairfax, Virginia 22031
Tel (703) 698–9300

Project Name:

WMATA Bus Facility
Northern Site
4615 14th Street NW,
Washington, DC 20011

Figure Title:

Proposed Groundwater Sampling Location Map

Interior SBs/Wells

Drawn By:

Adam Smak

Project Manager:

Andy Acosta

Figure Legend:

NORTH

0 40' 80'
APPROXIMATE SCALE IN FEET

Project Number:

0444100

Figure Date:

04–15–2021

Figure Number:

2

APPENDIX A – WELL APPLICATION FORMS

D.C. WELL CONSTRUCTION APPLICATION FORM

DO NOT USE FOR GEOTHERMAL WELLS

Please Fill Out As Thoroughly As Possible. Asterisks indicate where additional information is needed in the Comments Section. Attach site plan, well application schematic form, additional comments and details.

Well (hole) Owner – Property Owner:

Name(s) Ovidiu Puscas

Mailing Address 600 5th Street, NW City, St., Zip Washington DC 20001

Phone (202) 962-1234 Email opuscas@wmata.com

Driller/Company Responsible for Drilling/Installing the Well: DCRA Business License No. 400317800482

NAME(s) Siva Balu, E2CR, Inc. License State & No. Maryland No. MWD572

Mailing Address 1405-A Parker Road City, St., Zip Baltimore, MD 21227

Phone (410) 737-9100 Email sivabalu@e2cr.com

General Well Information: Intended Well Use Wells for better defining known groundwater impacts

Type of Well (circle all applicable): (Monitoring)/Geotechnical/Dewatering/Injection/Supply/Other*

Number of Wells 18

Are wells required as part of a regulatory action? Yes ☐ No ☒

If Yes, identify the regulatory agency and division n/a

Well Information:

Well Physical Address 4615 14th Street NW City, St., Zip Washington, DC 20011

Lot 0802 Square 2811 Topography (circle one): hilltop, flat, slope, valley, stream channel, local depression

Geology (circle one): ~~unconsolidated~~/consolidated Aquifer penetrated (circle one): (single)/multiple

Geologic Formation (if known) Laurel Aquifer name(s) (if known) _____

Drilling Method: (circle all applicable): (Hollow-Stem Auger)/Mud rotary/Air rotary/Sonic/(Geoprobe)/Other*

Will drilling fluids/muds include additives other than potable water? Yes ☐ No ☒ If yes, provide details and attach manufacturer's specifications and Materials Safety Data Sheet

Is the site potentially or known-to-be contaminated? Yes ☒ No ☐ If yes, attach details

Will Investigation Derived Waste be containerized, laboratory tested and taken offsite for proper disposal? Yes ☒ No ☐ If no, attach disposal details. Will permanent outer casing be used to prevent aquifer cross contamination where known or suspected contamination exists? Yes ☒ No ☐ If yes or no, attach details

Will the following be placed in well?(circle all applicable): downhole pumps/liners/monitoring equipment/other*

Please attach details about well development and any other relevant information.

*Comments (add an additional sheet if necessary):

Up to 14 temporary monitoring wells and 4 permanent monitoring wells.

I declare that the information provided is accurate, true and complete to the best of my knowledge and belief. I agree to comply with all applicable laws and regulations of the District of Columbia.

Name (print) Andy Reusche on behalf of E2CR. Signature _____ Date 9/8/2021

Owner ☐ Agent for owner ☐ Well Driller Performing Work ☒

DEPARTMENT OF ENERGY & ENVIRONMENT

BUILDING PERMIT APPLICATION SUPPLEMENTAL FORM - ENVIRONMENTAL QUESTIONNAIRE

PROJECT ADDRESS: 4615 14th Street, NW DC SQUARE: 2811 SUFFIX: _____ LOT: 0802

Directions: Please answer all 19 questions in this questionnaire, by checking either column "Yes" or "No" for each question. If you answer "Yes" to any of the questions, you should contact the corresponding office(s) indicated in column 'contact person/office,' as soon as possible. Until this supplement form is reviewed and approved by the concerned office(s), the building permit will not be issued.

SCOPE OF PROJECT	YES	NO	CONTACT PERSON/OFFICE	OFFICE USE
1. Will the work to be performed involve the installation, removal, close-in-place now, or repair of an underground storage tank (UST) system? *Please get approvals or signatures from the Underground Storage Tank Branch, Water Quality Division and the Air Quality Division.*	☐	☑	(202) 535-2600 or ust.ddoe@dc.gov, Underground Storage Tank Branch (202) 535-2600, Air Quality Division, Permitting Branch	
2. Will the work to be performed involve assessment of soil or soil-vapor, or cleanup of soil associated with the released material from an underground storage tank (UST)? *Please get approvals or signatures from the UndergroundStorage Tank Division, Water Quality Division and the Air Quality Division.*	☐	☑	(202) 535-2600 or ust.ddoe@dc.gov , Underground Storage Tank Branch (202) 535-2600, Water Quality Division (202) 535-2600, Air Quality Division	
3. Will the work to be performed involve the assessment or clean-up of groundwater associated with the release of material from an underground storage tank (UST)? *Please get approvals or signatures from the Underground Storage Tank Division, Water Quality Division and the Air Quality Division.*	☐	☑	(202) 535-2600 or ust.ddoe@dc.gov, Underground Storage Tank Branch (202) 535-2600, Air Quality Division (202) 535-2600, Water Quality Division	
4. Will the proposed project involve the installation or drilling of wells other than for the purposes stated in questions 2 and 3? *Please get approvals or signatures from the Water Quality Division.*	☑	☐	(202) 535-2600, Water Quality Division	
5. Will the proposed project involve installation or drilling of wells using air rotary drilling methods or any methods discharging gases or dust into the air? *Please get approvals or signatures from the Water Quality Division and the Air Quality Division.*	☐	☑	(202) 535-2600, Water Quality Division (202) 535-2600, Air Quality Division, Permitting Branch	
6. Will the proposed project involve the generation, treatment, storage, disposal or transportation of chemicals or other substances which may be considered hazardous? *Contact Hazardous Materials Branch (202) 535-2600.*	☐	☑	(202) 535-2600, Hazardous Waste Branch	
7. Will the proposed use involve the construction of a facility for the handling, transfer, storage, disposal or treatment of solid waste, medical waste, or recyclable materials? *Contact DOEE Environmental Review Coordinator (202) 535-2600.*	☐	☑	(202) 535-2600, DOEE EIS Coordinator	
8. Will the proposed project involve construction which will result in a discharge or release to or withdrawal from a river, stream, wetland, or groundwater or disturb the sediment in rivers, streams or wetlands? *Please get approvals or signatures from the Water Quality Division.*	☐	☑	(202) 535-2600, Water Quality Division	
9. Will the proposed project involve construction which may affect aquatic or terrestrial biota, their habitat, or water quality? *Please get approvals or signatures from the Water Quality Division and the Fisheries and Wildlife Division.*	☐	☑	(202) 535-2600, Water Quality Division (202) 535-2600, Fisheries and Wildlife Division	

10. Does the project site contain a species of plant or animal that is federally protected? *Federally protected means that the plant or animal is subjected to limited, restricted, specific, or approved interactions in accordance with Federal guidelines.*	☐	☑	(202) 535-2600, Fisheries and Wildlife Division	
11. Will the proposed project result in the discharge into the air of gases or dust or the creation of any objectionable odors? *Contact Air Quality Division Permitting Branch (202) 535-2600*	☐	☑	(202) 535-2600, Air Quality Division, Permitting Branch	
12. Was the building built before 1978? (Lead paint may be present). *Issuance of a lead abatement or renovation permit may be required.*	☐	☑	(202) 535-2600, Lead and Healthy Housing Division, Compliance and Enforcement Branch	
13. Does the building contain asbestos? *Requires a current asbestos survey (i.e., survey of all asbestos containing materials) for the building. A permit from the Air Quality Division is required for most asbestos removal projects.*	☐	☑	(202) 535-2600, Air Quality Division, Permitting Branch	
14. Does the project disturb 5,000 square feet or greater of land? *Major Land Disturbance: Submit a stormwater management plan to the Watershed Protection Division for approval.*	☐	☑	(202) 535-2600, Watershed Protection Division	
15. Is the project an interior renovation or addition where (1) the assessed value of the structure(s) is greater than or equal to 50% of the total cost of construction, AND (2) the sum of the structures' footprint and any soil disturbance is 5,000 square feet or greater? *Major Sustainable Improvement: Submit a storm water management plan to the Watershed Protection Division for approval.*	☐	☑	(202) 535-2600, Watershed Protection Division	
16. Is the project (1) a new building, addition and/or interior renovation where the total cost of construction is greater than 100% of the assessed value of the structure(s), AND (2) the property is assigned a zone district other than R1 - R4? *Submit a green area ratio (GAR) plan to the Watershed Protection Division for approval.*	☐	☑	(202) 535-2600, Watershed Protection Division	
17. Will the proposed project or the work to be performed be within a Special Flood Hazard Area (SFHA) or 100-year floodplain area (i.e., Zone A or AE)? *If YES,* *Compliance with DC Floodplain Regulations (DCMR 20, Flood Hazard Rules, and DCMR 12, Flood Provisions in the Construction Code is required.* *If NO,* *Please verify and confirm whether the project site is NOT located in a Special Flood Hazard Area (SFHA).* *http://ddoe.dc.gov/floodplainmap*	☐	☑	(202) 535-2600, Watershed Protection Division	
18. Will the proposed project result in the construction or installation of any equipment that burns fuel such as, but not limited to, stationary generators (any size) and boilers with heat input ratings greater than 5 million BTU/hr? *Note that separate air quality permits are required for most of these units.*	☐	☑	(202) 535-2600, Air Quality Division, Permitting Branch	
19. Will the proposed project result in the construction or installation of any other stationary pollution-emitting equipment? Examples include, but are not limited to, degreasing units, professional printing equipment, plating lines, spray painting operations, and gasoline dispensing systems. *Note that separate air quality permits are required for most of these units.*	☐	☑	(202) 535-2600, Air Quality Division, Permitting Branch	

I hereby certify that I have the authority of the owner of the property to make this application and that the answers to the above questions are complete and correct to the best of my knowledge. False statements may be subject to fines and prosecution, as applicable by statute.

Signature _____ Name (print) _____

Address 4615 14th Street, NW DC Date _____ Phone _____

OFFICE USE ONLY

DOEE APPROVAL BY _____ NAME (Print) _____

CONTACT NUMBER: (202) _____ DATE: _____

COMMENTS AND PERMIT RESTRICTIONS _____

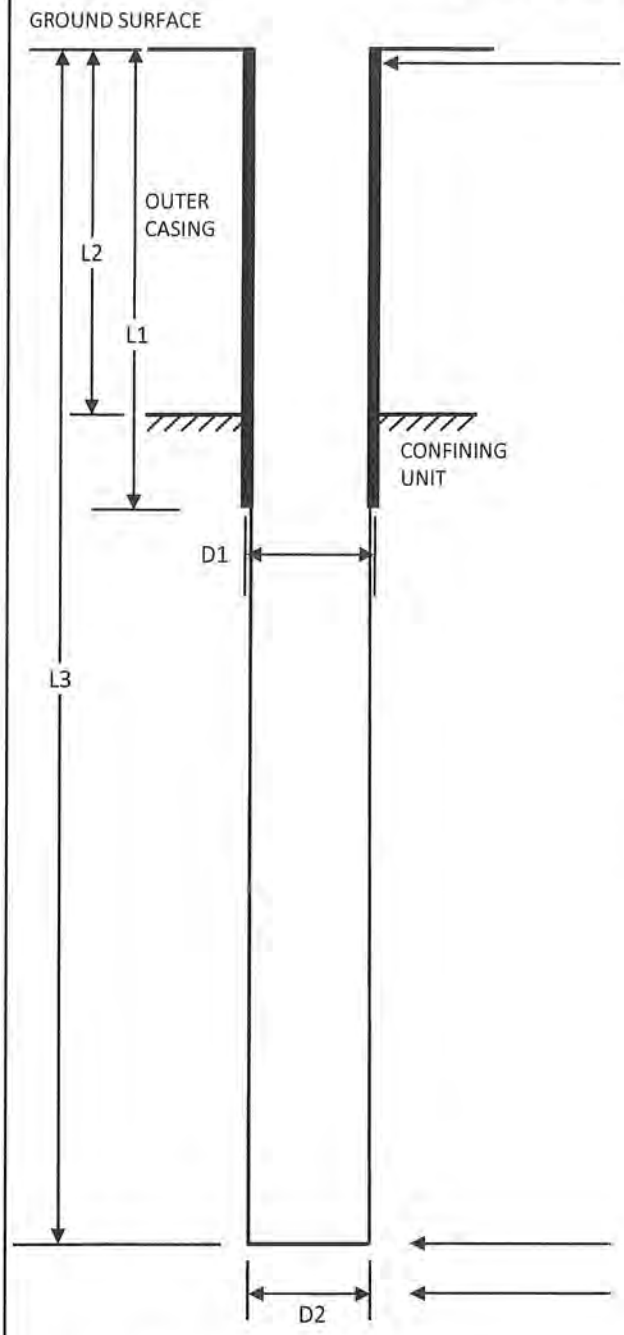
(USE REVERSE IF NECESSARY)

DDOE WELL APPLICATION SCHEMATIC

Geotechnical / Geophysical Boring
Confining Unit

Shallow Permanent Monitoring Wells

Check one: Application ☒ ***As-Built*** ☐



OUTER CASING (USE IF AREA IS CONTAMINATED)

MATERIAL: PVC

DIAMETER (D1) (inches): 2

LENGTH (L1) (feet): Dependent on groundwater table.

DEPTH TO TOP OF CONFINING UNIT (L2) (feet): Unknown at this time.

WILL WELL BE OPEN MORE THAN 24 CONSECUTIVE HOURS?

YES* ☒ NO ☐

If yes, how will open annular space be covered and protected?

The filter pack will extended from the bottom of the screen interval to approximatley 2 feet above the screen interval, ~~followed by a fine sand seal, and bentonite/neat grout to surface.~~ The surface of the monitoring wells will be finished with a 8-inch lockable manhole and 2'x2' concrete pad.

- Wells to be installed via hollow stem auger.

WILL WELL BE ABANDONDED ACCORDING TO WELL ABANDONMENT REQUIREMENTS, SECTION 8 IN DDOE WELL CONSTRUCTION REQUIREMENTS?

YES ☒ NO ☐ Following completion of periodic sampling and approval from DOEE.

WHAT TYPE OF GROUT AND GROUT:WATER RATIOS WILL BE USED?

Neat grout mixed with 5 5/8 to 5 3/4 gallon of water per bag of grout.

DEPTH TO THE BOTTOM OF HOLE (L3) (feet): Approximately 15 to 20 feet BLS depending on depth to groundwater table

DIAMETER OF BOREHOLE (D2) (inches): 6-8 inches

Rev. 05-17-12

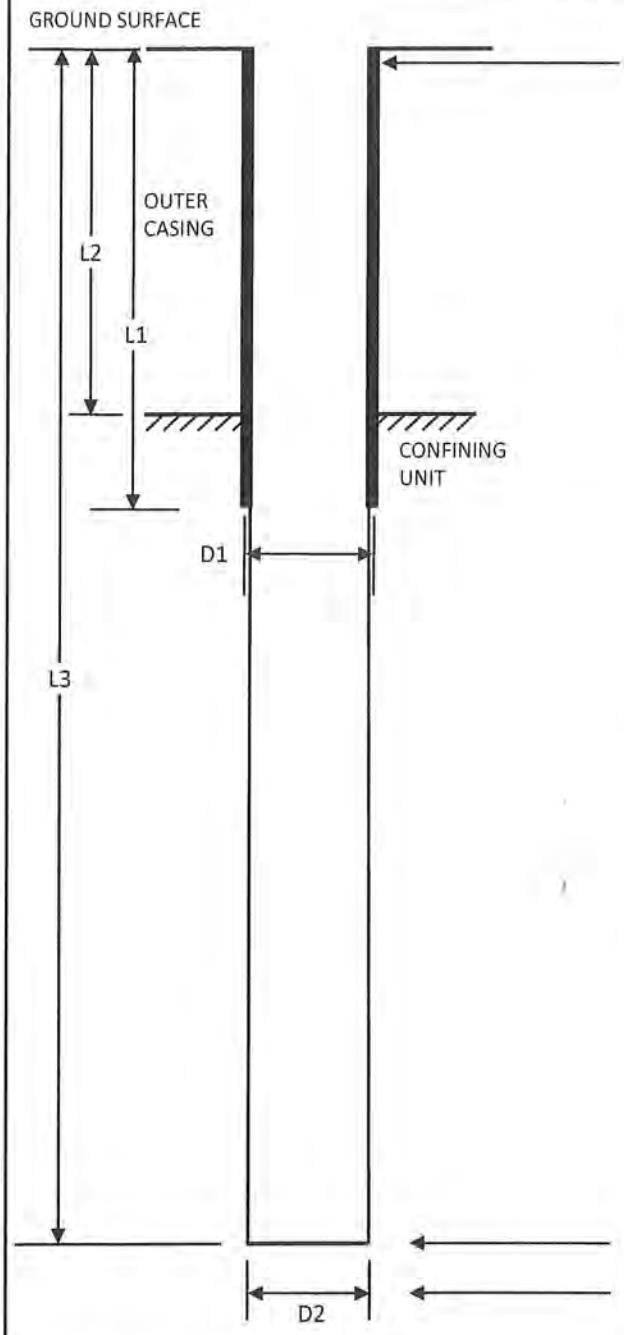
WELL ID(S): MW-001, MW-002, MW-003	WELL OWNER: E2CR, Inc. SIVA BALU
WELL ADDRESS: 4615 14th Street NW Washington D.C. 20011	OWNER ADDRESS: 1405-A Parker Road Baltimore, MD 21227
LOT NUMBER: 0801	SIGNATURE:
SQUARE NUMBER: 2811	

DDOE WELL APPLICATION SCHEMATIC

Geotechnical / Geophysical Boring
Confining Unit

Bedrock Permanent Monitoring Wells

Check one: Application ☒ *As-Built* ☐



OUTER CASING (USE IF AREA IS CONTAMINATED)

MATERIAL: PVC

DIAMETER (D1) (inches): 2

LENGTH (L1) (feet): Directly above bedrock

DEPTH TO TOP OF CONFINING UNIT (L2) (feet): Unknown at this time.

WILL WELL BE OPEN MORE THAN 24 CONSECUTIVE HOURS?

YES* ☒ NO ☐

If yes, how will open annular space be covered and protected?

The filter pack will extended from the bottom of the screen interval to approximatley 2 feet above the screen interval, followed by a fine sand seal, and bentonite/neat grout to surface. The surface of the monitoring wells will be finished with a 8-inch lockable manhole and 2'x2' concrete pad.

- Wells to be installed via hollow stem auger.

WILL WELL BE ABANDONDED ACCORDING TO WELL ABANDONMENT REQUIREMENTS, SECTION 8 IN DDOE WELL CONSTRUCTION REQUIREMENTS?

YES ☒ NO ☐ Following completion of periodic sampling and approval from DOEE.

WHAT TYPE OF GROUT AND GROUT:WATER RATIOS WILL BE USED?

Neat grout mixed with 5 5/8 to 5 3/4 gallon of water per bag of grout.

DEPTH TO THE BOTTOM OF HOLE (L3) (feet): Approximately 35 feet depedning on depth to bedrock.

DIAMETER OF BOREHOLE (D2) (inches): 6-8 inches

Rev. 05-17-12

WELL ID(S): MW-004

WELL ADDRESS: 4615 14th Street NW
Washington D.C. 20011

LOT NUMBER: 0801

SQUARE NUMBER: 2811

WELL OWNER: E2CR, Inc.
SIVA BALU

OWNER ADDRESS: 1405-A Parker Road
Baltimore, MD 21227

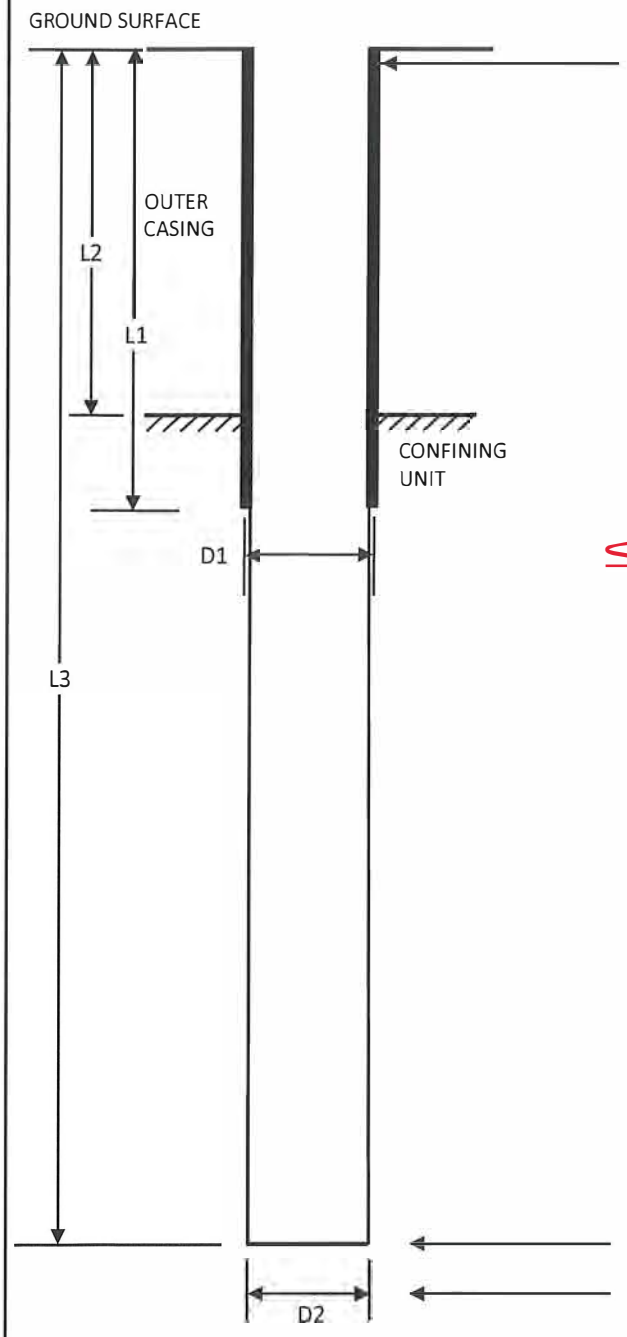
SIGNATURE:

DDOE WELL APPLICATION SCHEMATIC

Geotechnical / Geophysical Boring
Confining Unit

Shallow Temporary Monitoring Wells

Check one: Application ☒ ***As-Built*** ☐



OUTER CASING (USE IF AREA IS CONTAMINATED)

MATERIAL: PVC

DIAMETER (D1) (inches): 1.4 inch OD

LENGTH (L1) (feet): Dependent on groundwater table.

DEPTH TO TOP OF CONFINING UNIT (L2) (feet): Unknown at this time.

WILL WELL BE OPEN MORE THAN 24 CONSECUTIVE HOURS?

YES* ☒ NO ☐

If yes, how will open annular space be covered and protected?

The filter pack will extended from the bottom of the screen interval to approximatley 2 feet above the screen interval, ~~followed by a fine sand seal, and bentonite/neat grout to surface.~~

-Wells to be installed via Geoprobe.

WILL WELL BE ABANDONDED ACCORDING TO WELL ABANDONMENT REQUIREMENTS, SECTION 8 IN DDOE WELL CONSTRUCTION REQUIREMENTS?

YES ☒ NO ☐ Following completion of periodic sampling and approval from DOEE.

WHAT TYPE OF GROUT AND GROUT:WATER RATIOS WILL BE USED?

Neat grout mixed with 5 5/8 to 5 3/4 gallon of water per bag of grout.

DEPTH TO THE BOTTOM OF HOLE (L3) (feet): Approximately 15 to 20 feet BLS depending on depth to groundwater table

DIAMETER OF BOREHOLE (D2) (inches): Approximatley 3 1/4 inches

Rev. 05-17-12

WELL ID(S): TMW-001S through TMW-007S

WELL ADDRESS: 4615 14th Street NW
Washington D.C. 20011

LOT NUMBER: 0801

SQUARE NUMBER: 2811

WELL OWNER: E2CR, Inc.
SIVA BALU

OWNER ADDRESS: 1405-A Parker Road
Baltimore, MD 21227

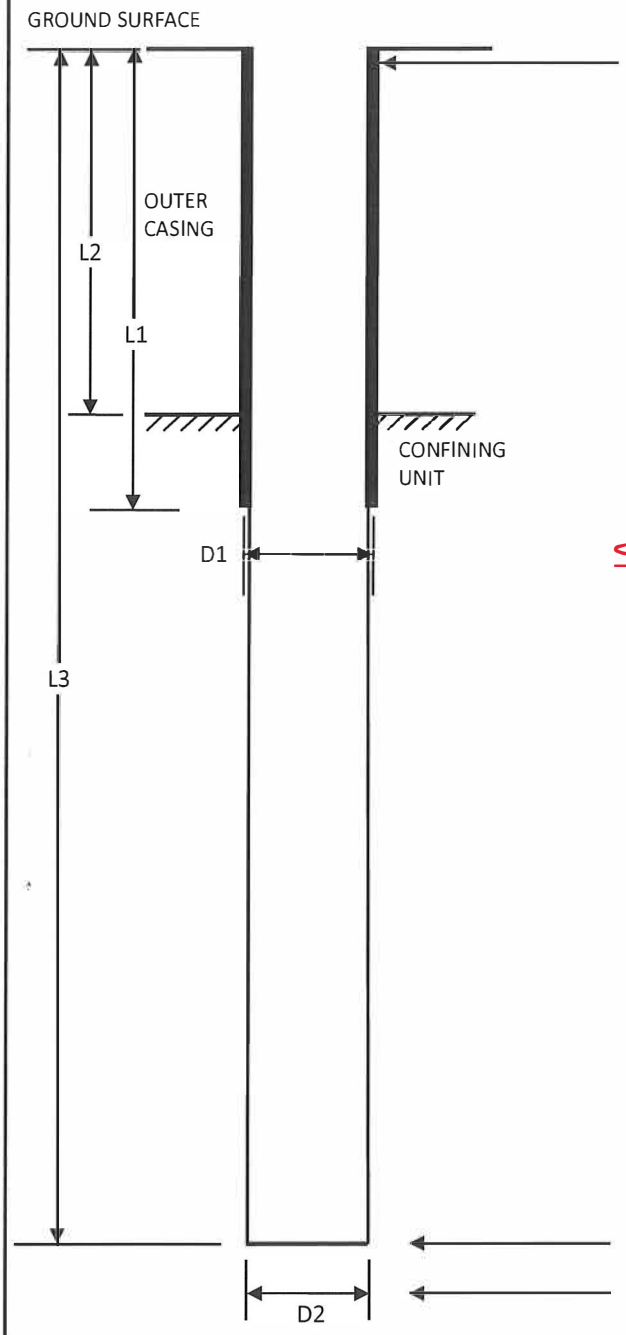
SIGNATURE:

DDOE WELL APPLICATION SCHEMATIC

Geotechnical / Geophysical Boring
Confining Unit

Bedrock Temporary Monitoring Wells

Check one: Application ☒ ***As-Built*** ☐



OUTER CASING (USE IF AREA IS CONTAMINATED)

MATERIAL: PVC

DIAMETER (D1) (inches): 1.4 inch OD

LENGTH (L1) (feet): Directly above bedrock.

DEPTH TO TOP OF CONFINING UNIT (L2) (feet): Unknown at this time.

WILL WELL BE OPEN MORE THAN 24 CONSECUTIVE HOURS?

YES* ☒ NO ☐

If yes, how will open annular space be covered and protected?

The filter pack will extended from the bottom of the screen interval to approximatley 2 feet above the screen interval, ~~followed by a fine sand seal, and bentonite/neat grout to surface.~~ -Wells to be installed via Geoprobe.

WILL WELL BE ABANDONDED ACCORDING TO WELL ABANDONMENT REQUIREMENTS, SECTION 8 IN DDOE WELL CONSTRUCTION REQUIREMENTS?

YES ☒ NO ☐ Following completion of periodic sampling and approval from DOEE.

WHAT TYPE OF GROUT AND GROUT: WATER RATIOS WILL BE USED?

Neat grout mixed with 5 5/8 to 5 3/4 gallon of water per bag of grout.

DEPTH TO THE BOTTOM OF HOLE (L3) (feet): Approximately 35 feet depending on depth to bedrock.

DIAMETER OF BOREHOLE (D2) (inches): Approximatley 3 1/4 inches

Rev. 05-17-12

WELL ID(S): TMW-001D through TMW-007D

WELL ADDRESS: 4615 14th Street NW
Washington D.C. 20011

LOT NUMBER: 0801

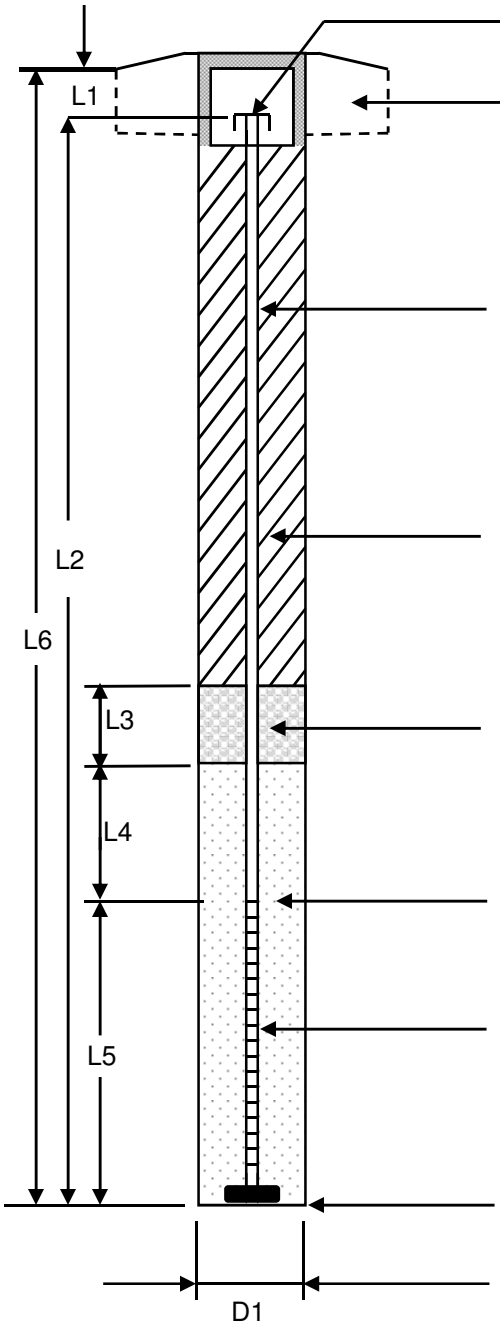
SQUARE NUMBER: 2811

WELL OWNER: E2CR, Inc.
SIVA BALU

OWNER ADDRESS: 1405-A Parker Road
Baltimore, MD 21227

SIGNATURE:

D.C. WELL APPLICATION SCHEMATIC FORM



LOCKABLE CAP

PROTECTIVE CASING AND CONCRETE PAD

TOP OF CASING TO GROUND SURFACE (L1) (inches): ~3

PAD DIMENSIONS: 2'x2'

HEIGHT ABOVE GROUND: Flush

WELL CASING

MATERIAL: PVC

INTERNAL DIAMETER (inches): 2

JOINT TYPE: Threaded

LENGTH (L2) (Feet): 10

GROUT AROUND CASING

MATERIAL: Portland & Bentonite

MIX RATIO OF SOLIDS: 94 lbs cement/150 lbs bentonite

MIX RATIO SOLIDS:WATER: 82 gal of water

LOW PERMEABILITY SEAL

MATERIAL: Bentonite

HEIGHT ABOVE FILTER PACK (L3) (Feet): 2

FILTER PACK

TYPE OF FILTER: 20/40 Silica Sand

HEIGHT ABOVE SCREEN (L4) (Feet): 2

WELL SCREEN

SCREEN MATERIAL: PVC Pre-packed

LENGTH (L5) (Feet): 10

SLOT SIZE: 0.010-inch

DEPTH TO THE BOTTOM OF WELL (L6) (Feet): 20

DIAMETER OF BOREHOLE (D1) (inches): 8

WELL ANNULUS (inches): 2

APPLICATION DATE: 9/15/2021

WELL ID NUMBER: MW-001, MW-002, MW-003

WELL ADDRESSS: 4615 14TH Street NW
Washington D.C. 20011

LOT NUMBER: 0801

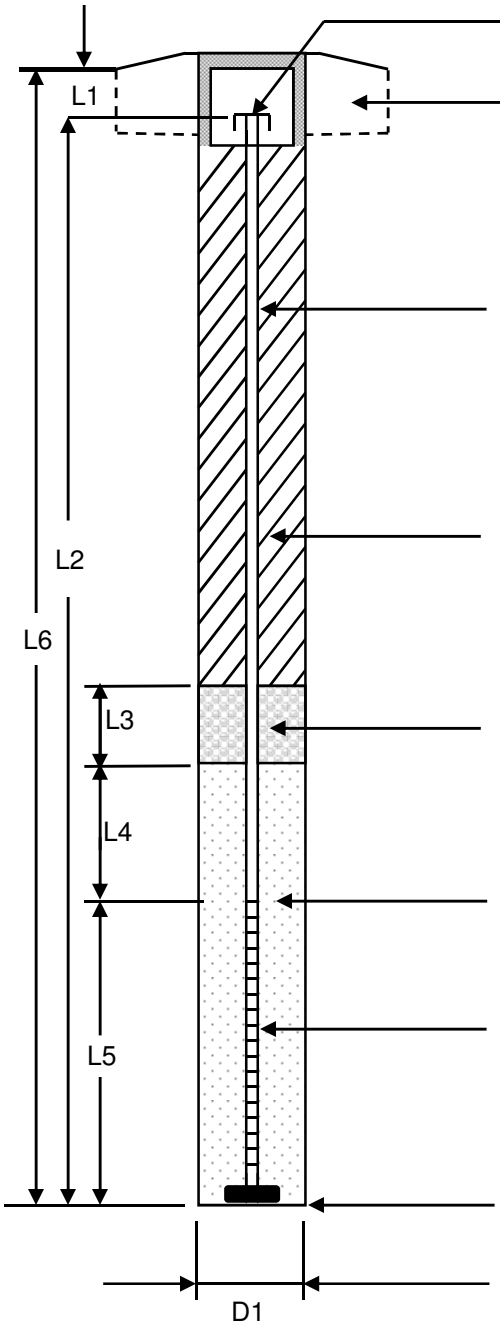
SQUARE NUMBER: 2811

WELL OWNER:
E2CR, Inc.

OWNER ADDRESS:
1405-A Parker Road

Baltimore, MD 21227

D.C. WELL APPLICATION SCHEMATIC FORM



LOCKABLE CAP

PROTECTIVE CASING AND CONCRETE PAD

TOP OF CASING TO GROUND SURFACE (L1) (inches): ~3

PAD DIMENSIONS: 2'x2'

HEIGHT ABOVE GROUND: Flush

WELL CASING

MATERIAL: PVC

INTERNAL DIAMETER (inches): 2

JOINT TYPE: Threaded

LENGTH (L2) (Feet): 25

GROUT AROUND CASING

MATERIAL: Portland & Bentonite

MIX RATIO OF SOLIDS: 94 lbs cement/150 lbs bentonite

MIX RATIO SOLIDS:WATER: 82 gal of water

LOW PERMEABILITY SEAL

MATERIAL: Bentonite

HEIGHT ABOVE FILTER PACK (L3) (Feet): 2

FILTER PACK

TYPE OF FILTER: 20/40 Silica Sand

HEIGHT ABOVE SCREEN (L4) (Feet): 2

WELL SCREEN

SCREEN MATERIAL: PVC Pre-packed

LENGTH (L5) (Feet): 5

SLOT SIZE: 0.010-inch

DEPTH TO THE BOTTOM OF WELL (L6) (Feet): 30

DIAMETER OF BOREHOLE (D1) (inches): 8

WELL ANNULUS (inches): 2

APPLICATION DATE: 9/15/2021

WELL ID NUMBER: MW-004

WELL ADDRESSS: 4615 14TH Street NW
Washington D.C. 20011

LOT NUMBER: 0801

SQUARE NUMBER: 2811

WELL OWNER:
E2CR, Inc.

OWNER ADDRESS:
1405-A Parker Road

Baltimore, MD 21227

APPENDIX B – U.S. EPA: LOW STRESS (LOW FLOW) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUND WATER SAMPLES FROM MONITORING WELLS, SEPTEMBER 19, 2017

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

LOW STRESS (low flow) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUNDWATER SAMPLES FROM MONITORING WELLS

Quality Assurance Unit
U.S. Environmental Protection Agency – Region 1
11 Technology Drive
North Chelmsford, MA 01863

The controlled version of this document is the electronic version viewed on-line only. If this is a printed copy of the document, it is an uncontrolled version and may or may not be the version currently in use.

This document contains direction developed solely to provide guidance to U.S. Environmental Protection Agency (EPA) personnel. EPA retains the discretion to adopt approaches that differ from these procedures on a case-by-case basis. The procedures set forth do not create any rights, substantive or procedural, enforceable at law by party to litigation with EPA or the United States.

Prepared by:_____ _____
(Robert Reinhart, Quality Assurance Unit) Date

Approved by:_____ _____
(John Smaldone, Quality Assurance Unit) Date

Revision Page

Date	Rev #	Summary of changes	Sections
7/30/96	1	Finalized	
01/19/10	2	Updated	All sections
3/23/17	3	Updated	All sections
9/20/17	4	Updated	Section 7.0

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1.0 USE OF TERMS

Equipment blank: The equipment blank shall include the pump and the pump's tubing. If tubing is dedicated to the well, the equipment blank needs only to include the pump in subsequent sampling rounds. If the pump and tubing are dedicated to the well, the equipment blank is collected prior to its placement in the well. If the pump and tubing will be used to sample multiple wells, the equipment blank is normally collected after sampling from contaminated wells and not after background wells.

Field duplicates: Field duplicates are collected to determine precision of the sampling procedure. For this procedure, collect duplicate for each analyte group in consecutive order (VOC original, VOC duplicate, SVOC original, SVOC duplicate, etc.).

Indicator field parameters: This SOP uses field measurements of turbidity, dissolved oxygen, specific conductance, temperature, pH, and oxidation/reduction potential (ORP) as indicators of when purging operations are sufficient and sample collection may begin.

Matrix Spike/Matrix Spike Duplicates: Used by the laboratory in its quality assurance program. Consult the laboratory for the sample volume to be collected.

Potentiometric Surface: The level to which water rises in a tightly cased well constructed in a confined aquifer. In an unconfined aquifer, the potentiometric surface is the water table.

QAPP: Quality Assurance Project Plan

SAP: Sampling and Analysis Plan

SOP: Standard operating procedure

Stabilization: A condition that is achieved when all indicator field parameter measurements are sufficiently stable (as described in the "Monitoring Indicator Field Parameters" section) to allow sample collection to begin.

Temperature blank: A temperature blank is added to each sample cooler. The blank is measured upon receipt at the laboratory to assess whether the samples were properly cooled during transit.

Trip blank (VOCs): Trip blank is a sample of analyte-free water taken to the sampling site and returned to the laboratory. The trip blanks (one pair) are added to each sample cooler that contains VOC samples.

2.0 SCOPE & APPLICATION

The goal of this groundwater sampling procedure is to collect water samples that reflect the total mobile organic and inorganic loads (dissolved and colloidal sized fractions) transported through the subsurface under ambient flow conditions, with minimal physical and chemical alterations from sampling operations. This standard operating procedure (SOP) for collecting groundwater samples will help ensure that the project's data quality objectives (DQOs) are met under certain low-flow conditions.

The SOP emphasizes the need to minimize hydraulic stress at the well-aquifer interface by maintaining low water-level drawdowns, and by using low pumping rates during purging and sampling operations. Indicator field parameters (e.g., dissolved oxygen, pH, etc.) are monitored during purging in order to determine when sample collection may begin. Samples properly collected using this SOP are suitable for analysis of groundwater contaminants (volatile and semi-volatile organic analytes, dissolved gases, pesticides, PCBs, metals and other inorganics), or naturally occurring analytes. This SOP is based on Puls, and Barcelona (1996).

This procedure is designed for monitoring wells with an inside diameter (1.5-inches or greater) that can accommodate a positive lift pump with a screen length or open interval ten feet or less and with a water level above the top of the screen or open interval (Hereafter, the "screen or open interval" will be referred to only as "screen interval"). This SOP is not applicable to other well-sampling conditions.

While the use of dedicated sampling equipment is not mandatory, dedicated pumps and tubing can reduce sampling costs significantly by streamlining sampling activities and thereby reducing the overall field costs.

The goal of this procedure is to emphasize the need for consistency in deploying and operating equipment while purging and sampling monitoring wells during each sampling event. This will help to minimize sampling variability.

This procedure describes a general framework for groundwater sampling. Other site specific information (hydrogeological context, conceptual site model (CSM), DQOs, etc.) coupled with systematic planning must be added to the procedure in order to develop an appropriate site specific SAP/QAPP. In addition, the site specific SAP/QAPP must identify the specific equipment that will be used to collect the groundwater samples.

This procedure does not address the collection of water or free product samples from wells containing free phase LNAPLs and/or DNAPLs (light or dense non-aqueous phase

liquids). For this type of situation, the reader may wish to check: Cohen, and Mercer (1993) or other pertinent documents.

This SOP is to be used when collecting groundwater samples from monitoring wells at all Superfund, Federal Facility and RCRA sites in Region 1 under the conditions described herein. Request for modification of this SOP, in order to better address specific situations at individual wells, must include adequate technical justification for proposed changes. All changes and modifications must be approved and included in a revised SAP/QAPP before implementation in field.

3.0 BACKGROUND FOR IMPLEMENTATION

It is expected that the monitoring well screen has been properly located (both laterally and vertically) to intercept existing contaminant plume(s) or along flow paths of potential contaminant migration. Problems with inappropriate monitoring well placement or faulty/improper well installation cannot be overcome by even the best water sampling procedures. This SOP presumes that the analytes of interest are moving (or will potentially move) primarily through the more permeable zones intercepted by the screen interval.

Proper well construction, development, and operation and maintenance cannot be overemphasized. The use of installation techniques that are appropriate to the hydrogeologic setting of the site often prevent "problem well" situations from occurring. During well development, or redevelopment, tests should be conducted to determine the hydraulic characteristics of the monitoring well. The data can then be used to set the purging/sampling rate, and provide a baseline for evaluating changes in well performance and the potential need for well rehabilitation. Note: if this installation data or well history (construction and sampling) is not available or discoverable, for all wells to be sampled, efforts to build a sampling history should commence with the next sampling event.

The pump intake should be located within the screen interval and at a depth that will remain under water at all times. It is recommended that the intake depth and pumping rate remain the same for all sampling events. The mid-point or the lowest historical midpoint of the saturated screen length is often used as the location of the pump intake. For new wells, or for wells without pump intake depth information, the site's SAP/QAPP must provide clear reasons and instructions on how the pump intake depth(s) will be selected, and reason(s) for the depth(s) selected. If the depths to top and bottom of the well screen are not known, the SAP/QAPP will need to describe how the sampling depth will be determined and how the data can be used.

Stabilization of indicator field parameters is used to indicate that conditions are suitable for sampling to begin. Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. Sample collection

may still take place provided the indicator field parameter criteria in this procedure are met. If after 2 hours of purging indicator field parameters have not stabilized, one of three optional courses of action may be taken: a) continue purging until stabilization is achieved, b) discontinue purging, do not collect any samples, and record in log book that stabilization could not be achieved (documentation must describe attempts to achieve stabilization), c) discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization (note: there is a risk that the analytical data obtained, especially metals and strongly hydrophobic organic analytes, may reflect a sampling bias and therefore, the data may not meet the data quality objectives of the sampling event).

It is recommended that low-flow sampling be conducted when the air temperature is above 32°F (0°C). If the procedure is used below 32°F, special precautions will need to be taken to prevent the groundwater from freezing in the equipment. Because sampling during freezing temperatures may adversely impact the data quality objectives, the need for water sample collection during months when these conditions are likely to occur should be evaluated during site planning and special sampling measures may need to be developed. Ice formation in the flow-through-cell will cause the monitoring probes to act erratically. A transparent flow-through-cell needs to be used to observe if ice is forming in the cell. If ice starts to form on the other pieces of the sampling equipment, additional problems may occur.

4.0 HEALTH & SAFETY

When working on-site, comply with all applicable OSHA requirements and the site's health/safety procedures. All proper personal protection clothing and equipment are to be worn. Some samples may contain biological and chemical hazards. These samples should be handled with suitable protection to skin, eyes, etc.

5.0 CAUTIONS

The following cautions need to be considered when planning to collect groundwater samples when the below conditions occur.

If the groundwater degasses during purging of the monitoring well, dissolved gases and VOCs will be lost. When this happens, the groundwater data for dissolved gases (e.g., methane, ethene, ethane, dissolved oxygen, etc.) and VOCs will need to be qualified. Some conditions that can promote degassing are the use of a vacuum pump (e.g., peristaltic pumps), changes in aperture along the sampling tubing, and squeezing/pinching the pump's tubing which results in a pressure change.

When collecting the samples for dissolved gases and VOCs analyses, avoid aerating the groundwater in the pump's tubing. This can cause loss of the dissolved gases and VOCs in

the groundwater. Having the pump's tubing completely filled prior to sampling will avoid this problem when using a centrifugal pump or peristaltic pump.

Direct sun light and hot ambient air temperatures may cause the groundwater in the tubing and flow-through-cell to heat up. This may cause the groundwater to degas which will result in loss of VOCs and dissolved gases. When sampling under these conditions, the sampler will need to shade the equipment from the sunlight (e.g., umbrella, tent, etc.). If possible, sampling on hot days, or during the hottest time of the day, should be avoided. The tubing exiting the monitoring well should be kept as short as possible to avoid the sun light or ambient air from heating up the groundwater.

Thermal currents in the monitoring well may cause vertical mixing of water in the well bore. When the air temperature is colder than the groundwater temperature, it can cool the top of the water column. Colder water which is denser than warm water sinks to the bottom of the well and the warmer water at the bottom of the well rises, setting up a convection cell. "During low-flow sampling, the pumped water may be a mixture of convecting water from within the well casing and aquifer water moving inward through the screen. This mixing of water during low-flow sampling can substantially increase equilibration times, can cause false stabilization of indicator parameters, can give false indication of redox state, and can provide biological data that are not representative of the aquifer conditions" (Vroblesky 2007).

Failure to calibrate or perform proper maintenance on the sampling equipment and measurement instruments (e.g., dissolved oxygen meter, etc.) can result in faulty data being collected.

Interferences may result from using contaminated equipment, cleaning materials, sample containers, or uncontrolled ambient/surrounding air conditions (e.g., truck/vehicle exhaust nearby).

Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment and/or proper planning to avoid ambient air interferences. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

Clean and decontaminate all sampling equipment prior to use. All sampling equipment needs to be routinely checked to be free from contaminants and equipment blanks collected to ensure that the equipment is free of contaminants. Check the previous equipment blank data for the site (if they exist) to determine if the previous cleaning procedure removed the contaminants. If contaminants were detected and they are a concern, then a more vigorous cleaning procedure will be needed.

6.0 PERSONNEL QUALIFICATIONS

All field samplers working at sites containing hazardous waste must meet the requirements of the OSHA regulations. OSHA regulations may require the sampler to take the 40 hour OSHA health and safety training course and a refresher course prior to engaging in any field activities, depending upon the site and field conditions.

The field samplers must be trained prior to the use of the sampling equipment, field instruments, and procedures. Training is to be conducted by an experienced sampler before initiating any sampling procedure.

The entire sampling team needs to read, and be familiar with, the site Health and Safety Plan, all relevant SOPs, and SAP/QAPP (and the most recent amendments) before going onsite for the sampling event. It is recommended that the field sampling leader attest to the understanding of these site documents and that it is recorded.

7.0 EQUIPMENT AND SUPPLIES

A. Informational materials for sampling event

A copy of the current Health and Safety Plan, SAP/QAPP, monitoring well construction data, location map(s), field data from last sampling event, manuals for sampling, and the monitoring instruments' operation, maintenance, and calibration manuals should be brought to the site.

B. Well keys.

C. Extraction device

Adjustable rate, submersible pumps (e.g., centrifugal, bladder, etc.) which are constructed of stainless steel or polytetrafluoroethylene (PTFE, i.e. Teflon®) are preferred. PTFE, however, should not be used when sampling for per- and polyfluoroalkyl substances (PFAS) as it is likely to contain these substances.

Note: If extraction devices constructed of other materials are to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

If bladder pumps are selected for the collection of VOCs and dissolved gases, the pump setting should be set so that one pulse will deliver a water volume that is sufficient to fill a 40 mL VOC vial. This is not mandatory, but is considered a "best practice". For the proper operation, the bladder pump will need a minimum amount of water above the pump; consult the manufacturer for the recommended submergence. The pump's recommended submergence value should be determined during the planning stage, since it may influence well construction and placement of dedicated pumps where water-level fluctuations are significant.

Adjustable rate, peristaltic pumps (suction) are to be used with caution when collecting samples for VOCs and dissolved gases (e.g., methane, carbon dioxide, etc.) analyses. Additional information on the use of peristaltic pumps can be found in Appendix A. If peristaltic pumps are used, the inside diameter of the rotor head tubing needs to match the inside diameter of the tubing installed in the monitoring well.

Inertial pumping devices (motor driven or manual) are not recommended. These devices frequently cause greater disturbance during purging and sampling, and are less easily controlled than submersible pumps (potentially increasing turbidity and sampling variability, etc.). This can lead to sampling results that are adversely affected by purging and sampling operations, and a higher degree of data variability.

D. Tubing

PTFE (Teflon®) or PTFE-lined polyethylene tubing are preferred when sampling is to include VOCs, SVOCs, pesticides, PCBs and inorganics. As discussed in the previous section, PTFE tubing should not be used when sampling for PFAS. In this case, a suitable alternative such as high-density polyethylene tubing should be used.

PVC, polypropylene or polyethylene tubing may be used when collecting samples for metal and other inorganics analyses.

Note: If tubing constructed of other materials is to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

The use of 1/4 inch or 3/8 inch (inside diameter) tubing is recommended. This will help ensure that the tubing remains liquid filled when operating at very low pumping rates when using centrifugal and peristaltic pumps.

Silastic tubing should be used for the section around the rotor head of a peristaltic pump. It should be less than a foot in length. The inside diameter of the tubing used at the pump rotor head must be the same as the inside diameter of tubing placed in the well. A tubing connector is used to connect the pump rotor head tubing to the well tubing. Alternatively, the two pieces of tubing can be connected to each other by placing the one end of the tubing inside the end of the other tubing. The tubing must not be reused.

E. The water level measuring device

Electronic ”tape”, pressure transducer, water level sounder/level indicator, etc. should be capable of measuring to 0.01 foot accuracy. Recording pressure transducers, mounted above the pump, are especially helpful in tracking water levels during pumping operations, but their use must include check measurements with a water level “tape” at the start and end of each sampling event.

F. Flow measurement supplies

Graduated cylinder (size according to flow rate) and stopwatch usually will suffice.

Large graduated bucket used to record total water purged from the well.

G. Interface probe

To be used to check on the presence of free phase liquids (LNAPL, or DNAPL) before purging begins (as needed).

H. Power source (generator, nitrogen tank, battery, etc.)

When a gasoline generator is used, locate it downwind and at least 30 feet from the well so that the exhaust fumes do not contaminate samples.

I. Indicator field parameter monitoring instruments

Use of a multi-parameter instrument capable of measuring pH, oxidation/reduction potential (ORP), dissolved oxygen (DO), specific conductance, temperature, and coupled with a flow-through-cell is required when measuring all indicator field parameters, except turbidity. Turbidity is collected using a separate instrument. Record equipment/instrument identification (manufacturer, and model number).

Transparent, small volume flow-through-cells (e.g., 250 mLs or less) are preferred. This allows observation of air bubbles and sediment buildup in the cell, which can interfere with the operation of the monitoring instrument probes, to be easily detected. A small volume

cell facilitates rapid turnover of water in the cell between measurements of the indicator field parameters.

It is recommended to use a flow-through-cell and monitoring probes from the same manufacturer and model to avoid incompatibility between the probes and flow-through-cell.

Turbidity samples are collected before the flow-through-cell. A "T" connector coupled with a valve is connected between the pump's tubing and flow-through-cell. When a turbidity measurement is required, the valve is opened to allow the groundwater to flow into a container. The valve is closed and the container sample is then placed in the turbidimeter.

Standards are necessary to perform field calibration of instruments. A minimum of two standards are needed to bracket the instrument measurement range for all parameters except ORP which use a Zobell solution as a standard. For dissolved oxygen, a wet sponge used for the 100% saturation and a zero dissolved oxygen solution are used for the calibration.

Barometer (used in the calibration of the Dissolved Oxygen probe) and the conversion formula to convert the barometric pressure into the units of measure used by the Dissolved Oxygen meter are needed.

J. Decontamination supplies

Includes (for example) non-phosphate detergent, distilled/deionized water, isopropyl alcohol, etc.

K. Record keeping supplies

Logbook(s), well purging forms, chain-of-custody forms, field instrument calibration forms, etc.

L. Sample bottles

M. Sample preservation supplies (as required by the analytical methods)

N. Sample tags or labels

O. PID or FID instrument

If appropriate, to detect VOCs for health and safety purposes, and provide qualitative field evaluations.

P. Miscellaneous Equipment

Equipment to keep the sampling apparatus shaded in the summer (e.g., umbrella) and from freezing in the winter. If the pump's tubing is allowed to heat up in the warm weather, the cold groundwater may degas as it is warmed in the tubing.

8.0 EQUIPMENT/INSTRUMENT CALIBRATION

Prior to the sampling event, perform maintenance checks on the equipment and instruments according to the manufacturer's manual and/or applicable SOP. This will ensure that the equipment/instruments are working properly before they are used in the field.

Prior to sampling, the monitoring instruments must be calibrated and the calibration documented. The instruments are calibrated using U.S Environmental Protection Agency Region 1 *Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction [ORP], and turbidity),* March 23, 2017, or latest version or from one of the methods listed in 40CFR136, 40CFR141 and SW-846.

The instruments shall be calibrated at the beginning of each day. If the field measurement falls outside the calibration range, the instrument must be re-calibrated so that all measurements fall within the calibration range. At the end of each day, a calibration check is performed to verify that instruments remained in calibration throughout the day. This check is performed while the instrument is in measurement mode, not calibration mode. If the field instruments are being used to monitor the natural attenuation parameters, then a calibration check at mid-day is highly recommended to ensure that the instruments did not drift out of calibration. Note: during the day if the instrument reads zero or a negative number for dissolved oxygen, pH, specific conductance, or turbidity (negative value only), this indicates that the instrument drifted out of calibration or the instrument is malfunctioning. If this situation occurs the data from this instrument will need to be qualified or rejected.

9.0 PRELIMINARY SITE ACTIVITIES (as applicable)

Check the well for security (damage, evidence of tampering, missing lock, etc.) and record pertinent observations (include photograph as warranted).

If needed, lay out a sheet of clean polyethylene for monitoring and sampling equipment, unless equipment is elevated above the ground (e.g., on a table, etc.).

Remove well cap and if appropriate measure VOCs at the rim of the well with a PID or FID instrument and record reading in field logbook or on the well purge form.

If the well casing does not have an established reference point (usually a V-cut or indelible mark in the well casing), make one. Describe its location and record the date of the mark in the logbook (consider a photographic record as well). All water level measurements must be recorded relative to this reference point (and the altitude of this point should be determined using techniques that are appropriate to site's DQOs.

If water-table or potentiometric surface map(s) are to be constructed for the sampling event, perform synoptic water level measurement round (in the shortest possible time) before any purging and sampling activities begin. If possible, measure water level depth (to 0.01 ft.) and total well depth (to 0.1 ft.) the day before sampling begins, in order to allow for re-settlement of any particulates in the water column. This is especially important for those wells that have not been recently sampled because sediment buildup in the well may require the well to be redeveloped. If measurement of total well depth is not made the day before, it should be measured after sampling of the well is complete. All measurements must be taken from the established referenced point. Care should be taken to minimize water column disturbance.

Check newly constructed wells for the presence of LNAPLs or DNAPLs before the initial sampling round. If none are encountered, subsequent check measurements with an interface probe may not be necessary unless analytical data or field analysis signal a worsening situation. This SOP cannot be used in the presence of LNAPLs or DNAPLs. If NAPLs are present, the project team must decide upon an alternate sampling method. All project modifications must be approved and documented prior to implementation.

If available check intake depth and drawdown information from previous sampling event(s) for each well. Duplicate, to the extent practicable, the intake depth and extraction rate (use final pump dial setting information) from previous event(s). If changes are made in the intake depth or extraction rate(s) used during previous sampling event(s), for either portable or dedicated extraction devices, record new values, and explain reasons for the changes in the field logbook.

10.0 PURGING AND SAMPLING PROCEDURE

Purging and sampling wells in order of increasing chemical concentrations (known or anticipated) are preferred.

The use of dedicated pumps is recommended to minimize artificial mobilization and entrainment of particulates each time the well is sampled. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

A. Initial Water Level

Measure the water level in the well before installing the pump if a non-dedicated pump is being used. The initial water level is recorded on the purge form or in the field logbook.

B. Install Pump

Lower pump, safety cable, tubing and electrical lines slowly (to minimize disturbance) into the well to the appropriate depth (may not be the mid-point of the screen/open interval). The Sampling and Analysis Plan/Quality Assurance Project Plan should specify the sampling depth (used previously), or provide criteria for selection of intake depth for each new well. If possible keep the pump intake at least two feet above the bottom of the well, to minimize mobilization of particulates present in the bottom of the well.

Pump tubing lengths, above the top of well casing should be kept as short as possible to minimize heating the groundwater in the tubing by exposure to sun light and ambient air temperatures. Heating may cause the groundwater to degas, which is unacceptable for the collection of samples for VOC and dissolved gases analyses.

C. Measure Water Level

Before starting pump, measure water level. Install recording pressure transducer, if used to track drawdowns, to initialize starting condition.

D. Purge Well

From the time the pump starts purging and until the time the samples are collected, the purged water is discharged into a graduated bucket to determine the total volume of groundwater purged. This information is recorded on the purge form or in the field logbook.

Start the pump at low speed and slowly increase the speed until discharge occurs. Check water level. Check equipment for water leaks and if present fix or replace the affected equipment. Try to match pumping rate used during previous sampling event(s). Otherwise, adjust pump speed until there is little or no water level drawdown. If the

minimal drawdown that can be achieved exceeds 0.3 feet, but remains stable, continue purging.

Monitor and record the water level and pumping rate every five minutes (or as appropriate) during purging. Record any pumping rate adjustments (both time and flow rate). Pumping rates should, as needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. During pump start-up, drawdown may exceed the 0.3 feet target and then "recover" somewhat as pump flow adjustments are made. Purge volume calculations should utilize stabilized drawdown value, not the initial drawdown. If the initial water level is above the top of the screen do not allow the water level to fall into the well screen. The final purge volume must be greater than the stabilized drawdown volume plus the pump's tubing volume. If the drawdown has exceeded 0.3 feet and stabilizes, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are collected.

Avoid the use of constriction devices on the tubing to decrease the flow rate because the constrictor will cause a pressure difference in the water column. This will cause the groundwater to degas and result in a loss of VOCs and dissolved gasses in the groundwater samples.

Note: the flow rate used to achieve a stable pumping level should remain constant while monitoring the indicator parameters for stabilization and while collecting the samples.

Wells with low recharge rates may require the use of special pumps capable of attaining very low pumping rates (e.g., bladder, peristaltic), and/or the use of dedicated equipment. For new monitoring wells, or wells where the following situation has not occurred before, if the recovery rate to the well is less than 50 mL/min., or the well is being essentially dewatered during purging, the well should be sampled as soon as the water level has recovered sufficiently to collect the volume needed for all anticipated samples. The project manager or field team leader will need to make the decision when samples should be collected, how the sample is to be collected, and the reasons recorded on the purge form or in the field logbook. A water level measurement needs to be performed and recorded before samples are collected. If the project manager decides to collect the samples using the pump, it is best during this recovery period that the pump intake tubing not be removed, since this will aggravate any turbidity problems. Samples in this specific situation may be collected without stabilization of indicator field parameters. Note that field conditions and efforts to overcome problematic situations must be recorded in order to support field decisions to deviate from normal procedures described in this SOP. If this type of problematic situation persists in a well, then water sample collection should be

changed to a passive or no-purge method, if consistent with the site's DQOs, or have a new well installed.

E. Monitor Indicator Field Parameters

After the water level has stabilized, connect the "T" connector with a valve and the flow-through-cell to monitor the indicator field parameters. If excessive turbidity is anticipated or encountered with the pump startup, the well may be purged for a while without connecting up the flow-through-cell, in order to minimize particulate buildup in the cell (This is a judgment call made by the sampler). Water level drawdown measurements should be made as usual. If possible, the pump may be installed the day before purging to allow particulates that were disturbed during pump insertion to settle.

During well purging, monitor indicator field parameters (turbidity, temperature, specific conductance, pH, ORP, DO) at a frequency of five minute intervals or greater. The pump's flow rate must be able to "turn over" at least one flow-through-cell volume between measurements (for a 250 mL flow-through-cell with a flow rate of 50 mLs/min., the monitoring frequency would be every five minutes; for a 500 mL flow-through-cell it would be every ten minutes). If the cell volume cannot be replaced in the five minute interval, then the time between measurements must be increased accordingly. Note: during the early phase of purging, emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments followed by stabilization of indicator parameters. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings are within the following limits:

Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

All measurements, except turbidity, must be obtained using a flow-through-cell. Samples for turbidity measurements are obtained before water enters the flow-through-cell. Transparent flow-through-cells are preferred, because they allow field personnel to watch for particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell. If the cell needs to be cleaned during purging operations, continue pumping and disconnect cell for cleaning, then reconnect after cleaning and

continue monitoring activities. Record start and stop times and give a brief description of cleaning activities.

The flow-through-cell must be designed in a way that prevents gas bubble entrapment in the cell. Placing the flow-through-cell at a 45 degree angle with the port facing upward can help remove bubbles from the flow-through-cell (see Appendix B Low-Flow Setup Diagram). Throughout the measurement process, the flow-through-cell must remain free of any gas bubbles. Otherwise, the monitoring probes may act erratically. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must remain submerged in water at all times.

F. Collect Water Samples

When samples are collected for laboratory analyses, the pump's tubing is disconnected from the "T" connector with a valve and the flow-through-cell. The samples are collected directly from the pump's tubing. Samples must not be collected from the flow-through-cell or from the "T" connector with a valve.

VOC samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

If the pump's flow rate is too high to collect the VOC/dissolved gases samples, collect the other samples first. Lower the pump's flow rate to a reasonable rate and collect the VOC/dissolved gases samples and record the new flow rate.

During purging and sampling, the centrifugal/peristaltic pump tubing must remain filled with water to avoid aeration of the groundwater. It is recommended that 1/4 inch or 3/8 inch (inside diameter) tubing be used to help ensure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, use the following procedure to collect samples: collect non-VOC/dissolved gases samples first, then increase flow rate slightly until the water completely fills the tubing, collect the VOC/dissolved gases samples, and record new drawdown depth and flow rate.

For bladder pumps that will be used to collect VOC or dissolved gas samples, it is recommended that the pump be set to deliver long pulses of water so that one pulse will fill a 40 mL VOC vial.

Use pre-preserved sample containers or add preservative, as required by analytical methods, to the samples immediately after they are collected. Check the analytical methods

(e.g. EPA SW-846, 40 CFR 136, water supply, etc.) for additional information on preservation.

If determination of filtered metal concentrations is a sampling objective, collect filtered water samples using the same low flow procedures. The use of an in-line filter (transparent housing preferred) is required, and the filter size (0.45 µm is commonly used) should be based on the sampling objective. Pre-rinse the filter with groundwater prior to sample collection. Make sure the filter is free of air bubbles before samples are collected. Preserve the filtered water sample immediately. Note: filtered water samples are not an acceptable substitute for unfiltered samples when the monitoring objective is to obtain chemical concentrations of total mobile contaminants in groundwater for human health or ecological risk calculations.

Label each sample as collected. Samples requiring cooling will be placed into a cooler with ice or refrigerant for delivery to the laboratory. Metal samples after acidification to a pH less than 2 do not need to be cooled.

G. Post Sampling Activities

If a recording pressure transducer is used to track drawdown, re-measure water level with tape.

After collection of samples, the pump tubing may be dedicated to the well for re-sampling (by hanging the tubing inside the well), decontaminated, or properly discarded.

Before securing the well, measure and record the well depth (to 0.1 ft.), if not measured the day before purging began. Note: measurement of total well depth annually is usually sufficient after the initial low stress sampling event. However, a greater frequency may be needed if the well has a “silting” problem or if confirmation of well identity is needed.

Secure the well.

11.0 DECONTAMINATION

Decontaminate sampling equipment prior to use in the first well, and then following sampling of each subsequent well. Pumps should not be removed between purging and sampling operations. The pump, tubing, support cable and electrical wires which were in contact with the well should be decontaminated by one of the procedures listed below.

The use of dedicated pumps and tubing will reduce the amount of time spent on decontamination of the equipment. If dedicated pumps and tubing are used, only the initial sampling event will require decontamination of the pump and tubing.

Note if the previous equipment blank data showed that contaminant(s) were present after using the below procedure or the one described in the SAP/QAPP, a more vigorous procedure may be needed.

Procedure 1

Decontaminating solutions can be pumped from either buckets or short PVC casing sections through the pump and tubing. The pump may be disassembled and flushed with the decontaminating solutions. It is recommended that detergent and alcohol be used sparingly in the decontamination process and water flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

Flush the equipment/pump with potable water.

Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

Optional - flush with isopropyl alcohol (pesticide grade; must be free of ketones {e.g., acetone}) or with methanol. This step may be required if the well is highly contaminated or if the equipment blank data from the previous sampling event show that the level of contaminants is significant.

Flush with distilled/deionized water. This step must remove all traces of alcohol (if used) from the equipment. The final water rinse must not be recycled.

Procedure 2

Steam clean the outside of the submersible pump.

Pump hot potable water from the steam cleaner through the inside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with end cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.

Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

12.0 FIELD QUALITY CONTROL

Quality control samples are required to verify that the sample collection and handling process has not compromised the quality of the groundwater samples. All field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation. Quality control samples include field duplicates, equipment blanks, matrix spike/matrix spike duplicates, trip blanks (VOCs), and temperature blanks.

13.0 FIELD LOGBOOK

A field log shall be kept to document all groundwater field monitoring activities (see Appendix C, example table), and record the following for each well:

Site name, municipality, state.

Well identifier, latitude-longitude or state grid coordinates.

Measuring point description (e.g., north side of PVC pipe).

Well depth, and measurement technique.

Well screen length.

Pump depth.

Static water level depth, date, time and measurement technique.

Presence and thickness of immiscible liquid (NAPL) layers and detection method.

Pumping rate, drawdown, indicator parameters values, calculated or measured total volume pumped, and clock time of each set of measurements.

Type of tubing used and its length.

Type of pump used.

Clock time of start and end of purging and sampling activity.

Types of sample bottles used and sample identification numbers.

Preservatives used.

Parameters requested for analyses.

Field observations during sampling event.

Name of sample collector(s).

Weather conditions, including approximate ambient air temperature.

QA/QC data for field instruments.

Any problems encountered should be highlighted.

Description of all sampling/monitoring equipment used, including trade names, model number, instrument identification number, diameters, material composition, etc.

14.0 DATA REPORT

Data reports are to include laboratory analytical results, QA/QC information, field indicator parameters measured during purging, field instrument calibration information, and whatever other field logbook information is needed to allow for a full evaluation of data usability.

Note: the use of trade, product, or firm names in this sampling procedure is for descriptive purposes only and does not constitute endorsement by the U.S. EPA.

15.0 REFERENCES

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APPENDIX A

PERISTALTIC PUMPS

Before selecting a peristaltic pump to collect groundwater samples for VOCs and/or dissolved gases, (e.g., methane, carbon dioxide, etc.) consideration should be given to the following:

- The decision of whether or not to use a peristaltic pump is dependent on the intended use of the data.
- If the additional sampling error that may be introduced by this device is NOT of concern for the VOC/dissolved gases data's intended use, then this device may be acceptable.
- If minor differences in the groundwater concentrations could affect the decision, such as to continue or terminate groundwater cleanup or whether the cleanup goals have been reached, then this device should NOT be used for VOC/dissolved gases sampling. In these cases, centrifugal or bladder pumps are a better choice for more accurate results.

EPA and USGS have documented their concerns with the use of the peristaltic pumps to collect water sample in the below documents.

- "Suction Pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds" *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, December 1987.
- "The agency does not recommend the use of peristaltic pumps to sample ground water particularly for volatile organic analytes" *RCRA Ground-Water Monitoring Draft Technical Guidance*, EPA Office of Solid Waste, November 1992.
- "The peristaltic pump is limited to shallow applications and can cause degassing resulting in alteration of pH, alkalinity, and volatiles loss", *Low-flow (Minimal drawdown) Ground-Water Sampling Procedures*, by Robert Puls & Michael Barcelona, April 1996, EPA/540/S-95/504.
- "Suction-lift pumps, such as peristaltic pumps, can operate at a very low pumping rate; however, using negative pressure to lift the sample can result in the loss of volatile analytes", USGS Book 9 Techniques of Water-Resources Investigation, Chapter A4. (Version 2.0, 9/2006).

APPENDIX B

SUMMARY OF SAMPLING INSTRUCTIONS

These instructions are for using an adjustable rate, submersible pump or a peristaltic pump with the pump's intake placed at the midpoint of a 10 foot or less well screen or an open interval. The water level in the monitoring well is above the top of the well screen or open interval, the ambient temperature is above 32°F, and the equipment is not dedicated. Field instruments are already calibrated. The equipment is setup according to the diagram at the end of these instructions.

1. Review well installation information. Record well depth, length of screen or open interval, and depth to top of the well screen. Determine the pump's intake depth (e.g., mid-point of screen/open interval).

2. On the day of sampling, check security of the well casing, perform any safety checks needed for the site, lay out a sheet of polyethylene around the well (if necessary), and setup the equipment. If necessary a canopy or an equivalent item can be setup to shade the pump's tubing and flow-through-cell from the sun light to prevent the sun light from heating the groundwater.

3. Check well casing for a reference mark. If missing, make a reference mark. Measure the water level (initial) to 0.01 ft. and record this information.

4. Install the pump's intake to the appropriate depth (e.g., midpoint) of the well screen or open interval. Do not turn-on the pump at this time.

5. Measure water level and record this information.

6. Turn-on the pump and discharge the groundwater into a graduated waste bucket. Slowly increase the flow rate until the water level starts to drop. Reduce the flow rate slightly so the water level stabilizes. Record the pump's settings. Calculate the flow rate using a graduated container and a stop watch. Record the flow rate. Do not let the water level drop below the top of the well screen.

If the groundwater is highly turbid or discolored, continue to discharge the water into the bucket until the water clears (visual observation); this usually takes a few minutes. The turbid or discolored water is usually from the well-being disturbed during the pump installation. If the water does not clear, then you need to make a choice whether to continue purging the well (hoping that it will clear after a reasonable time) or continue to

the next step. Note, it is sometimes helpful to install the pump the day before the sampling event so that the disturbed materials in the well can settle out.

If the water level drops to the top of the well screen during the purging of the well, stop purging the well, and do the following:

> Wait for the well to recharge to a sufficient volume so samples can be collected. This may take a while (pump may be removed from well, if turbidity is not a problem). The project manager will need to make the decision when samples should be collected and the reasons recorded in the site's log book. A water level measurement needs to be performed and recorded before samples are collected. When samples are being collected, the water level must not drop below the top of the screen or open interval. Collect the samples from the pump's tubing. Always collect the VOCs and dissolved gases samples first. Normally, the samples requiring a small volume are collected before the large volume samples are collected just in case there is not sufficient water in the well to fill all the sample containers. All samples must be collected, preserved, and stored according to the analytical method. Remove the pump from the well and decontaminate the sampling equipment.

If the water level has dropped 0.3 feet or less from the initial water level (water level measure before the pump was installed); proceed to Step 7. If the water level has dropped more than 0.3 feet, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are be collected.

7. Attach the pump's tubing to the "T" connector with a valve (or a three-way stop cock). The pump's tubing from the well casing to the "T" connector must be as short as possible to prevent the groundwater in the tubing from heating up from the sun light or from the ambient air. Attach a short piece of tubing to the other end of the end of the "T" connector to serve as a sampling port for the turbidity samples. Attach the remaining end of the "T" connector to a short piece of tubing and connect the tubing to the flow-through-cell bottom port. To the top port, attach a small piece of tubing to direct the water into a calibrated waste bucket. Fill the cell with the groundwater and remove all gas bubbles from the cell. Position the flow-through-cell in such a way that if gas bubbles enter the cell they can easily exit the cell. If the ports are on the same side of the cell and the cell is cylindrical shape, the cell can be placed at a 45-degree angle with the ports facing upwards; this position should keep any gas bubbles entering the cell away from the monitoring probes and allow the gas bubbles to exit the cell easily (see Low-Flow Setup Diagram). Note:

make sure there are no gas bubbles caught in the probes' protective guard; you may need to shake the cell to remove these bubbles.

8. Turn-on the monitoring probes and turbidity meter.

9. Record the temperature, pH, dissolved oxygen, specific conductance, and oxidation/reduction potential measurements. Open the valve on the "T" connector to collect a sample for the turbidity measurement, close the valve, do the measurement, and record this measurement. Calculate the pump's flow rate from the water exiting the flow-through-cell using a graduated container and a stop watch, and record the measurement. Measure and record the water level. Check flow-through-cell for gas bubbles and sediment; if present, remove them.

10. Repeat Step 9 every 5 minutes or as appropriate until monitoring parameters stabilized. Note: at least one flow-through-cell volume must be exchanged between readings. If not, the time interval between readings will need to be increased. Stabilization is achieved when three consecutive measurements are within the following limits:

Turbidity (10% for values greater than 5 NTUs; if three Turbidity values are less than 5 NTUs, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

If these stabilization requirements do not stabilize in a reasonable time, the probes may have been coated from the materials in the groundwater, from a buildup of sediment in the flow-through-cell, or a gas bubble is lodged in the probe. The cell and the probes will need to be cleaned. Turn-off the probes (not the pump), disconnect the cell from the "T" connector and continue to purge the well. Disassemble the cell, remove the sediment, and clean the probes according to the manufacturer's instructions. Reassemble the cell and connect the cell to the "T" connector. Remove all gas bubbles from the cell, turn-on the probes, and continue the measurements. Record the time the cell was cleaned.

11. When it is time to collect the groundwater samples, turn-off the monitoring probes, and disconnect the pump's tubing from the "T" connector. If you are using a centrifugal or peristaltic pump check the pump's tubing to determine if the tubing is completely filled with water (no air space).

All samples must be collected and preserved according to the analytical method. VOCs and dissolved gases samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

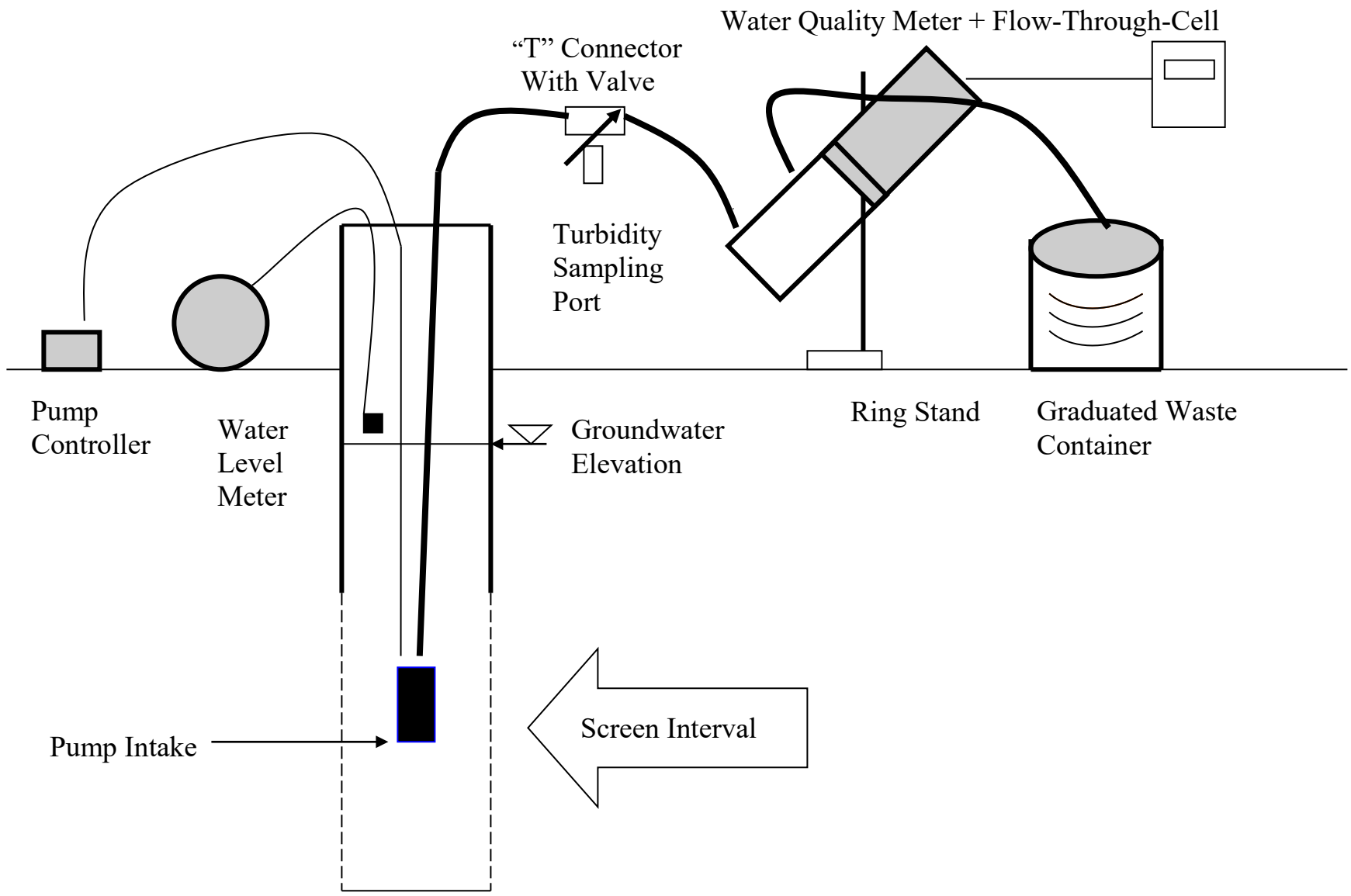
If the pump's tubing is not completely filled with water and the samples are being collected for VOCs and/or dissolved gases analyses using a centrifugal or peristaltic pump, do the following:

> All samples must be collected and preserved according to the analytical method. The VOCs and the dissolved gases (e.g., methane, ethane, ethene, and carbon dioxide) samples are collected last. When it becomes time to collect these samples increase the pump's flow rate until the tubing is completely filled. Collect the samples and record the new flow rate.

12. Store the samples according to the analytical method.

13. Record the total purged volume (graduated waste bucket). Remove the pump from the well and decontaminate the sampling equipment.

Low-Flow Setup Diagram



APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name)_____
Well Number_____ Date_____
Field Personnel_____
Sampling Organization_____
Identify MP_____

Depth to _____/_____ of screen
(below MP) top bottom
Pump Intake at (ft. below MP)_____
Purging Device; (pump type)_____
Total Volume Purged _____

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged liters	Temp. "C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Tur-bidity NTU	Comments
Stabilization Criteria					3%	3%	±0.1	±10 mv	10%	10%	

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

APPENDIC C – DRILLER CERTIFICATION AND LICENSE

Department of Consumer and Regulatory Affairs

GOVERNMENT
OF THE
DISTRICT OF COLUMBIA
Muriel Bowser, Mayor

Business Licensing Division
1100 4th Street S.W.
Washington DC 20024

Date Issued : 04/11/2018
Category : 4105
License# : 410512000317
License Period : 05/01/2020 - 05/31/2022

BASIC BUSINESS LICENSE

Billing Name and Address :

SOMENDRA KAHATAPITIYA
E2cr Inc.

1405-a Parker RoAD
Baltimore MD 21227

Premise/Application's Name and Address :

E2cr Inc.

1405 A PARKER RD -, BALTIMORE, MD 21227

Registered Agent's Name and Address :

Resagent Inc.

1025 Connecticut Avenue N.W., Suite 400
Washington DC 20036

Owner's Name :

Corp. Name : E2cr Inc.

Trade Name :

CofO/HOP# :	SSL : NA	Zone :	Ward :	ANC :	PERM NO. :
Class A		UNITS : 1			

General Service and Repair - Gen Contr/Construction Mngr

--THE LAW REQUIRES THIS LICENSE TO BE POSTED IN A CONSPICUOUS PLACE ON THE PREMISES--

*License Effective from the later of Issued or Start of License-Period Date

Ernest Chrappah

Interim Director :
Ernest Chrappah

Date : 5/11/2020 9:51:36 AM

Surface and Groundwater System - Wells and Soil Borings

Welcome, Siva +

SGS Home

Wells Home

My Well Permits

User Resources +

Support +

Add driller company

Note: Each drilling company is limited to a single account on this application, which is required to be administered by a sole representative for that company, or account manager. This person will have the ability to add and update licenses and add individual drillers to the account.

Driller companies (1 record)

Column Filter(s) (0 Set)

		Driller Company Name	Full Address	Add Individual Driller
		E2CR, Inc.	1405-A Parker Road, Baltimore, Maryland 21227	Add Individual Driller

Previous Page 1 of 1 5 rows Next

Individual drillers (1 record)

Column Filter(s) (0 Set)

		Name of Licens...	License Number	License State	License Expirati...	License Title	Driller
		Gregory Scott Lyon	MGD089	Maryland	05-31-2023	Master Well Driller - Geotechnical	email

Previous Page 1 of 1 5 rows Next

Driller Company permits (0 record)

Column Filter(s) (0 Set)

Government of the District of Columbia
Office of the Chief Financial Officer
Office of Tax and Revenue

1101 4th Street, SW
Washington, DC 20024

Date of Notice: June 16, 2021

Notice Number: L0005720537

E2CR INC
1405-A PARKER ROAD
BALTIMORE MD 21227

FEIN: **-***5901
Case ID: 853700

CERTIFICATE OF CLEAN HANDS

As reported in the Clean Hands system, the above referenced individual/entity has no outstanding liability with the District of Columbia Office of Tax and Revenue or the Department of Employment Services. As of the date above, the individual/entity has complied with DC Code § 47-2862, therefore this Certificate of Clean Hands is issued.

TITLE 47. TAXATION, LICENSING, PERMITS, ASSESSMENTS, AND FEES
CHAPTER 28 GENERAL LICENSE
SUBCHAPTER II. CLEAN HANDS BEFORE RECEIVING A LICENSE OR PERMIT
D.C. CODE § 47-2862 (2006)
§ 47-2862 PROHIBITION AGAINST ISSUANCE OF LICENSE OR PERMIT

Authorized By Marc Aronin
Chief, Collection Division

To validate this certificate, please visit MyTax.DC.gov. On the MyTax DC homepage, click the "Validate a Certificate of Clean Hands" hyperlink under the Clean Hands section.

DEPARTMENT OF ENERGY & ENVIRONMENT

The following stamp was applied electronically.

The electronic signature was applied at the indicated time.

Well Permit Application Cover Page

Permit number: TOPS# 382061

Address: 4615 14th Street NW, Washington, DC 20011

SSL, if applicable: 2811 0802

Applicant Name: Justin Donnelly

Applicant Email: justin.donnelly@interagency.biz

Applicant Phone: 202-255-7656

Applicant Title: Managing Director

Applicant Organization: InterAgency, Inc.

Applicant Address:

Instructions

1. Fill out the right side of this page with your project information. Do not move/alter the text box in any way.
2. Save this page as a PDF.
3. Insert this page (in PDF format) as the first page in your application package.
4. Email your application package to your DOEE reviewer.
5. DOEE will electronically stamp/approve the application and provide the approved package to you via email.
   a. This page will have a watermark, stamp, and reviewer signature
   b. Each subsequent page will have a watermark
6. Save the approved package for your records. Do not modify the package in any way following DOEE's approval.

GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Energy and Environment
Natural Resources Administration
Regulatory Review Division

WELL AND SOIL BORING PERMIT CONDITIONS
(Conditions must be attached to each permit at all times)

LOCATION: 4615 14th Street NW, Washington, DC 20011 (TOPs# 382061)

1) All drill cuttings and investigation derived wastes from potentially contaminated sites or known contaminated sites **shall be containerized and laboratory tested for offsite disposal**.

2) In addition to standard disposal testing, soils with **suspected petroleum contamination** shall be tested using USEPA Method 8015M and shall **not be used as backfill or placed on the ground** if the concentrations exceed standards for soil quality stated in 20 DCMR 6208.1. Non-hazardous soils with Total Petroleum Hydrocarbons concentrations less than 100 ppm may be used as backfill or placed on the site. Soils shall **not be stockpiled** but spread in a manner consistent with DC Erosion and Sediment Control Standards.

3) **Ground water** and/or any liquid **wastes generated by the boring or well drilling and testing** activities (such as decontamination water, purge water, well development water, dewatering effluent and mud slurries) **shall be laboratory tested** for chemical analytes known or suspected to be at the site and the results compared to the DC Ground Water Standards (21 DCMR 11) and the DC Underground Storage Tank Regulation for Total Petroleum Hydrocarbons in ground water [20 DCMR 6209.1(b)]. If these values are not exceeded, the water may be slowly placed on the ground surface in such a manner as to **not produce ponding or a discharge** onto adjacent properties or into nearby surface water bodies or into a storm drain or stormwater catchment basin. For discharges to the storm sewer system, contact The Department of Energy and Environment, Regulatory Review Division (DOEE RRD) at (202) 671-3033.

4) A well shall be grouted as soon as possible but not later than twenty-four (24) hours after the well casing has been set in place unless otherwise permitted in writing from DOEE RRD. If construction activities halt before the well is grouted, the open annular space shall be covered and protected from contamination from any source, including surface water drainage, and the well casing capped.

5) In accordance with DC Law § 8-103.13a, **wells or borings shall be drilled/installed, maintained and abandoned in a manner to prevent contamination of ground water resources and cross-contamination of ground water aquifers** (also see DOEE's **Well Construction Requirements). Five (5) days** of advanced notice of drilling activities shall be given to DOEE. **Within 60 days** of installation, well owner(s) contact information, the horizontal locations of the wells or borings using either the Maryland State Plane Coordinate System or latitude and longitude, vertical elevations including the reference datum used, well construction details and lithologic boring **logs shall submitted to DOEE RRD, 1200 First St. NE, 5th Floor, Washington, DC 20002.**

6) **Prior to sealing a well**, the owner shall ensure that all obstructions which may interfere with the effective sealing operations are removed. Appurtenant structures, including terminal structures and any well casing shall be removed. If removal of the casing is not possible, the casing shall be ripped or perforated.

7) **Abandoned wells and boreholes shall be filled using bentonite slurry (two pounds bentonite powder to one gallon water).** Sealing materials must be introduced at the bottom of the well or borehole and placed progressively upward. The owner shall **report any abandoned wells within 60 days of abandonment to the DOEE RRD, 1200 First St. NE, 5th Floor, Washington, DC 20002.**

8) **Vertical, closed-loop ground source heat pump wells shall be constructed** using **high density polyethylene pipes (HDPE)**, an **anti-freeze solution,** preferably < 20% propylene glycol and, inert **bentonite or thermally-enhanced low permeability grout** that would not allow groundwater flow through the grout to exceed $1x10^{-7}$ cm/s. Geothermal systems shall not be abandoned without first obtaining approval from DOEE RRD.

Note: granting of well permit does not constitute approval of workplan for regulatory groundwater sampling requirements. For more information please contact the Regulatory Review Division of the DOEE.

10/08/21
Ki Don Cho, DOEE RRD

Rev. 09-22-15

DEPARTMENT OF ENERGY & ENVIRONMENT

ENVIRONMENTAL SOIL BORING AND WELL INSTALLATION WORK PLAN
(SB/Wells in Public Spaces)

For
WMATA NORTHERN BUS STATION
4615 14th Street NW
WASHINGTON, D.C. 20011

Prepared behalf of
CLARK CONSTRUCTION GROUP, LLC
7500 OLD GEORGETOWN RD
BETHESDA, MD 20814

For submittal to
DEPARTMENT OF ENERGY & ENVIRONMENT
REGULATORY REVIEW DIVISION (RRD)
1200 FIRST STREET, NE, 5TH FLOOR
WASHINGTON, DC 20002

Prepared by
PROFESSIONAL SERVICE INDUSTRIES, INC.
2930 ESKRIDGE ROAD
FAIRFAX, VIRGINIA 22030

October 6, 2021

PSI Project Number: 04481517

intertek psi

Andy Acosta, P.G.
Project Manager

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1 INTRODUCTION

This work plan has been developed in support of drilling borings and well installations for the collection of soil and groundwater samples proposed for the property located at 4615 14th Street NW, DC 20011 (Subject Property).

The subject property is located in a mixed-use neighborhood surrounded by residential housing and commercial properties. The site is improved with an approximately 270,000 square foot building with the initial portion of the building constructed in the early 1900s. The subject property is owned by the Washington Metropolitan Area Transit Authority (WMATA) and consists of an administrative building, parking deck, and a garage capacity of 175 buses. The site location is illustrated on **Figure 1**. The proposed boring and well locations are illustrated on **Figure 2**. Note that **Figure 2** highlights only those borings/wells outlined per the approved Comprehensive Site Assessment work plan outlined in **Section 2.2.**

The site is located on Square 2811/2815 and Property ID 2811 0802 of the Washington DC Real Estate Map. The owner of the parcel of land is WMATA.

1.1 PURPOSE AND OBJECTIVES

The scope of work proposed in this work plan includes soil boring and well installation for environmental testing. This Work Plan has been prepared in accordance with the District of Columbia Department of the Energy and the Environment (DOEE) Well Regulations 21 DCMR chapter 18.

A list of potential concerns at the site include: Bus maintenance/repair facility(ies), historic on- site service station, historic off-site service station and other sites with documented impacts, bus wash bays, bus painting facility(ies), underground storage tanks, aboveground storage tanks, and oil/water separator(s). Professional Service Industries, Inc., an Intertek company (PSI)'s Client requested that soil and/or groundwater samples be collected to determine if any residual contamination is still present at the site from previous site operations prior to the proposed redevelopment of the subject property.

The environmental services that are being proposed are associated with the installation of soil borings at the site. Copies of the DC Well-Boring Construction Application and DDOE Environmental Questionnaire are included in **Appendix A**.

1.2 SITE LOCATION AND PHYSICAL CHARACTERISTICS

The site is currently inactive and not occupied – preexisting infrastructure is present, but WMATA has committed to removing up to approximately 95% of their on-site assets. The site is bounded by residential and commercial properties to the north and east along Iowa Ave NW and Arkansas Ave NW, to the west by 14th St NW, and to the south by Buchanan St NW. The site location is illustrated on **Figure 1**. The proposed boring and well locations are illustrated on **Figure 2**.

The site is situated at an approximate average elevation of 199 feet above mean sea level (AMSL) to the north, with a gradual topographic slope to 177 feet AMSL to the south.

The USDA 1976 Soil Survey for the District of Columbia and the current USDA Web Soil Survey listing identify site soils primarily as Urban Land. Urban Land is used to designate areas where natural soils have been disturbed by development or are covered by impervious surface or structures.

Based on the 1994 USGS Geologic map of the Washington West quadrangle (District of Columbia, Montgomery and Prince George's Counties, Maryland, and Arlington and Fairfax Counties, Virginia) the Site is situated in the Laurel Formation, a sedimentary mélange of conglomerate units that are partially metamorphosed. The mélange is underlain by coastal plain sandstone litho-facies. Natural overburden at the site is mostly reported as primarily sandy loam down to 7 feet below ground surface (bgs), however Urban Land and associated fill material is generally anticipated. Competent bedrock is reported to be approximately 30 to 40 feet bgs in published studies adjacent to the Site area.

Approximate groundwater elevation and potentiometric flow are currently not known, although shallow groundwater potentiometric flow in the Site vicinity would be expected to follow the general topographic gradient to the south.

The site is fully serviced by public utilities including water and sewer. Groundwater is not used as a source of potable water on or in the vicinity of the site.

The District of Columbia Department of Energy and Environment (DOEE) Underground Storage Tank (UST) Database lists the property address as the site of a closed Leaking Underground Storage Tank (LUST) case (#89018). The incident occurred on February 3, 1989 and was listed as closed on September 28, 2017.

2 FIELD ACTIVITIES

2.1 HEALTH AND SAFETY

A site specific Health and Safety Plan (HSP) will be developed for the environmental work proposed for the site. Based on existing site soil and groundwater data, low levels of contaminants are anticipated to be encountered.

Miss utility clearance(s) will be obtained for public utilities prior to each phase of intrusive work. Utility clearances will be supplemented by a private utility locating service.

2.2 DIRECT GROUNDWATER SAMPLING

Groundwater samples will be collected at eleven (11) locations located along exterior of the on-site building and along the north right-of-way of Arkansas Avenue. At each of the eleven (11) locations, two (2) soil borings will be advanced, which will be converted to temporary groundwater monitoring wells (for a total of 22 soil borings [SB/TMW-008S THROUGH SB/TMW-018S and SB/TMW-008D through SB/TMW-018D], and 22 temporary monitoring wells [TMW-008S through TMW-0018S, and TMW-008D through TMW-018D]). Within each of the soil borings advanced at each of the eleven (11) locations, temporary groundwater monitoring wells will be installed to two (2) depths; the soil/groundwater interface and at the top of bedrock utilizing low-flow methodologies. Following reaching the desired sampling depth, a 1.25-inch diameter PVC well casing with pre-packed well screen will be installed and purged to clear the direct groundwater sampling point of suspended silts and/or sediment. Upon completion of purging and following a stabilization period (>24 hours), PSI personnel will then collect groundwater samples for laboratory analysis by EPA Method 8260 for VOCs and EPA Method 8270 for SVOCs from the temporary monitoring wells.

Additionally, soil samples will be collected at continuous 2-foot intervals to depths extending to two-feet into the groundwater table, or refusal, whichever is encountered first at three locations. Each soil sample will be visually classified, and field screened for organic vapors utilizing a organic vapor analyzer equipped with a photoionization detector (OVA-PID). Based on field observation and OVA-PID screening responses, personnel will collect up to two (2) soil samples from each borehole. One soil sample will be collected from the soil/groundwater interface and one soil sample will be collected from the soil interval exhibiting the highest OVA-PID response. The soil samples will be submitted for laboratory analysis by EPA Method 8260 for VOCs, EPA Method 8270 for SVOCs, TPH-GRO/DRO/ORO, and 4 RCRA metals.

Refer to Figure 2 for the locations of the proposed temporary groundwater monitoring well locations.

2.3 INVESTIGATIVE DERIVED WASTE

Due to the presence of contaminated soils at the site, it is anticipated that decontamination of the drilling equipment between boring locations will be required using a decontamination pad. Borings will be backfilled with grout. Boring cuttings, decontamination/development/purge water and disposable sampling equipment will be collected into clean, clearly labeled 55-gallon drums. The drums will be sealed and temporarily stored in designated areas established by WMATA at the site for management pending receipt of analytical results. A designated temporary storage area for up to 8 drums as well as space to work will be identified. Drums will remain on site until completion of logging, characterization, and disposal facility acceptance.

Based on the presence and nature of contamination, the most cost effective option to dispose of IDW containerized within drums at the subject property will be to assume all drums contain some level of impacted material, perform composite sampling for additional analytical characterization required for disposal, and to dispose of all IDW at a licensed facility based on their acceptance of the composite sampling and environmental assessment analytical results.

To facilitate this necessary documentation, up to two (2) composite samples will be collected from the drums and submit the sample to a licensed laboratory following standard chain-of-custody and shipping procedures. The composite sample will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) including Resource Conservation and Recovery Act (RCRA)-8 Metals via EPA Method 1311, VOCs via EPA Method 8260, and SVOCs via EPA Method 8270. Upon the licensed disposal facility's receipt and acceptance of the analytical results, IDW drums to be shipped to the licensed disposal facility for processing.

2.4 TEMPORARY WELL ABANDONMENT

The proposed twenty-two (22) temporary monitoring wells at the site will be abandoned within 30 days of construction in accordance with requirements of the DOEE Well Regulations 1802.7.

The procedures for abandonment of the wells will consist of the preparation of a DC DOEE Well Abandonment Work Plan, field procedures to accomplish the abandonment, and completion of a well abandonment report (including the DC Well Abandonment Form).

Upon completion of the boreholes, the bedrock well casings will be removed from the bedrock (i.e. consolidated formation) portion of the borings and will be tremie grouted with bentonite-cement grout with a mix ratio of no greater than 6 gallons of water per 94 pounds of Portland cement with an additional 5 pounds of sodium-based bentonite per 21 District of Columbia Municipal Regulations (DCMR) §1818.14 Upon completion of the bedrock grouting, all borings will be tremie grouted with bentonite-cement grout with a mix ratio of 94 pounds Portland cement, 150 pounds bentonite and 82 gallons potable water from the bottom up to at least 5-feet above the bottom depth of the bedrock temporary casing to maintain positive pressure head in the borehole. The well casing will then be removed while tremie- grouting from bottom to surface of the borehole. No instrumentation is planned for these boreholes.

A completion/abandonment report will be submitted to DOEE within 60 days of well installation in accordance with 21 DCMR § 1826 to include:

1. Lithologic Soil boring log(s) with any groundwater level readings;
2. D.C. Well Construction Completion and Abandonment Form;
3. Final boring location plan; and
4. Photographs showing entire abandonment procedures.

2.5 SCHEDULE

PSI will provide DDOE with a minimum of 5 day's notice prior to the initiation of work.

2.6 SUBCONTRACTORS

PSI has identified E2CR, Inc. (E2CR) as the qualified environmental drilling subcontractor for this project. Copies of E2CR's District of Columbia Business Licenses and state drilling certification information are included in **Appendix C**. Proof of business licensure and state drilling certifications shall be provided to the DDOE RRD for any additional drillers that may be selected prior to starting their respective phase of work on the site.

3 QUALITY ASSURANCE AND QUALITY CONTROL

Field and laboratory tasks will generally follow industry standards for Quality Assurance/Quality Control (QA/QC) as well as corporate QA/QC guidelines established by PSI for field activities and HC for laboratory tasks.

QA/QC samples will include trip and equipment blanks to be submitted for laboratory analysis of VOCs per EPA Method 8260.

Complete copies of PSI Data Validation Guidelines (2000) and PSI Field Methods Technical Guidance (2001) are maintained in PSI's files in Fairfax, VA.

A complete copy of HC's Comprehensive Quality Assurance Plan is also maintained in PSI's files.

Copies of these QA/QC documents are available for review upon request.

4 REFERENCES

District of Columbia Well Construction Application Form: DDOE Well Construction Application Process and Well Construction Requirements.

United States Environmental Protection Agency: Low Flow Groundwater Sampling Procedures, April 1996.

5 STATEMENT OF LIMITATIONS

The information provided in this Work Plan, prepared by Professional Service Industries, Inc. (PSI), is intended exclusively for submittal to the District of Columbia Department of the Environment (DDOE) on behalf of Clark Construction Group, LLC as it pertains to as it pertains to environmental investigations to be conducted at the site located at 4615 14th Street NW, Washington, D.C. 20011. It is not provided for the benefit or use of any third party. PSI does not and cannot warrant that the plan provided herein will eliminate exposure pathways or prevent impact to human health or the environment. All work conducted on the site will be done in accordance with local, state, and federal laws and regulations.

The professional services will be provided in accordance with practices generally accepted by other appropriate environmental and geotechnical professionals, geologists, hydrologists, hydrogeologists, engineers, and scientists practicing in this field. No other warranty, either expressed or implied, is made. PSI is not an insurer and makes no guarantee or warranty that the services supplied will avert or mitigate occurrences, or the consequences of occurrences, that the services are designed to prevent or ameliorate. As with all surface and subsurface soil investigations, there is no guarantee that the work conducted will identify all sources or locations of hazardous substances or chemicals that may be present at the site.

FIGURES

Legend:

Subject Property

NORTH

SITE LOCATION MAP
4615 14th Street NW,
Washington, DC. 20011
Prepared For SVT, Inc.

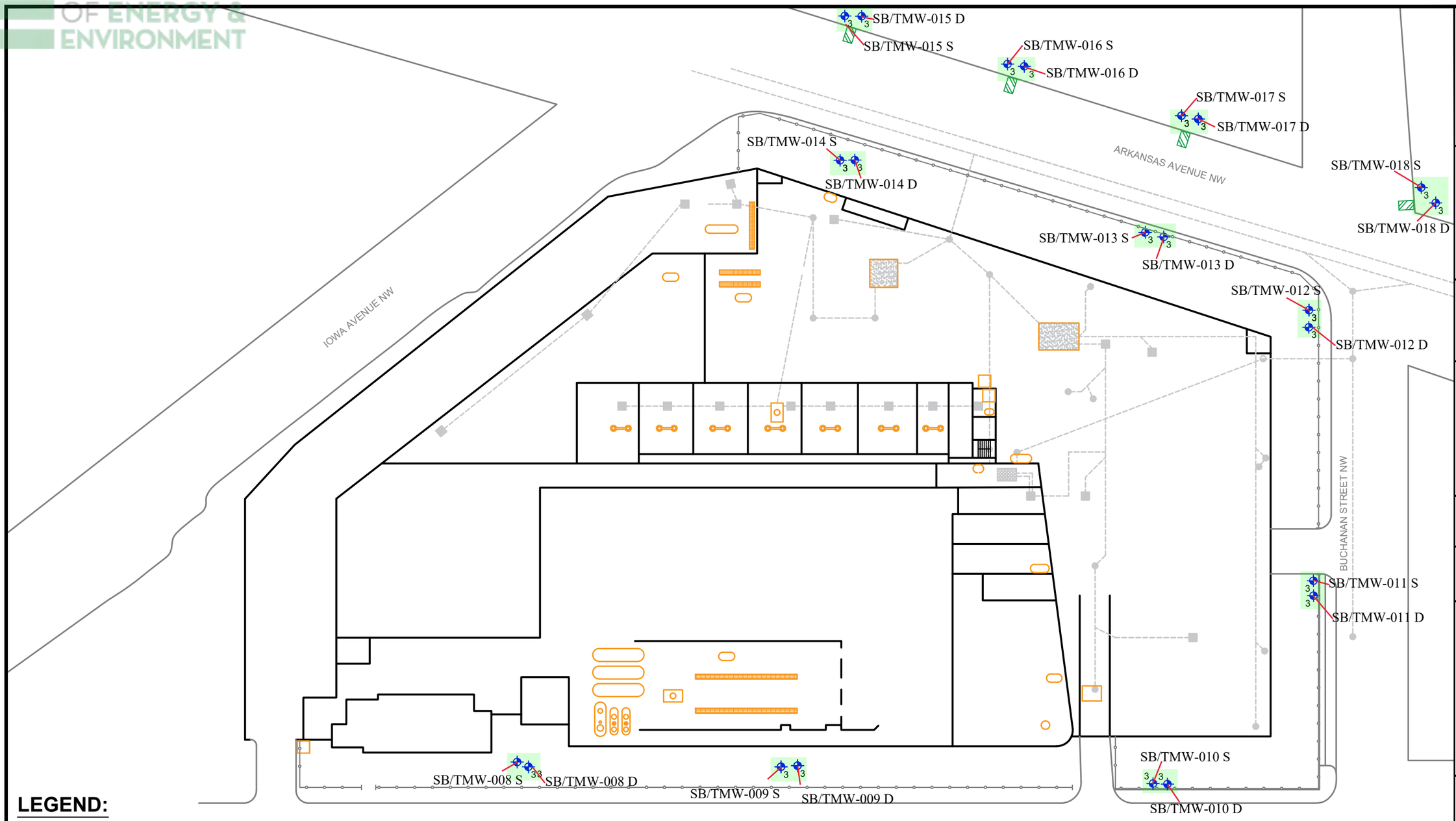
Figure No.: **1**

intertek psi
2930 Eskridge Road - Fairfax, VA 22031
(703) 698-9300 - FAX (703) 698-4414

Project Manager: **Andres Acosta**

Drawn By: **Rinzo Renthlei**

Project No.: **0444100**



LEGEND:

- FENCING
- GEOPROBE DRILL RIG (12' X 7')
- PROPOSED MONITORING WELL DIRECT WATER SAMPLING LOCATION; WITH VADOSE SOIL SAMPLING
- PROPOSED MONITORING WELL DIRECT WATER SAMPLING LOCATION; GROUNDWATER INTERFACE AND BEDROCK INTERFACE
- PROPOSED PERMANENT SHALLOW MONITORING WELL LOCATION; 2"; MAX 15' BLS
- PROPOSED PERMANENT DEEP MONITORING WELL LOCATION; 2"; MAX 30' BLS

SUPERSCRIPT:

1 - GROUNDWATER SAMPLE FOR LABORATORY ANALYSIS BY EPA METHOD 8260 FOR VOCs, METHOD 8270 FOR SVOCs, TPH-GRO/DRO, AND 13 PRIORITY POLLUTANT METALS

2 - SOIL AND GROUNDWATER SAMPLE FOR LABORATORY ANALYSIS BY EPA METHOD 8260 FOR VOC's, METHOD 8270 FOR SVOCs, TPH-GRO/DRO, AND 13 PRIORITY POLLUTANT METALS

3 - GROUNDWATER SAMPLE FOR LABORATORY ANALYSIS BY EPA METHOD 8260 FOR VOCs AND METHOD 8270 FOR SVOCs

intertek psi

Environmental Services

2930 Eskridge Road,
Fairfax, Virginia 22031
Tel (703) 698–9300

Project Name:

WMATA Bus Facility
Northern Site
4615 14th Street NW,
Washington, DC 20011

Figure Title:

Proposed Groundwater Sampling Location Map

Exterior SBs/TMWs

Drawn By:

Adam Smak

Project Manager:

Andy Acosta

Figure Legend:

NORTH

0 40' 80'

APPROXIMATE SCALE IN FEET

Project Number:

0444100

Figure Date:

04–15–2021

Figure Number:

2

APPENDIX A – WELL APPLICATION FORMS

D.C. WELL CONSTRUCTION APPLICATION FORM

DO NOT USE FOR GEOTHERMAL WELLS

Please Fill Out As Thoroughly As Possible. Asterisks indicate where additional information is needed in the Comments Section. Attach site plan, well application schematic form, additional comments and details.

Well (hole) Owner – Property Owner:

Name(s) Ovidiu Puscas

Mailing Address 600 5th Street, NW City, St., Zip Washington DC 20001

Phone (202) 962-1234 Email opuscas@wmata.com

Driller/Company Responsible for Drilling/Installing the Well: DCRA Business License No. 400317800482

NAME(s) Siva Balu, E2CR, Inc. License State & No. Maryland No. MWD572

Mailing Address 1405-A Parker Road City, St., Zip Baltimore, MD 21227

Phone (410) 737-9100 Email sivabalu@e2cr.com

General Well Information:

Intended Well Use Wells for better defining known groundwater impacts

Type of Well (circle all applicable): Monitoring/Geotechnical/Dewatering/Injection/Supply/Other*

Number of Wells 22

Are wells required as part of a regulatory action? Yes ☐ No ☒

If Yes, identify the regulatory agency and division n/a

Well Information:

Well Physical Address 4615 14th Street NW City, St., Zip Washington, DC 20011

Lot 0802 Square 2811 Topography (circle one): hilltop, flat, slope, valley, stream channel, local depression

Geology (circle one): ~~unconsolidated~~/consolidated Aquifer penetrated (circle one): single/multiple

Geologic Formation (if known) Laurel Aquifer name(s) (if known) _____

Drilling Method: (circle all applicable): Hollow-Stem Auger/Mud rotary/Air rotary/Sonic/Geoprobe/Other*

Will drilling fluids/muds include additives other than potable water? Yes ☐ No ☒ If yes, provide details and attach manufacturer's specifications and Materials Safety Data Sheet

Is the site potentially or known-to-be contaminated? Yes ☒ No ☐ If yes, attach details

Will Investigation Derived Waste be containerized, laboratory tested and taken offsite for proper disposal? Yes ☒ No ☐ If no, attach disposal details. Will permanent outer casing be used to prevent aquifer cross contamination where known or suspected contamination exists? Yes ☒ No ☐ If yes or no, attach details

Will the following be placed in well?(circle all applicable): downhole pumps/liners/monitoring equipment/other*

Please attach details about well development and any other relevant information.

*Comments (add an additional sheet if necessary):

Installation of up to 22 temporary monitoring wells.

I declare that the information provided is accurate, true and complete to the best of my knowledge and belief. I agree to comply with all applicable laws and regulations of the District of Columbia.

Name (print) Andy Acosta on behalf of E2CR Signature _____ Date 7/[illegible]/2011

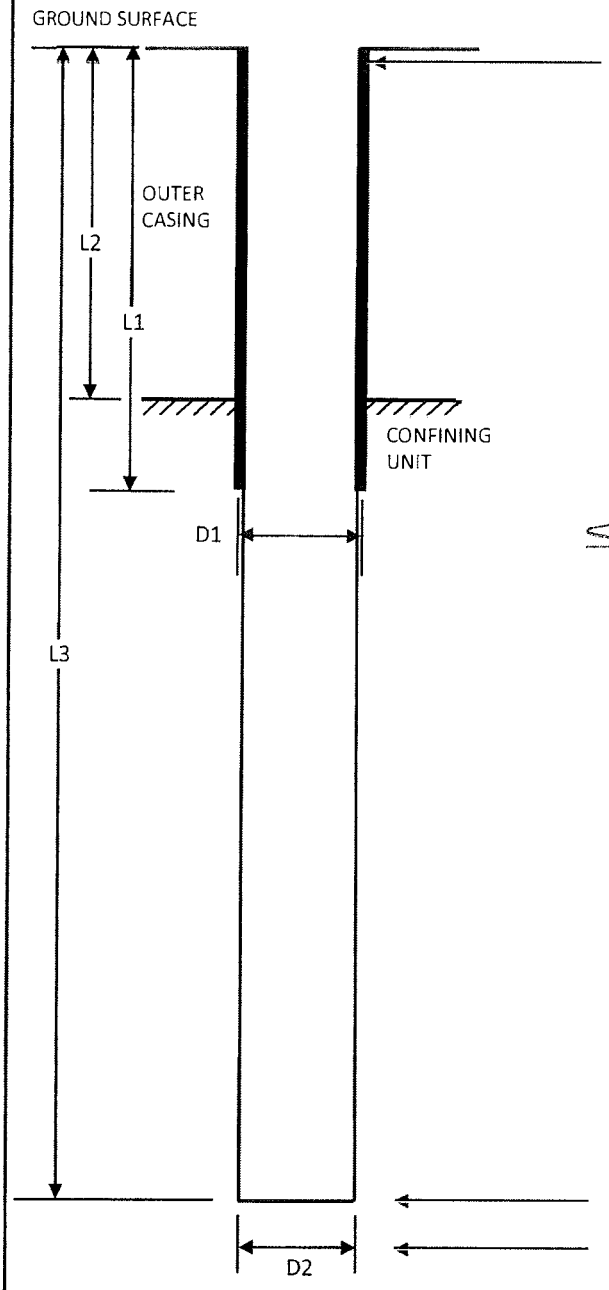
Owner ☐ Agent for owner ☐ Well Driller Performing Work ☒

DDOE WELL APPLICATION SCHEMATIC

Geotechnical / Geophysical Boring
Confining Unit

Shallow Temporary Monitoring Wells

Check one: Application ☒ *As-Built* ☐



OUTER CASING (USE IF AREA IS CONTAMINATED)

MATERIAL: PVC

DIAMETER (D1) (inches): 1.4 inch OD

LENGTH (L1) (feet): Dependent on groundwater table.

DEPTH TO TOP OF CONFINING UNIT (L2) (feet): Unknown at this time.

WILL WELL BE OPEN MORE THAN 24 CONSECUTIVE HOURS?

YES* ☒ NO ☐

If yes, how will open annular space be covered and protected?

The filter pack will extended from the bottom of the screen interval to approximatley 2 feet above the screen interval, ~~followed by a fine sand seal, and bentonite/neat grout to surface.~~

-Wells to be installed via Geoprobe.

WILL WELL BE ABANDONDED ACCORDING TO WELL ABANDONMENT REQUIREMENTS, SECTION 8 IN DDOE WELL CONSTRUCTION REQUIREMENTS?

YES ☒ NO ☐ Following completion of periodic sampling and approval from DOEE.

WHAT TYPE OF GROUT AND GROUT:WATER RATIOS WILL BE USED?

60:40 ratio of bentenite-cement mixture with a mix ratio of 94 lbs of Portland cement, 150 lbs of bentonite and 82 gal of water.

DEPTH TO THE BOTTOM OF HOLE (L3) (feet): Approximately 15 to 20 feet BLS depending on depth to groundwater table

DIAMETER OF BOREHOLE (D2) (inches): Approximatley 3 1/4 inches

Rev. 05-17-12

WELL ID(S): TMW-008S through TMW-018S

WELL ADDRESS: 4615 14th Street NW
Washington D.C. 20011

LOT NUMBER: 0801

SQUARE NUMBER: 2811

WELL OWNER: E2CR, Inc.
SIVA BALU

OWNER ADDRESS: 1405-A Parker Road
Baltimore, MD 21227

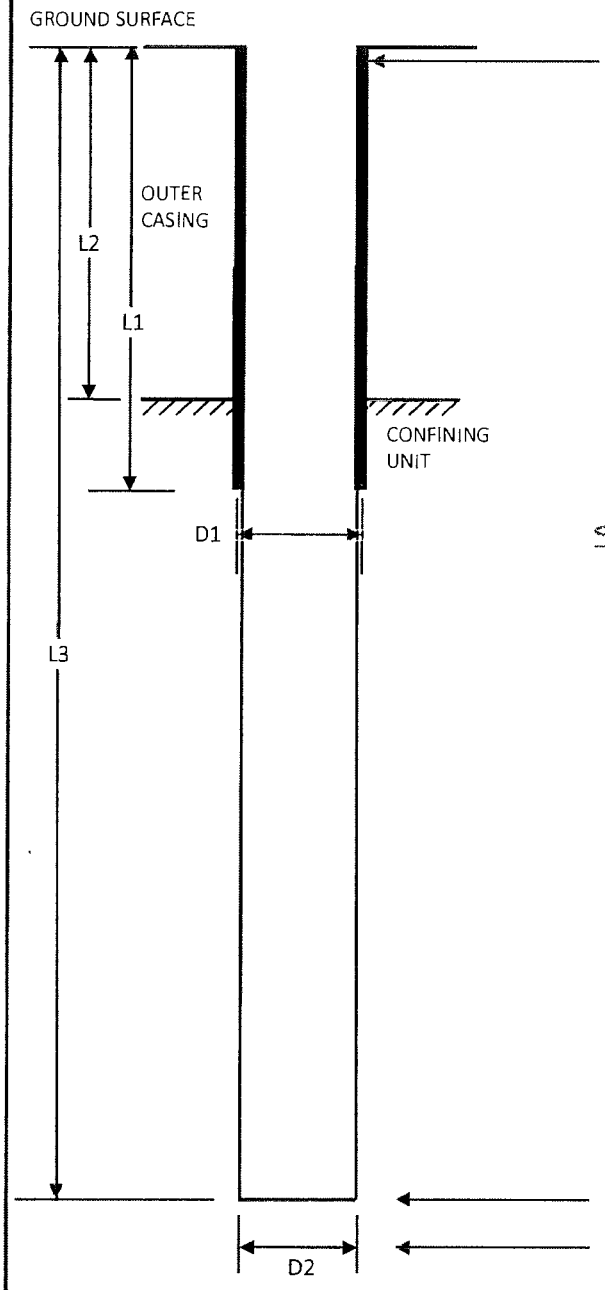
SIGNATURE:

DDOE WELL APPLICATION SCHEMATIC

Geotechnical / Geophysical Boring
Confining Unit

Bedrock Temporary Monitoring Wells

Check one: Application ☒ *As-Built* ☐



OUTER CASING (USE IF AREA IS CONTAMINATED)

MATERIAL: PVC

DIAMETER (D1) (inches): 1.4 inch OD

LENGTH (L1) (feet): Directly above bedrock.

DEPTH TO TOP OF CONFINING UNIT (L2) (feet): Unknown at this time.

WILL WELL BE OPEN MORE THAN 24 CONSECUTIVE HOURS?

YES* ☒ NO ☐

If yes, how will open annular space be covered and protected?

The filter pack will extended from the bottom of the screen interval to approximatley 2 feet above the screen interval, ~~followed by a fine sand seal, an dbentonite/neat grout to surface.~~ -Wells to be installed via Geoprobe.

WILL WELL BE ABANDONDED ACCORDING TO WELL ABANDONMENT REQUIREMENTS, SECTION 8 IN DDOE WELL CONSTRUCTION REQUIREMENTS?

YES ☒ NO ☐ Following completion of periodic sampling and approval from DOEE.

WHAT TYPE OF GROUT AND GROUT: WATER RATIOS WILL BE USED?

60:40 ratio of bentonite-cement mixture with a mix ratio of 94 lbs of portland cement 150 lbs of bentonite and 82 gal of water.

DEPTH TO THE BOTTOM OF HOLE (L3) (feet): Approximately 35 feet depending on depth to bedrock.

DIAMETER OF BOREHOLE (D2) (inches): Approximatley 3 1/4 inches

Rev. 05-17-12

WELL ID(S): TMW-008 through TMW-018 D

WELL ADDRESS: 4615 14th Street NW
Washington D.C. 20011

LOT NUMBER: 0801

SQUARE NUMBER: 2811

WELL OWNER: E2CR, Inc.
SIVA BALU

OWNER ADDRESS: 1405-A Parker Road
Baltimore, MD 21227

SIGNATURE:

DEPARTMENT OF ENERGY & ENVIRONMENT

BUILDING PERMIT APPLICATION SUPPLEMENTAL FORM - ENVIRONMENTAL QUESTIONNAIRE

PROJECT ADDRESS: 4615 14th Street, NW DC SQUARE: 2811 SUFFIX: _____ LOT: 0802

Directions: Please answer all 19 questions in this questionnaire, by checking either column "Yes" or "No" for each question. If you answer "Yes" to any of the questions, you should contact the corresponding office(s) indicated in column 'contact person/office,' as soon as possible. Until this supplement form is reviewed and approved by the concerned office(s), the building permit will not be issued.

SCOPE OF PROJECT	YES	NO	CONTACT PERSON/OFFICE	OFFICE USE
1. Will the work to be performed involve the installation, removal, close-in-place now, or repair of an underground storage tank (UST) system? *Please get approvals or signatures from the Underground Storage Tank Branch, Water Quality Division and the Air Quality Division.*	☐	☑	(202) 535-2600 or ust.ddoe@dc.gov, Underground Storage Tank Branch (202) 535-2600, Air Quality Division, Permitting Branch	
2. Will the work to be performed involve assessment of soil or soil-vapor, or cleanup of soil associated with the released material from an underground storage tank (UST)? *Please get approvals or signatures from the UndergroundStorage Tank Division, Water Quality Division and the Air Quality Division.*	☐	☑	(202) 535-2600 or ust.ddoe@dc.gov , Underground Storage Tank Branch (202) 535-2600, Water Quality Division (202) 535-2600, Air Quality Division	
3. Will the work to be performed involve the assessment or clean-up of groundwater associated with the release of material from an underground storage tank (UST)? *Please get approvals or signatures from the Underground Storage Tank Division, Water Quality Division and the Air Quality Division.*	☐	☑	(202) 535-2600 or ust.ddoe@dc.gov, Underground Storage Tank Branch (202) 535-2600, Air Quality Division (202) 535-2600, Water Quality Division	
4. Will the proposed project involve the installation or drilling of wells other than for the purposes stated in questions 2 and 3? *Please get approvals or signatures from the Water Quality Division.*	☑	☐	(202) 535-2600, Water Quality Division	
5. Will the proposed project involve installation or drilling of wells using air rotary drilling methods or any methods discharging gases or dust into the air? *Please get approvals or signatures from the Water Quality Division and the Air Quality Division.*	☐	☑	(202) 535-2600, Water Quality Division (202) 535-2600, Air Quality Division, Permitting Branch	
6. Will the proposed project involve the generation, treatment, storage, disposal or transportation of chemicals or other substances which may be considered hazardous? *Contact Hazardous Materials Branch (202) 535-2600.*	☐	☑	(202) 535-2600, Hazardous Waste Branch	
7. Will the proposed use involve the construction of a facility for the handling, transfer, storage, disposal or treatment of solid waste, medical waste, or recyclable materials? *Contact DOEE Environmental Review Coordinator (202) 535-2600.*	☐	☑	(202) 535-2600, DOEE EIS Coordinator	
8. Will the proposed project involve construction which will result in a discharge or release to or withdrawal from a river, stream, wetland, or groundwater or disturb the sediment in rivers, streams or wetlands? *Please get approvals or signatures from the Water Quality Division.*	☐	☑	(202) 535-2600, Water Quality Division	
9. Will the proposed project involve construction which may affect aquatic or terrestrial biota, their habitat, or water quality? *Please get approvals or signatures from the Water Quality Division and the Fisheries and Wildlife Division.*	☐	☑	(202) 535-2600, Water Quality Division (202) 535-2600, Fisheries and Wildlife Division	

10. Does the project site contain a species of plant or animal that is federally protected? *Federally protected means that the plant or animal is subjected to limited, restricted, specific, or approved interactions in accordance with Federal guidelines.*	☐	☑	(202) 535-2600, Fisheries and Wildlife Division	
11. Will the proposed project result in the discharge into the air of gases or dust or the creation of any objectionable odors? *Contact Air Quality Division Permitting Branch (202) 535-2600*	☐	☑	(202) 535-2600, Air Quality Division, Permitting Branch	
12. Was the building built before 1978? (Lead paint may be present). *Issuance of a lead abatement or renovation permit may be required.*	☐	☑	(202) 535-2600, Lead and Healthy Housing Division, Compliance and Enforcement Branch	
13. Does the building contain asbestos? *Requires a current asbestos survey (i.e., survey of all asbestos containing materials) for the building. A permit from the Air Quality Division is required for most asbestos removal projects.*	☐	☑	(202) 535-2600, Air Quality Division, Permitting Branch	
14. Does the project disturb 5,000 square feet or greater of land? *Major Land Disturbance: Submit a stormwater management plan to the Watershed Protection Division for approval.*	☐	☑	(202) 535-2600, Watershed Protection Division	
15. Is the project an interior renovation or addition where (1) the assessed value of the structure(s) is greater than or equal to 50% of the total cost of construction, AND (2) the sum of the structures' footprint and any soil disturbance is 5,000 square feet or greater? *Major Sustainable Improvement: Submit a storm water management plan to the Watershed Protection Division for approval.*	☐	☑	(202) 535-2600, Watershed Protection Division	
16. Is the project (1) a new building, addition and/or interior renovation where the total cost of construction is greater than 100% of the assessed value of the structure(s), AND (2) the property is assigned a zone district other than R1 - R4? *Submit a green area ratio (GAR) plan to the Watershed Protection Division for approval.*	☐	☑	(202) 535-2600, Watershed Protection Division	
17. Will the proposed project or the work to be performed be within a Special Flood Hazard Area (SFHA) or 100-year floodplain area (i.e., Zone A or AE)? *If YES,* *Compliance with DC Floodplain Regulations (DCMR 20, Flood Hazard Rules, and DCMR 12, Flood Provisions in the Construction Code is required.* *If NO,* *Please verify and confirm whether the project site is NOT located in a Special Flood Hazard Area (SFHA).* *http://ddoe.dc.gov/floodplainmap*	☐	☑	(202) 535-2600, Watershed Protection Division	
18. Will the proposed project result in the construction or installation of any equipment that burns fuel such as, but not limited to, stationary generators (any size) and boilers with heat input ratings greater than 5 million BTU/hr? *Note that separate air quality permits are required for most of these units.*	☐	☑	(202) 535-2600, Air Quality Division, Permitting Branch	
19. Will the proposed project result in the construction or installation of any other stationary pollution-emitting equipment? Examples include, but are not limited to, degreasing units, professional printing equipment, plating lines, spray painting operations, and gasoline dispensing systems. *Note that separate air quality permits are required for most of these units.*	☐	☑	(202) 535-2600, Air Quality Division, Permitting Branch	

I hereby certify that I have the authority of the owner of the property to make this application and that the answers to the above questions are complete and correct to the best of my knowledge. False statements may be subject to fines and prosecution, as applicable by statute.

Signature _____ Name (print) _____

Address 4615 14th Street, NW DC Date _____ Phone _____

OFFICE USE ONLY

DOEE APPROVAL BY _____ NAME (Print) _____

CONTACT NUMBER: (202) _____ DATE: _____

COMMENTS AND PERMIT RESTRICTIONS _____

(USE REVERSE IF NECESSARY)

APPENDIX B – U.S. EPA: LOW STRESS (LOW FLOW) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUND WATER SAMPLES FROM MONITORING WELLS, SEPTEMBER 19, 2017

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

LOW STRESS (low flow) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUNDWATER SAMPLES FROM MONITORING WELLS

Quality Assurance Unit
U.S. Environmental Protection Agency – Region 1
11 Technology Drive
North Chelmsford, MA 01863

The controlled version of this document is the electronic version viewed on-line only. If this is a printed copy of the document, it is an uncontrolled version and may or may not be the version currently in use.

This document contains direction developed solely to provide guidance to U.S. Environmental Protection Agency (EPA) personnel. EPA retains the discretion to adopt approaches that differ from these procedures on a case-by-case basis. The procedures set forth do not create any rights, substantive or procedural, enforceable at law by party to litigation with EPA or the United States.

Prepared by:_____ _____
(Robert Reinhart, Quality Assurance Unit) Date

Approved by:_____ _____
(John Smaldone, Quality Assurance Unit) Date

Revision Page

Date	Rev #	Summary of changes	Sections
7/30/96	1	Finalized	
01/19/10	2	Updated	All sections
3/23/17	3	Updated	All sections
9/20/17	4	Updated	Section 7.0

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1.0 USE OF TERMS

Equipment blank: The equipment blank shall include the pump and the pump's tubing. If tubing is dedicated to the well, the equipment blank needs only to include the pump in subsequent sampling rounds. If the pump and tubing are dedicated to the well, the equipment blank is collected prior to its placement in the well. If the pump and tubing will be used to sample multiple wells, the equipment blank is normally collected after sampling from contaminated wells and not after background wells.

Field duplicates: Field duplicates are collected to determine precision of the sampling procedure. For this procedure, collect duplicate for each analyte group in consecutive order (VOC original, VOC duplicate, SVOC original, SVOC duplicate, etc.).

Indicator field parameters: This SOP uses field measurements of turbidity, dissolved oxygen, specific conductance, temperature, pH, and oxidation/reduction potential (ORP) as indicators of when purging operations are sufficient and sample collection may begin.

Matrix Spike/Matrix Spike Duplicates: Used by the laboratory in its quality assurance program. Consult the laboratory for the sample volume to be collected.

Potentiometric Surface: The level to which water rises in a tightly cased well constructed in a confined aquifer. In an unconfined aquifer, the potentiometric surface is the water table.

QAPP: Quality Assurance Project Plan

SAP: Sampling and Analysis Plan

SOP: Standard operating procedure

Stabilization: A condition that is achieved when all indicator field parameter measurements are sufficiently stable (as described in the "Monitoring Indicator Field Parameters" section) to allow sample collection to begin.

Temperature blank: A temperature blank is added to each sample cooler. The blank is measured upon receipt at the laboratory to assess whether the samples were properly cooled during transit.

Trip blank (VOCs): Trip blank is a sample of analyte-free water taken to the sampling site and returned to the laboratory. The trip blanks (one pair) are added to each sample cooler that contains VOC samples.

2.0 SCOPE & APPLICATION

The goal of this groundwater sampling procedure is to collect water samples that reflect the total mobile organic and inorganic loads (dissolved and colloidal sized fractions) transported through the subsurface under ambient flow conditions, with minimal physical and chemical alterations from sampling operations. This standard operating procedure (SOP) for collecting groundwater samples will help ensure that the project's data quality objectives (DQOs) are met under certain low-flow conditions.

The SOP emphasizes the need to minimize hydraulic stress at the well-aquifer interface by maintaining low water-level drawdowns, and by using low pumping rates during purging and sampling operations. Indicator field parameters (e.g., dissolved oxygen, pH, etc.) are monitored during purging in order to determine when sample collection may begin. Samples properly collected using this SOP are suitable for analysis of groundwater contaminants (volatile and semi-volatile organic analytes, dissolved gases, pesticides, PCBs, metals and other inorganics), or naturally occurring analytes. This SOP is based on Puls, and Barcelona (1996).

This procedure is designed for monitoring wells with an inside diameter (1.5-inches or greater) that can accommodate a positive lift pump with a screen length or open interval ten feet or less and with a water level above the top of the screen or open interval (Hereafter, the "screen or open interval" will be referred to only as "screen interval"). This SOP is not applicable to other well-sampling conditions.

While the use of dedicated sampling equipment is not mandatory, dedicated pumps and tubing can reduce sampling costs significantly by streamlining sampling activities and thereby reducing the overall field costs.

The goal of this procedure is to emphasize the need for consistency in deploying and operating equipment while purging and sampling monitoring wells during each sampling event. This will help to minimize sampling variability.

This procedure describes a general framework for groundwater sampling. Other site specific information (hydrogeological context, conceptual site model (CSM), DQOs, etc.) coupled with systematic planning must be added to the procedure in order to develop an appropriate site specific SAP/QAPP. In addition, the site specific SAP/QAPP must identify the specific equipment that will be used to collect the groundwater samples.

This procedure does not address the collection of water or free product samples from wells containing free phase LNAPLs and/or DNAPLs (light or dense non-aqueous phase

liquids). For this type of situation, the reader may wish to check: Cohen, and Mercer (1993) or other pertinent documents.

This SOP is to be used when collecting groundwater samples from monitoring wells at all Superfund, Federal Facility and RCRA sites in Region 1 under the conditions described herein. Request for modification of this SOP, in order to better address specific situations at individual wells, must include adequate technical justification for proposed changes. All changes and modifications must be approved and included in a revised SAP/QAPP before implementation in field.

3.0 BACKGROUND FOR IMPLEMENTATION

It is expected that the monitoring well screen has been properly located (both laterally and vertically) to intercept existing contaminant plume(s) or along flow paths of potential contaminant migration. Problems with inappropriate monitoring well placement or faulty/improper well installation cannot be overcome by even the best water sampling procedures. This SOP presumes that the analytes of interest are moving (or will potentially move) primarily through the more permeable zones intercepted by the screen interval.

Proper well construction, development, and operation and maintenance cannot be overemphasized. The use of installation techniques that are appropriate to the hydrogeologic setting of the site often prevent "problem well" situations from occurring. During well development, or redevelopment, tests should be conducted to determine the hydraulic characteristics of the monitoring well. The data can then be used to set the purging/sampling rate, and provide a baseline for evaluating changes in well performance and the potential need for well rehabilitation. Note: if this installation data or well history (construction and sampling) is not available or discoverable, for all wells to be sampled, efforts to build a sampling history should commence with the next sampling event.

The pump intake should be located within the screen interval and at a depth that will remain under water at all times. It is recommended that the intake depth and pumping rate remain the same for all sampling events. The mid-point or the lowest historical midpoint of the saturated screen length is often used as the location of the pump intake. For new wells, or for wells without pump intake depth information, the site's SAP/QAPP must provide clear reasons and instructions on how the pump intake depth(s) will be selected, and reason(s) for the depth(s) selected. If the depths to top and bottom of the well screen are not known, the SAP/QAPP will need to describe how the sampling depth will be determined and how the data can be used.

Stabilization of indicator field parameters is used to indicate that conditions are suitable for sampling to begin. Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. Sample collection

may still take place provided the indicator field parameter criteria in this procedure are met. If after 2 hours of purging indicator field parameters have not stabilized, one of three optional courses of action may be taken: a) continue purging until stabilization is achieved, b) discontinue purging, do not collect any samples, and record in log book that stabilization could not be achieved (documentation must describe attempts to achieve stabilization), c) discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization (note: there is a risk that the analytical data obtained, especially metals and strongly hydrophobic organic analytes, may reflect a sampling bias and therefore, the data may not meet the data quality objectives of the sampling event).

It is recommended that low-flow sampling be conducted when the air temperature is above 32°F (0°C). If the procedure is used below 32°F, special precautions will need to be taken to prevent the groundwater from freezing in the equipment. Because sampling during freezing temperatures may adversely impact the data quality objectives, the need for water sample collection during months when these conditions are likely to occur should be evaluated during site planning and special sampling measures may need to be developed. Ice formation in the flow-through-cell will cause the monitoring probes to act erratically. A transparent flow-through-cell needs to be used to observe if ice is forming in the cell. If ice starts to form on the other pieces of the sampling equipment, additional problems may occur.

4.0 HEALTH & SAFETY

When working on-site, comply with all applicable OSHA requirements and the site's health/safety procedures. All proper personal protection clothing and equipment are to be worn. Some samples may contain biological and chemical hazards. These samples should be handled with suitable protection to skin, eyes, etc.

5.0 CAUTIONS

The following cautions need to be considered when planning to collect groundwater samples when the below conditions occur.

If the groundwater degasses during purging of the monitoring well, dissolved gases and VOCs will be lost. When this happens, the groundwater data for dissolved gases (e.g., methane, ethene, ethane, dissolved oxygen, etc.) and VOCs will need to be qualified. Some conditions that can promote degassing are the use of a vacuum pump (e.g., peristaltic pumps), changes in aperture along the sampling tubing, and squeezing/pinching the pump's tubing which results in a pressure change.

When collecting the samples for dissolved gases and VOCs analyses, avoid aerating the groundwater in the pump's tubing. This can cause loss of the dissolved gases and VOCs in

the groundwater. Having the pump's tubing completely filled prior to sampling will avoid this problem when using a centrifugal pump or peristaltic pump.

Direct sun light and hot ambient air temperatures may cause the groundwater in the tubing and flow-through-cell to heat up. This may cause the groundwater to degas which will result in loss of VOCs and dissolved gases. When sampling under these conditions, the sampler will need to shade the equipment from the sunlight (e.g., umbrella, tent, etc.). If possible, sampling on hot days, or during the hottest time of the day, should be avoided. The tubing exiting the monitoring well should be kept as short as possible to avoid the sun light or ambient air from heating up the groundwater.

Thermal currents in the monitoring well may cause vertical mixing of water in the well bore. When the air temperature is colder than the groundwater temperature, it can cool the top of the water column. Colder water which is denser than warm water sinks to the bottom of the well and the warmer water at the bottom of the well rises, setting up a convection cell. "During low-flow sampling, the pumped water may be a mixture of convecting water from within the well casing and aquifer water moving inward through the screen. This mixing of water during low-flow sampling can substantially increase equilibration times, can cause false stabilization of indicator parameters, can give false indication of redox state, and can provide biological data that are not representative of the aquifer conditions" (Vroblesky 2007).

Failure to calibrate or perform proper maintenance on the sampling equipment and measurement instruments (e.g., dissolved oxygen meter, etc.) can result in faulty data being collected.

Interferences may result from using contaminated equipment, cleaning materials, sample containers, or uncontrolled ambient/surrounding air conditions (e.g., truck/vehicle exhaust nearby).

Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment and/or proper planning to avoid ambient air interferences. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

Clean and decontaminate all sampling equipment prior to use. All sampling equipment needs to be routinely checked to be free from contaminants and equipment blanks collected to ensure that the equipment is free of contaminants. Check the previous equipment blank data for the site (if they exist) to determine if the previous cleaning procedure removed the contaminants. If contaminants were detected and they are a concern, then a more vigorous cleaning procedure will be needed.

6.0 PERSONNEL QUALIFICATIONS

All field samplers working at sites containing hazardous waste must meet the requirements of the OSHA regulations. OSHA regulations may require the sampler to take the 40 hour OSHA health and safety training course and a refresher course prior to engaging in any field activities, depending upon the site and field conditions.

The field samplers must be trained prior to the use of the sampling equipment, field instruments, and procedures. Training is to be conducted by an experienced sampler before initiating any sampling procedure.

The entire sampling team needs to read, and be familiar with, the site Health and Safety Plan, all relevant SOPs, and SAP/QAPP (and the most recent amendments) before going onsite for the sampling event. It is recommended that the field sampling leader attest to the understanding of these site documents and that it is recorded.

7.0 EQUIPMENT AND SUPPLIES

A. Informational materials for sampling event

A copy of the current Health and Safety Plan, SAP/QAPP, monitoring well construction data, location map(s), field data from last sampling event, manuals for sampling, and the monitoring instruments' operation, maintenance, and calibration manuals should be brought to the site.

B. Well keys.

C. Extraction device

Adjustable rate, submersible pumps (e.g., centrifugal, bladder, etc.) which are constructed of stainless steel or polytetrafluoroethylene (PTFE, i.e. Teflon®) are preferred. PTFE, however, should not be used when sampling for per- and polyfluoroalkyl substances (PFAS) as it is likely to contain these substances.

Note: If extraction devices constructed of other materials are to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

If bladder pumps are selected for the collection of VOCs and dissolved gases, the pump setting should be set so that one pulse will deliver a water volume that is sufficient to fill a 40 mL VOC vial. This is not mandatory, but is considered a "best practice". For the proper operation, the bladder pump will need a minimum amount of water above the pump; consult the manufacturer for the recommended submergence. The pump's recommended submergence value should be determined during the planning stage, since it may influence well construction and placement of dedicated pumps where water-level fluctuations are significant.

Adjustable rate, peristaltic pumps (suction) are to be used with caution when collecting samples for VOCs and dissolved gases (e.g., methane, carbon dioxide, etc.) analyses. Additional information on the use of peristaltic pumps can be found in Appendix A. If peristaltic pumps are used, the inside diameter of the rotor head tubing needs to match the inside diameter of the tubing installed in the monitoring well.

Inertial pumping devices (motor driven or manual) are not recommended. These devices frequently cause greater disturbance during purging and sampling, and are less easily controlled than submersible pumps (potentially increasing turbidity and sampling variability, etc.). This can lead to sampling results that are adversely affected by purging and sampling operations, and a higher degree of data variability.

D. Tubing

PTFE (Teflon®) or PTFE-lined polyethylene tubing are preferred when sampling is to include VOCs, SVOCs, pesticides, PCBs and inorganics. As discussed in the previous section, PTFE tubing should not be used when sampling for PFAS. In this case, a suitable alternative such as high-density polyethylene tubing should be used.

PVC, polypropylene or polyethylene tubing may be used when collecting samples for metal and other inorganics analyses.

Note: If tubing constructed of other materials is to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

The use of 1/4 inch or 3/8 inch (inside diameter) tubing is recommended. This will help ensure that the tubing remains liquid filled when operating at very low pumping rates when using centrifugal and peristaltic pumps.

Silastic tubing should be used for the section around the rotor head of a peristaltic pump. It should be less than a foot in length. The inside diameter of the tubing used at the pump rotor head must be the same as the inside diameter of tubing placed in the well. A tubing connector is used to connect the pump rotor head tubing to the well tubing. Alternatively, the two pieces of tubing can be connected to each other by placing the one end of the tubing inside the end of the other tubing. The tubing must not be reused.

E. The water level measuring device

Electronic ”tape”, pressure transducer, water level sounder/level indicator, etc. should be capable of measuring to 0.01 foot accuracy. Recording pressure transducers, mounted above the pump, are especially helpful in tracking water levels during pumping operations, but their use must include check measurements with a water level “tape” at the start and end of each sampling event.

F. Flow measurement supplies

Graduated cylinder (size according to flow rate) and stopwatch usually will suffice.

Large graduated bucket used to record total water purged from the well.

G. Interface probe

To be used to check on the presence of free phase liquids (LNAPL, or DNAPL) before purging begins (as needed).

H. Power source (generator, nitrogen tank, battery, etc.)

When a gasoline generator is used, locate it downwind and at least 30 feet from the well so that the exhaust fumes do not contaminate samples.

I. Indicator field parameter monitoring instruments

Use of a multi-parameter instrument capable of measuring pH, oxidation/reduction potential (ORP), dissolved oxygen (DO), specific conductance, temperature, and coupled with a flow-through-cell is required when measuring all indicator field parameters, except turbidity. Turbidity is collected using a separate instrument. Record equipment/instrument identification (manufacturer, and model number).

Transparent, small volume flow-through-cells (e.g., 250 mLs or less) are preferred. This allows observation of air bubbles and sediment buildup in the cell, which can interfere with the operation of the monitoring instrument probes, to be easily detected. A small volume

cell facilitates rapid turnover of water in the cell between measurements of the indicator field parameters.

It is recommended to use a flow-through-cell and monitoring probes from the same manufacturer and model to avoid incompatibility between the probes and flow-through-cell.

Turbidity samples are collected before the flow-through-cell. A "T" connector coupled with a valve is connected between the pump's tubing and flow-through-cell. When a turbidity measurement is required, the valve is opened to allow the groundwater to flow into a container. The valve is closed and the container sample is then placed in the turbidimeter.

Standards are necessary to perform field calibration of instruments. A minimum of two standards are needed to bracket the instrument measurement range for all parameters except ORP which use a Zobell solution as a standard. For dissolved oxygen, a wet sponge used for the 100% saturation and a zero dissolved oxygen solution are used for the calibration.

Barometer (used in the calibration of the Dissolved Oxygen probe) and the conversion formula to convert the barometric pressure into the units of measure used by the Dissolved Oxygen meter are needed.

J. Decontamination supplies

Includes (for example) non-phosphate detergent, distilled/deionized water, isopropyl alcohol, etc.

K. Record keeping supplies

Logbook(s), well purging forms, chain-of-custody forms, field instrument calibration forms, etc.

L. Sample bottles

M. Sample preservation supplies (as required by the analytical methods)

N. Sample tags or labels

O. PID or FID instrument

If appropriate, to detect VOCs for health and safety purposes, and provide qualitative field evaluations.

P. Miscellaneous Equipment

Equipment to keep the sampling apparatus shaded in the summer (e.g., umbrella) and from freezing in the winter. If the pump's tubing is allowed to heat up in the warm weather, the cold groundwater may degas as it is warmed in the tubing.

8.0 EQUIPMENT/INSTRUMENT CALIBRATION

Prior to the sampling event, perform maintenance checks on the equipment and instruments according to the manufacturer's manual and/or applicable SOP. This will ensure that the equipment/instruments are working properly before they are used in the field.

Prior to sampling, the monitoring instruments must be calibrated and the calibration documented. The instruments are calibrated using U.S Environmental Protection Agency Region 1 *Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction [ORP], and turbidity),* March 23, 2017, or latest version or from one of the methods listed in 40CFR136, 40CFR141 and SW-846.

The instruments shall be calibrated at the beginning of each day. If the field measurement falls outside the calibration range, the instrument must be re-calibrated so that all measurements fall within the calibration range. At the end of each day, a calibration check is performed to verify that instruments remained in calibration throughout the day. This check is performed while the instrument is in measurement mode, not calibration mode. If the field instruments are being used to monitor the natural attenuation parameters, then a calibration check at mid-day is highly recommended to ensure that the instruments did not drift out of calibration. Note: during the day if the instrument reads zero or a negative number for dissolved oxygen, pH, specific conductance, or turbidity (negative value only), this indicates that the instrument drifted out of calibration or the instrument is malfunctioning. If this situation occurs the data from this instrument will need to be qualified or rejected.

9.0 PRELIMINARY SITE ACTIVITIES (as applicable)

Check the well for security (damage, evidence of tampering, missing lock, etc.) and record pertinent observations (include photograph as warranted).

If needed, lay out a sheet of clean polyethylene for monitoring and sampling equipment, unless equipment is elevated above the ground (e.g., on a table, etc.).

Remove well cap and if appropriate measure VOCs at the rim of the well with a PID or FID instrument and record reading in field logbook or on the well purge form.

If the well casing does not have an established reference point (usually a V-cut or indelible mark in the well casing), make one. Describe its location and record the date of the mark in the logbook (consider a photographic record as well). All water level measurements must be recorded relative to this reference point (and the altitude of this point should be determined using techniques that are appropriate to site's DQOs.

If water-table or potentiometric surface map(s) are to be constructed for the sampling event, perform synoptic water level measurement round (in the shortest possible time) before any purging and sampling activities begin. If possible, measure water level depth (to 0.01 ft.) and total well depth (to 0.1 ft.) the day before sampling begins, in order to allow for re-settlement of any particulates in the water column. This is especially important for those wells that have not been recently sampled because sediment buildup in the well may require the well to be redeveloped. If measurement of total well depth is not made the day before, it should be measured after sampling of the well is complete. All measurements must be taken from the established referenced point. Care should be taken to minimize water column disturbance.

Check newly constructed wells for the presence of LNAPLs or DNAPLs before the initial sampling round. If none are encountered, subsequent check measurements with an interface probe may not be necessary unless analytical data or field analysis signal a worsening situation. This SOP cannot be used in the presence of LNAPLs or DNAPLs. If NAPLs are present, the project team must decide upon an alternate sampling method. All project modifications must be approved and documented prior to implementation.

If available check intake depth and drawdown information from previous sampling event(s) for each well. Duplicate, to the extent practicable, the intake depth and extraction rate (use final pump dial setting information) from previous event(s). If changes are made in the intake depth or extraction rate(s) used during previous sampling event(s), for either portable or dedicated extraction devices, record new values, and explain reasons for the changes in the field logbook.

10.0 PURGING AND SAMPLING PROCEDURE

Purging and sampling wells in order of increasing chemical concentrations (known or anticipated) are preferred.

The use of dedicated pumps is recommended to minimize artificial mobilization and entrainment of particulates each time the well is sampled. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

A. Initial Water Level

Measure the water level in the well before installing the pump if a non-dedicated pump is being used. The initial water level is recorded on the purge form or in the field logbook.

B. Install Pump

Lower pump, safety cable, tubing and electrical lines slowly (to minimize disturbance) into the well to the appropriate depth (may not be the mid-point of the screen/open interval). The Sampling and Analysis Plan/Quality Assurance Project Plan should specify the sampling depth (used previously), or provide criteria for selection of intake depth for each new well. If possible keep the pump intake at least two feet above the bottom of the well, to minimize mobilization of particulates present in the bottom of the well.

Pump tubing lengths, above the top of well casing should be kept as short as possible to minimize heating the groundwater in the tubing by exposure to sun light and ambient air temperatures. Heating may cause the groundwater to degas, which is unacceptable for the collection of samples for VOC and dissolved gases analyses.

C. Measure Water Level

Before starting pump, measure water level. Install recording pressure transducer, if used to track drawdowns, to initialize starting condition.

D. Purge Well

From the time the pump starts purging and until the time the samples are collected, the purged water is discharged into a graduated bucket to determine the total volume of groundwater purged. This information is recorded on the purge form or in the field logbook.

Start the pump at low speed and slowly increase the speed until discharge occurs. Check water level. Check equipment for water leaks and if present fix or replace the affected equipment. Try to match pumping rate used during previous sampling event(s). Otherwise, adjust pump speed until there is little or no water level drawdown. If the

minimal drawdown that can be achieved exceeds 0.3 feet, but remains stable, continue purging.

Monitor and record the water level and pumping rate every five minutes (or as appropriate) during purging. Record any pumping rate adjustments (both time and flow rate). Pumping rates should, as needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. During pump start-up, drawdown may exceed the 0.3 feet target and then "recover" somewhat as pump flow adjustments are made. Purge volume calculations should utilize stabilized drawdown value, not the initial drawdown. If the initial water level is above the top of the screen do not allow the water level to fall into the well screen. The final purge volume must be greater than the stabilized drawdown volume plus the pump's tubing volume. If the drawdown has exceeded 0.3 feet and stabilizes, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are collected.

Avoid the use of constriction devices on the tubing to decrease the flow rate because the constrictor will cause a pressure difference in the water column. This will cause the groundwater to degas and result in a loss of VOCs and dissolved gasses in the groundwater samples.

Note: the flow rate used to achieve a stable pumping level should remain constant while monitoring the indicator parameters for stabilization and while collecting the samples.

Wells with low recharge rates may require the use of special pumps capable of attaining very low pumping rates (e.g., bladder, peristaltic), and/or the use of dedicated equipment. For new monitoring wells, or wells where the following situation has not occurred before, if the recovery rate to the well is less than 50 mL/min., or the well is being essentially dewatered during purging, the well should be sampled as soon as the water level has recovered sufficiently to collect the volume needed for all anticipated samples. The project manager or field team leader will need to make the decision when samples should be collected, how the sample is to be collected, and the reasons recorded on the purge form or in the field logbook. A water level measurement needs to be performed and recorded before samples are collected. If the project manager decides to collect the samples using the pump, it is best during this recovery period that the pump intake tubing not be removed, since this will aggravate any turbidity problems. Samples in this specific situation may be collected without stabilization of indicator field parameters. Note that field conditions and efforts to overcome problematic situations must be recorded in order to support field decisions to deviate from normal procedures described in this SOP. If this type of problematic situation persists in a well, then water sample collection should be

changed to a passive or no-purge method, if consistent with the site's DQOs, or have a new well installed.

E. Monitor Indicator Field Parameters

After the water level has stabilized, connect the "T" connector with a valve and the flow-through-cell to monitor the indicator field parameters. If excessive turbidity is anticipated or encountered with the pump startup, the well may be purged for a while without connecting up the flow-through-cell, in order to minimize particulate buildup in the cell (This is a judgment call made by the sampler). Water level drawdown measurements should be made as usual. If possible, the pump may be installed the day before purging to allow particulates that were disturbed during pump insertion to settle.

During well purging, monitor indicator field parameters (turbidity, temperature, specific conductance, pH, ORP, DO) at a frequency of five minute intervals or greater. The pump's flow rate must be able to "turn over" at least one flow-through-cell volume between measurements (for a 250 mL flow-through-cell with a flow rate of 50 mLs/min., the monitoring frequency would be every five minutes; for a 500 mL flow-through-cell it would be every ten minutes). If the cell volume cannot be replaced in the five minute interval, then the time between measurements must be increased accordingly. Note: during the early phase of purging, emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments followed by stabilization of indicator parameters. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings are within the following limits:

Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

All measurements, except turbidity, must be obtained using a flow-through-cell. Samples for turbidity measurements are obtained before water enters the flow-through-cell. Transparent flow-through-cells are preferred, because they allow field personnel to watch for particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell. If the cell needs to be cleaned during purging operations, continue pumping and disconnect cell for cleaning, then reconnect after cleaning and

continue monitoring activities. Record start and stop times and give a brief description of cleaning activities.

The flow-through-cell must be designed in a way that prevents gas bubble entrapment in the cell. Placing the flow-through-cell at a 45 degree angle with the port facing upward can help remove bubbles from the flow-through-cell (see Appendix B Low-Flow Setup Diagram). Throughout the measurement process, the flow-through-cell must remain free of any gas bubbles. Otherwise, the monitoring probes may act erratically. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must remain submerged in water at all times.

F. Collect Water Samples

When samples are collected for laboratory analyses, the pump's tubing is disconnected from the "T" connector with a valve and the flow-through-cell. The samples are collected directly from the pump's tubing. Samples must not be collected from the flow-through-cell or from the "T" connector with a valve.

VOC samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

If the pump's flow rate is too high to collect the VOC/dissolved gases samples, collect the other samples first. Lower the pump's flow rate to a reasonable rate and collect the VOC/dissolved gases samples and record the new flow rate.

During purging and sampling, the centrifugal/peristaltic pump tubing must remain filled with water to avoid aeration of the groundwater. It is recommended that 1/4 inch or 3/8 inch (inside diameter) tubing be used to help ensure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, use the following procedure to collect samples: collect non-VOC/dissolved gases samples first, then increase flow rate slightly until the water completely fills the tubing, collect the VOC/dissolved gases samples, and record new drawdown depth and flow rate.

For bladder pumps that will be used to collect VOC or dissolved gas samples, it is recommended that the pump be set to deliver long pulses of water so that one pulse will fill a 40 mL VOC vial.

Use pre-preserved sample containers or add preservative, as required by analytical methods, to the samples immediately after they are collected. Check the analytical methods

(e.g. EPA SW-846, 40 CFR 136, water supply, etc.) for additional information on preservation.

If determination of filtered metal concentrations is a sampling objective, collect filtered water samples using the same low flow procedures. The use of an in-line filter (transparent housing preferred) is required, and the filter size (0.45 µm is commonly used) should be based on the sampling objective. Pre-rinse the filter with groundwater prior to sample collection. Make sure the filter is free of air bubbles before samples are collected. Preserve the filtered water sample immediately. Note: filtered water samples are not an acceptable substitute for unfiltered samples when the monitoring objective is to obtain chemical concentrations of total mobile contaminants in groundwater for human health or ecological risk calculations.

Label each sample as collected. Samples requiring cooling will be placed into a cooler with ice or refrigerant for delivery to the laboratory. Metal samples after acidification to a pH less than 2 do not need to be cooled.

G. Post Sampling Activities

If a recording pressure transducer is used to track drawdown, re-measure water level with tape.

After collection of samples, the pump tubing may be dedicated to the well for re-sampling (by hanging the tubing inside the well), decontaminated, or properly discarded.

Before securing the well, measure and record the well depth (to 0.1 ft.), if not measured the day before purging began. Note: measurement of total well depth annually is usually sufficient after the initial low stress sampling event. However, a greater frequency may be needed if the well has a “silting” problem or if confirmation of well identity is needed.

Secure the well.

11.0 DECONTAMINATION

Decontaminate sampling equipment prior to use in the first well, and then following sampling of each subsequent well. Pumps should not be removed between purging and sampling operations. The pump, tubing, support cable and electrical wires which were in contact with the well should be decontaminated by one of the procedures listed below.

The use of dedicated pumps and tubing will reduce the amount of time spent on decontamination of the equipment. If dedicated pumps and tubing are used, only the initial sampling event will require decontamination of the pump and tubing.

Note if the previous equipment blank data showed that contaminant(s) were present after using the below procedure or the one described in the SAP/QAPP, a more vigorous procedure may be needed.

Procedure 1

Decontaminating solutions can be pumped from either buckets or short PVC casing sections through the pump and tubing. The pump may be disassembled and flushed with the decontaminating solutions. It is recommended that detergent and alcohol be used sparingly in the decontamination process and water flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

Flush the equipment/pump with potable water.

Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

Optional - flush with isopropyl alcohol (pesticide grade; must be free of ketones {e.g., acetone}) or with methanol. This step may be required if the well is highly contaminated or if the equipment blank data from the previous sampling event show that the level of contaminants is significant.

Flush with distilled/deionized water. This step must remove all traces of alcohol (if used) from the equipment. The final water rinse must not be recycled.

Procedure 2

Steam clean the outside of the submersible pump.

Pump hot potable water from the steam cleaner through the inside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with end cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.

Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

12.0 FIELD QUALITY CONTROL

Quality control samples are required to verify that the sample collection and handling process has not compromised the quality of the groundwater samples. All field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation. Quality control samples include field duplicates, equipment blanks, matrix spike/matrix spike duplicates, trip blanks (VOCs), and temperature blanks.

13.0 FIELD LOGBOOK

A field log shall be kept to document all groundwater field monitoring activities (see Appendix C, example table), and record the following for each well:

Site name, municipality, state.

Well identifier, latitude-longitude or state grid coordinates.

Measuring point description (e.g., north side of PVC pipe).

Well depth, and measurement technique.

Well screen length.

Pump depth.

Static water level depth, date, time and measurement technique.

Presence and thickness of immiscible liquid (NAPL) layers and detection method.

Pumping rate, drawdown, indicator parameters values, calculated or measured total volume pumped, and clock time of each set of measurements.

Type of tubing used and its length.

Type of pump used.

Clock time of start and end of purging and sampling activity.

Types of sample bottles used and sample identification numbers.

Preservatives used.

Parameters requested for analyses.

Field observations during sampling event.

Name of sample collector(s).

Weather conditions, including approximate ambient air temperature.

QA/QC data for field instruments.

Any problems encountered should be highlighted.

Description of all sampling/monitoring equipment used, including trade names, model number, instrument identification number, diameters, material composition, etc.

14.0 DATA REPORT

Data reports are to include laboratory analytical results, QA/QC information, field indicator parameters measured during purging, field instrument calibration information, and whatever other field logbook information is needed to allow for a full evaluation of data usability.

Note: the use of trade, product, or firm names in this sampling procedure is for descriptive purposes only and does not constitute endorsement by the U.S. EPA.

15.0 REFERENCES

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Robert W. Puls and Michael J. Barcelona, *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*, April 1996 (EPA/540/S-95/504).

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U.S Environmental Protection Agency, EPA SW-846.

U.S Environmental Protection Agency, 40 CFR 136.

U.S Environmental Protection Agency, 40 CFR 141.

Vroblesky, Don A., Clifton C. Casey, and Mark A. Lowery, Summer 2007, Influence of Dissolved Oxygen Convection on Well Sampling, *Ground Water Monitoring & Remediation* 27, no. 3: 49-58.

APPENDIX A

PERISTALTIC PUMPS

Before selecting a peristaltic pump to collect groundwater samples for VOCs and/or dissolved gases, (e.g., methane, carbon dioxide, etc.) consideration should be given to the following:

- The decision of whether or not to use a peristaltic pump is dependent on the intended use of the data.
- If the additional sampling error that may be introduced by this device is NOT of concern for the VOC/dissolved gases data's intended use, then this device may be acceptable.
- If minor differences in the groundwater concentrations could affect the decision, such as to continue or terminate groundwater cleanup or whether the cleanup goals have been reached, then this device should NOT be used for VOC/dissolved gases sampling. In these cases, centrifugal or bladder pumps are a better choice for more accurate results.

EPA and USGS have documented their concerns with the use of the peristaltic pumps to collect water sample in the below documents.

- "Suction Pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds" *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, December 1987.
- "The agency does not recommend the use of peristaltic pumps to sample ground water particularly for volatile organic analytes" *RCRA Ground-Water Monitoring Draft Technical Guidance*, EPA Office of Solid Waste, November 1992.
- "The peristaltic pump is limited to shallow applications and can cause degassing resulting in alteration of pH, alkalinity, and volatiles loss", *Low-flow (Minimal drawdown) Ground-Water Sampling Procedures*, by Robert Puls & Michael Barcelona, April 1996, EPA/540/S-95/504.
- "Suction-lift pumps, such as peristaltic pumps, can operate at a very low pumping rate; however, using negative pressure to lift the sample can result in the loss of volatile analytes", USGS Book 9 Techniques of Water-Resources Investigation, Chapter A4. (Version 2.0, 9/2006).

APPENDIX B

SUMMARY OF SAMPLING INSTRUCTIONS

These instructions are for using an adjustable rate, submersible pump or a peristaltic pump with the pump's intake placed at the midpoint of a 10 foot or less well screen or an open interval. The water level in the monitoring well is above the top of the well screen or open interval, the ambient temperature is above 32°F, and the equipment is not dedicated. Field instruments are already calibrated. The equipment is setup according to the diagram at the end of these instructions.

1. Review well installation information. Record well depth, length of screen or open interval, and depth to top of the well screen. Determine the pump's intake depth (e.g., mid-point of screen/open interval).

2. On the day of sampling, check security of the well casing, perform any safety checks needed for the site, lay out a sheet of polyethylene around the well (if necessary), and setup the equipment. If necessary a canopy or an equivalent item can be setup to shade the pump's tubing and flow-through-cell from the sun light to prevent the sun light from heating the groundwater.

3. Check well casing for a reference mark. If missing, make a reference mark. Measure the water level (initial) to 0.01 ft. and record this information.

4. Install the pump's intake to the appropriate depth (e.g., midpoint) of the well screen or open interval. Do not turn-on the pump at this time.

5. Measure water level and record this information.

6. Turn-on the pump and discharge the groundwater into a graduated waste bucket. Slowly increase the flow rate until the water level starts to drop. Reduce the flow rate slightly so the water level stabilizes. Record the pump's settings. Calculate the flow rate using a graduated container and a stop watch. Record the flow rate. Do not let the water level drop below the top of the well screen.

If the groundwater is highly turbid or discolored, continue to discharge the water into the bucket until the water clears (visual observation); this usually takes a few minutes. The turbid or discolored water is usually from the well-being disturbed during the pump installation. If the water does not clear, then you need to make a choice whether to continue purging the well (hoping that it will clear after a reasonable time) or continue to

the next step. Note, it is sometimes helpful to install the pump the day before the sampling event so that the disturbed materials in the well can settle out.

If the water level drops to the top of the well screen during the purging of the well, stop purging the well, and do the following:

> Wait for the well to recharge to a sufficient volume so samples can be collected. This may take a while (pump may be removed from well, if turbidity is not a problem). The project manager will need to make the decision when samples should be collected and the reasons recorded in the site's log book. A water level measurement needs to be performed and recorded before samples are collected. When samples are being collected, the water level must not drop below the top of the screen or open interval. Collect the samples from the pump's tubing. Always collect the VOCs and dissolved gases samples first. Normally, the samples requiring a small volume are collected before the large volume samples are collected just in case there is not sufficient water in the well to fill all the sample containers. All samples must be collected, preserved, and stored according to the analytical method. Remove the pump from the well and decontaminate the sampling equipment.

If the water level has dropped 0.3 feet or less from the initial water level (water level measure before the pump was installed); proceed to Step 7. If the water level has dropped more than 0.3 feet, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are be collected.

7. Attach the pump's tubing to the "T" connector with a valve (or a three-way stop cock). The pump's tubing from the well casing to the "T" connector must be as short as possible to prevent the groundwater in the tubing from heating up from the sun light or from the ambient air. Attach a short piece of tubing to the other end of the end of the "T" connector to serve as a sampling port for the turbidity samples. Attach the remaining end of the "T" connector to a short piece of tubing and connect the tubing to the flow-through-cell bottom port. To the top port, attach a small piece of tubing to direct the water into a calibrated waste bucket. Fill the cell with the groundwater and remove all gas bubbles from the cell. Position the flow-through-cell in such a way that if gas bubbles enter the cell they can easily exit the cell. If the ports are on the same side of the cell and the cell is cylindrical shape, the cell can be placed at a 45-degree angle with the ports facing upwards; this position should keep any gas bubbles entering the cell away from the monitoring probes and allow the gas bubbles to exit the cell easily (see Low-Flow Setup Diagram). Note:

make sure there are no gas bubbles caught in the probes' protective guard; you may need to shake the cell to remove these bubbles.

8. Turn-on the monitoring probes and turbidity meter.

9. Record the temperature, pH, dissolved oxygen, specific conductance, and oxidation/reduction potential measurements. Open the valve on the "T" connector to collect a sample for the turbidity measurement, close the valve, do the measurement, and record this measurement. Calculate the pump's flow rate from the water exiting the flow-through-cell using a graduated container and a stop watch, and record the measurement. Measure and record the water level. Check flow-through-cell for gas bubbles and sediment; if present, remove them.

10. Repeat Step 9 every 5 minutes or as appropriate until monitoring parameters stabilized. Note: at least one flow-through-cell volume must be exchanged between readings. If not, the time interval between readings will need to be increased. Stabilization is achieved when three consecutive measurements are within the following limits:

Turbidity (10% for values greater than 5 NTUs; if three Turbidity values are less than 5 NTUs, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

If these stabilization requirements do not stabilize in a reasonable time, the probes may have been coated from the materials in the groundwater, from a buildup of sediment in the flow-through-cell, or a gas bubble is lodged in the probe. The cell and the probes will need to be cleaned. Turn-off the probes (not the pump), disconnect the cell from the "T" connector and continue to purge the well. Disassemble the cell, remove the sediment, and clean the probes according to the manufacturer's instructions. Reassemble the cell and connect the cell to the "T" connector. Remove all gas bubbles from the cell, turn-on the probes, and continue the measurements. Record the time the cell was cleaned.

11. When it is time to collect the groundwater samples, turn-off the monitoring probes, and disconnect the pump's tubing from the "T" connector. If you are using a centrifugal or peristaltic pump check the pump's tubing to determine if the tubing is completely filled with water (no air space).

All samples must be collected and preserved according to the analytical method. VOCs and dissolved gases samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

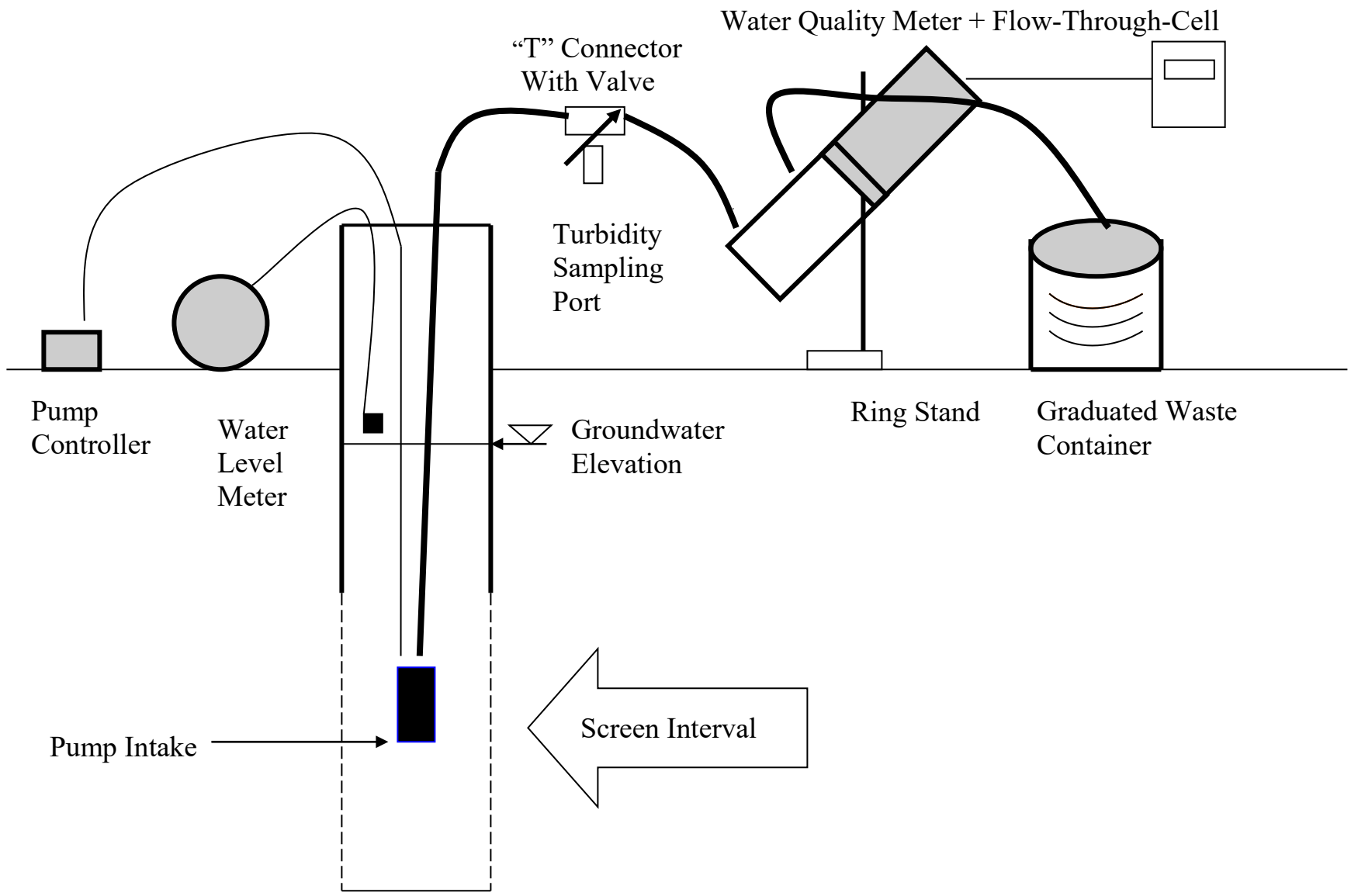
If the pump's tubing is not completely filled with water and the samples are being collected for VOCs and/or dissolved gases analyses using a centrifugal or peristaltic pump, do the following:

> All samples must be collected and preserved according to the analytical method. The VOCs and the dissolved gases (e.g., methane, ethane, ethene, and carbon dioxide) samples are collected last. When it becomes time to collect these samples increase the pump's flow rate until the tubing is completely filled. Collect the samples and record the new flow rate.

12. Store the samples according to the analytical method.

13. Record the total purged volume (graduated waste bucket). Remove the pump from the well and decontaminate the sampling equipment.

Low-Flow Setup Diagram



APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name)_____
Well Number_____ Date_____
Field Personnel_____
Sampling Organization_____
Identify MP_____

Depth to _____/_____ of screen
(below MP) top bottom
Pump Intake at (ft. below MP)_____
Purging Device; (pump type)_____
Total Volume Purged _____

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged liters	Temp. "C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Tur-bidity NTU	Comments
Stabilization Criteria					3%	3%	±0.1	±10 mv	10%	10%	

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

APPENDIC C – DRILLER CERTIFICATION AND LICENSE

Department of Consumer and Regulatory Affairs

GOVERNMENT
OF THE
DISTRICT OF COLUMBIA
Muriel Bowser, Mayor

Business Licensing Division
1100 4th Street S.W.
Washington DC 20024

Date Issued : 04/11/2018
Category : 4105
License# : 410512000317
License Period : 05/01/2020 - 05/31/2022

BASIC BUSINESS LICENSE

Billing Name and Address :

SOMENDRA KAHATAPITIYA
E2cr Inc.

1405-a Parker RoAD
Baltimore MD 21227

Premise/Application's Name and Address :

E2cr Inc.

1405 A PARKER RD -, BALTIMORE, MD 21227

Registered Agent's Name and Address :

Resagent Inc.

1025 Connecticut Avenue N.W., Suite 400
Washington DC 20036

Owner's Name :

Corp. Name : E2cr Inc.

Trade Name :

CofO/HOP# :	SSL : NA	Zone :	Ward :	ANC :	PERM NO. :
Class A		UNITS : 1			

General Service and Repair - Gen Contr/Construction Mngr

--THE LAW REQUIRES THIS LICENSE TO BE POSTED IN A CONSPICUOUS PLACE ON THE PREMISES--

*License Effective from the later of Issued or Start of License-Period Date

Ernest Chrappah

Interim Director :
Ernest Chrappah

Date : 5/11/2020 9:51:36 AM

Surface and Groundwater System - Wells and Soil Borings

Welcome, Siva +

SGS Home

Wells Home

My Well Permits

User Resources +

Support +

Add driller company

Note: Each drilling company is limited to a single account on this application, which is required to be administered by a sole representative for that company, or account manager. This person will have the ability to add and update licenses and add individual drillers to the account.

Driller companies (1 record)

Column Filter(s) (0 Set)

		Driller Company Name	Full Address	Add Individual Driller
		E2CR, Inc.	1405-A Parker Road, Baltimore, Maryland 21227	Add Individual Driller

Previous Page 1 of 1 5 rows Next

Individual drillers (1 record)

Column Filter(s) (0 Set)

		Name of Licens...	License Number	License State	License Expirati...	License Title	Driller
		Gregory Scott Lyon	MGD089	Maryland	05-31-2023	Master Well Driller - Geotechnical	email

Previous Page 1 of 1 5 rows Next

Driller Company permits (0 record)

Column Filter(s) (0 Set)

Government of the District of Columbia
Office of the Chief Financial Officer
Office of Tax and Revenue

1101 4th Street, SW
Washington, DC 20024

Date of Notice: June 16, 2021

Notice Number: L0005720537

E2CR INC
1405-A PARKER ROAD
BALTIMORE MD 21227

FEIN: **-***5901
Case ID: 853700

CERTIFICATE OF CLEAN HANDS

As reported in the Clean Hands system, the above referenced individual/entity has no outstanding liability with the District of Columbia Office of Tax and Revenue or the Department of Employment Services. As of the date above, the individual/entity has complied with DC Code § 47-2862, therefore this Certificate of Clean Hands is issued.

TITLE 47. TAXATION, LICENSING, PERMITS, ASSESSMENTS, AND FEES
CHAPTER 28 GENERAL LICENSE
SUBCHAPTER II. CLEAN HANDS BEFORE RECEIVING A LICENSE OR PERMIT
D.C. CODE § 47-2862 (2006)
§ 47-2862 PROHIBITION AGAINST ISSUANCE OF LICENSE OR PERMIT

Authorized By Marc Aronin
Chief, Collection Division

To validate this certificate, please visit MyTax.DC.gov. On the MyTax DC homepage, click the "Validate a Certificate of Clean Hands" hyperlink under the Clean Hands section.

GOVERNMENT OF DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION
1100 4TH STREET SW / 2ND FLOOR, WASHINGTON, DC 20024

PUBLIC SPACE OCCUPANCY/PARKING PERMIT

		PERMIT NO:	**PA10899603-R1**
EWR No:		**Source Permit:**	**PA10899603**
Location:	**4500 - 4599 BLOCK OF ARKANSAS AVENUE NW,4600 - 4699 BLOCK OF ARKANSAS AVENUE NW**		
Permission Granted To:	**WMATA Northern Bus Garage**	**DCRA License Number:**	
Permit Fee No:	**301579183**	**Permit Fee Amount:**	**$110.00**
Meter Fee No:		**Meter Fee Amount:**	**$0.00**
Deposit No:	**S68189**	**Deposit Amount:**	**$44,488.88 (Waived)**
Public Inconvenience Fee No:	**PIF79184**	**Public Inconvenience Fee Amount:**	**$552.64**

Permission is hereby granted to the entity named above to perform the work described herein at the address shown above in strict accordance with all conditions stated on all pages of this permit as well as on the application submitted.

Event: Construction Staging Area **Number of Steel Plate:** **Spaces Occupied: 8**

Approved sets of hours and days:

Time	Days
7:00 AM 7:00 PM	Mon Tue Wed Thu Fri

Meter Numbers (*If applicable*):

Location Description: **Contractor will perform soil borings from truck mounted drilling rig located in curb parking lane. MOT is phased. Traffic will be restricted to one-way, with flaggers on both ends of the construction staging area. Sidewalks will be temporarily closed during drilling operations to protect pedestrians. Work will be performed quickly. All drilling is expected to be completed within a week of mobilization.**

Conditions: ***"Emergency No Parking" and "Reserved Parking" signs must be posted no less than 72 hours in residential zones and 24 hours in business zones prior to occupancy. Signs must be immediately removed upon completion of work.**
***All work and occupancy must comply with all District regulations and statutes. Violation may result in revocation of this permit.**
***If street, alley or sidewalk closures are involved, approved Traffic Control Plan (TCP) is a part of this permit and must be on site at all times and visible from public space.**
***Must not block any Metro Transit bus stops or Metro entrances without the permission of WMATA and DDOT.**
***Must not block Fire Hydrants or any important utility structures (e.g. manholes, vault grates, ventilation, traffic signal box, etc...)**
***Must not occupy Loading Zones and driveways.**
***No crossing of sidewalk with trucks unless permission is granted and noted on TCP by DDOT.**
***Only registered commercial vehicles directly needed for construction are permitted to be parked in the area defined by this Permit when applicable.**
***Permit holder is responsible for all damage to public space as a result of work done under this permit.**
***Permit holder is responsible for obtaining any additional permits required by statute or regulation including DOH, WASA, FEMS, MPDC, DDOT and DCRA permits.**
***Prior to street, alley and sidewalk closures Permittee must immediately notify FEMS, MPDC and MPTD.**
***Renewals require all prior public space permits be on premise.**
***This permit is revocable at any time at the discretion of FEMS, MPD and/or DDOT.**
***This permit must be on site at all times and visible from public space.**
*** Person(s) who posts an unauthorized sign or removes an authorized sign is subject to a fine of $100 per day.**
*** Trash containers and Moving Containers are to be placed in curb lane at the front of this property unless specified elsewhere on the Permit.**
***No work or construction in public space is authorized by this permit.**
***No work is permitted before 7am or after 7pm Mon. thru Sat. or all day Sun.. Work before 7am or after 7pm Mon. thru Sat. or all day Sun. requires permit from DCRA.**
***Permit holder is responsible for contacting DDOT at 202-671-2020 to request the reinstallation of parking meters.**
***This permit does not authorize the removal of parking meters or parking meter heads.**
***Contractor must call Meter Branch at 671-2020 for meter bagging or to remove parking meters or parking meter heads.**
***This permit is not valid until the later of the Effective Date and the Issuance Date.**
All street trees located within the work zone shall have a 6' high chain link fence placed around the tree space to the extent of the box (min 4' x 9') or in a continuous planting space to the extent of the dripline. The fence shall be installed prior to work starting and removed after work has been completed.

Permit Effective: 12/12/2021 **Permit Expires: 12/18/2021**

TIFFANY TENBROOK **Everett Lott**

Public Space Permit Staff **Director**

d.

GOVERNMENT OF DISTRICT OF COLUMBIA
DEPARTMENT OF PUBLIC WORKS

VERIFICATION PROCESS FOR EMERGENCY NO PARKING/RESERVED PARKING SIGNS

After posting your Emergency No Parking/Reserved Parking (ENP/RP) signs, you must contact the Department of Public Works (DPW) to verify your signs are properly posted.

ONLINE VERIFICATION

Online photo verification is available through the Transportation Online Permitting System (TOPS) (https://tops.ddot.dc.gov). For information on the number of photos and what the photos should show, along with sample photos, please see the back of your ENP/RP signs.

PHONE VERIFICATION

You may also contact DPW at (202) 541-6083 to request in field verification, Monday – Saturday, 7am – 7pm.

Either phone or online verification is required. You do not need to do both.

WHEN YOUR SIGNS NEED TO BE POSTED

Your signs must be posted 72 hours in advance in a residential area, and 24 hours in advance in a commercial area. If your signs are removed before the 72 hours' or 24 hours' notice period expires you must immediately re-post the ENP/RP signs to maintain compliance. After the notice period has been fulfilled (72 hours for residential areas or 24 hours for commercial areas), an enforcement officer with DPW will ticket and tow all vehicles not in compliance with the posted ENP/RP signs.