

SCS BT SQUARED

April 11, 2012
File No. 25211374.46

Mr. Gary Edelstein
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921

Subject: Off-Site Investigation of Chlorinated VOC Plume in Bedrock
Land and Gas Reclamation Landfill, Horicon, Wisconsin

Dear Mr. Edelstein:

On behalf of the potentially responsible party (PRP) group for the Land & Gas Reclamation Landfill (LGRL), SCS BT Squared (SCS) is submitting this Workplan for additional off-site investigation at LGRL. The purpose of the work described in the plan is to investigate the horizontal and vertical extent of dissolved chlorinated volatile organic compounds (CVOCs) present in the bedrock aquifers downgradient from LGRL. The scope of work was developed based on conversations with the Wisconsin Department of Natural Resources (WDNR) on July 5 and August 1, 2011.

INTRODUCTION

The WDNR has requested additional investigation of the plume of dissolved CVOCs in the bedrock aquifer downgradient from LGRL. The objectives of the investigation are to evaluate the vertical and horizontal extent of CVOCs in the bedrock aquifer and to characterize the flow directions and pathways in the bedrock.

Results of recent source investigation activities were documented in a report to WDNR dated May 6, 2011. The results of these investigations may be summarized as follows:

- Rising vinyl chloride concentrations at the northern end of the shallow groundwater plume on Veolia property, northeast of LGRL, indicate that the shallow plume is continuing to expand slowly to the north.
- Relatively low CVOC concentrations in on-site wells screened in unconsolidated sediments near the top of the shale bedrock at the north end of LGRL suggest that there is not a direct connection between the shallow CVOC plume north of the site and the CVOCs in the bedrock aquifer; and that dense non-aqueous phase liquid (DNAPL) is not present at the north end of LGRL.
- Samples collected from on-site dolomite bedrock monitoring wells and off-site water supply wells indicate that CVOCs are present in the bedrock aquifer below



the Maquoketa Shale. The suite of CVOCs detected in samples from on-site bedrock monitoring well P-402E is similar to the suite of CVOCs detected in samples from downgradient water supply wells PW-27, P-423D (formerly PW-21R), and PW-21RR, located east and northeast of LGRL.

- Analysis of contaminant concentrations and groundwater chemistry indicates that the shallow and deep plumes have the same source. Multiple lines of evidence indicate that vertical migration of CVOCs to the bedrock aquifer is via transport of dissolved CVOCs in groundwater rather than transport of solvents in the DNAPL.
- There is an interconnection between the groundwater in the unconsolidated aquifer above the shale and the dolomite bedrock aquifer below the shale; however, the nature, location(s), and timing of vertical plume migration across the shale between the unconsolidated sediments and the dolomite bedrock have not been identified.

PROPOSED INVESTIGATION

Sherren Clark and Eric Oelkers of SCS and Andi Gregg of Veolia ES met with the WDNR Remediation and Redevelopment project manager for the LGRL site on August 1, 2011, to discuss the approach for off-site investigation of the dissolved CVOC plume in the bedrock aquifers below LGRL. The WDNR agreed that a phased approach to the investigation is reasonable and may avoid unnecessary costs and investigation activities. The general scope of proposed investigation, as agreed in the meeting, has been modified slightly based on additional considerations. The proposed investigation includes installation and sampling of new, off-site bedrock monitoring wells in addition to continued periodic sampling of downgradient water supply wells.

The continued monitoring of downgradient water supply wells will include the current monthly sampling of the Andrew Oechsner well (PW-21RR), and semi-annual sampling of the J. Oechsner (PW32), Weis (PW23), Muche (PW28), Sellnow (PW-20), and King (PW-38) wells. A minimum of two rounds of samples will also be collected from additional downgradient water supply wells located northeast of the PW-21RR, including Antonioni (PW-19), Steinbach, Hinz, and Christian. The locations of these wells are shown on Figure 1.

Phase 1 – Vertical Profiling of the CVOC Plume near PW-27

The first phase of the bedrock investigation is to identify the vertical distribution of contamination in what appears to be the main body of the CVOC plume. Water supply well PW-27, located on the All-Line property, has the highest concentrations of CVOCs detected in bedrock beyond the limits of the LGRL site boundary. (This well has not been used for water supply since 2009.) It appears that this well may be on or near the centerline of the plume.

The approach outlined below is designed to minimize the potential for migration of CVOCs from the upper dolomite to the underlying sandstone through an open multi-aquifer borehole. Based on the geophysical logging in PW-21R, the dolomite bedrock appears to become less fractured,

more competent, and more massive below a depth of about 350 feet below ground surface. The proposed drilling sequence therefore aims to avoid creation of an open connection across the lower dolomite - between the upper dolomite and the sandstone.

Relative depths and elevations of the geologic units and proposed wells are shown on the conceptual cross section sketch included in Attachment A. The proposed steps are:

1. Drill the initial borehole near PW-27 as a 6-inch open hole to an approximate depth of 370 feet. Terminate the hole in the "massive" dolomite approximately 20 feet above the top of the sandstone.
2. Log the open borehole using down-hole geophysical tools to profile the naturally occurring gamma radiation, fluid temperature and conductivity, and borehole diameter. Based on review of the geophysical logging results in the field, select intervals for heat pulse flow logging under ambient and pumped conditions. Characterize and quantify the flow in the dolomite bedrock with the heat pulse logs to allow identification of the zone(s) where transport of CVOCs is most likely to be occurring.
3. If it appears that there are productive zones below the same uppermost zone of the dolomite tapped by PW-27 and MW P423D (former PW-21R on the Andrew Oechsner property), a temporary packer may be used to facilitate sampling of one or more lower intervals of the open hole. Samples will be analyzed for volatile organic compounds (VOCs).
4. Based on the logging and packer sampling (if performed), select an interval for construction of a 2-inch monitoring well with screen, filter pack, and grout seal within the 6-inch open hole. Seal any unused portion of the bottom of the hole prior to the construction of the monitoring well. (If it appears that there are more than two intermediate zones in the dolomite that are worthy of long-term monitoring, then construction of a multi-level monitoring well in the borehole will be considered as an alternative to the construction of multiple single-interval conventional monitoring wells.)
5. Collect at least two rounds of groundwater samples from the new well and PW-27.

We will evaluate the observations and results of the dolomite hole and ongoing private well monitoring before making a decision about whether to install any additional monitoring wells at other intervals in the dolomite or underlying sandstone near PW-27. Depending on the results of the initial vertical profiling at PW-27 and the concentrations trends in the downgradient water supply wells, it may be necessary to install a sandstone well at this location to evaluate whether the CVOC contamination at MW-21RR is a localized effect or an indication of broader contamination in the sandstone aquifer.

If a sandstone monitoring well is required near PW27, the well will be constructed with a 6-inch steel casing grouted into a 10-inch hole drilled to a depth about 20 feet above the top of the sandstone. This casing depth may be adjusted as necessary depending on the data from the

dolomite well. After the grout had been allowed to set, a 6-inch open hole will be drilled into the sandstone to the depth of the uppermost productive water bearing zone. This well could then either be left open or a standard 2-inch well and annular space seal could be installed to further limit the potential for vertical migration in the lower open portion of the hole below the steel casing. Relative depths and proposed construction details are shown on the cross-section sketch included as Attachment A.

Following completion of the vertical profiling near PW-27, we will prepare a brief summary of the work completed and an analysis of the results. Based on the results obtained from Phase 1, we will recommend monitoring depth interval(s) for Phase 2 north and south of the plume.

Phase 2 – Evaluate Horizontal Extent of the Plume

This phase includes boreholes located to the north and south of the apparent centerline of the plume. The purpose of drilling at these two locations is to evaluate the width of the plume and to obtain groundwater elevation data to better understand the likely groundwater flow directions in the bedrock aquifer(s).

The proposed well locations are shown on the attached drawing (Figure 1). The proposed monitoring well located north of the Sellnow property is intended to help identify the northern extent of the plume and support a better understanding of the source of CVOCs detected in the water supply wells north of Andrew Oechsner's property. This location is on Veolia-owned property.

The general approach for installation of the monitoring wells in Phase 2 is described below. Final decisions about well depths and locations will be based on the information obtained from Phase 1.

- Install a minimum of one monitoring well at each of the indicated locations north and south of the apparent plume centerline.
- Profile the open borehole at each location with geophysical logs and heat pulse flow meter to allow correlation of geologic features and horizontal flow zones between the boreholes.
- Select monitoring interval(s) at each location based on the borehole logging results and the CVOC data obtained from Phase 1.
- Collect two rounds of samples (at least one month apart) from all new monitoring points and also points installed in Phase 1 with detected CVOCs.
- Prepare a brief summary of the work completed and an analysis of the results with recommendations for the monitoring well location and depth interval(s) for Phase 3.

Phase 3 – Evaluate Downgradient Extent of the Plume

In the event that concentrations of CVOCs greater than enforcement standards remain in the Oechsner well (PW-21RR) after the first two phases of the bedrock investigation have been completed and/or sample results from previous phases of investigation indicate that significant CVOC concentrations are migrating in the sandstone bedrock, it will likely be necessary to install and sample one or more monitoring wells downgradient from PW-21RR. The reasons for drilling at location(s) downgradient from PW-21RR would be to evaluate the full extent of the plume, provide an early warning (sentinel) monitoring point for other water supply wells downgradient from the plume, and obtain additional groundwater elevation data to better understand the likely groundwater flow directions in the bedrock aquifer(s).

A preliminary monitoring well location is shown on the attached drawing; however, the actual location, if needed, will be selected after the Phase 2 wells have been drilled and monitored. If downgradient monitoring wells are required, at least one borehole will be profiled using procedures similar to those outlined in Phases 1 and 2.

INVESTIGATION UPDATE REPORT

SCS will prepare an investigation update report with full documentation of all drilling, logging, well installation, and sampling activities. The report will summarize the results of field measurements and laboratory analyses, and provide recommendations for further investigation and/or remedial measures as necessary.

Please do not hesitate to contact us at (608) 224-2830 if you have any questions regarding the proposed investigation approach.

Sincerely,



Sherren Clark, PG, PE
Vice President
SCS BT SQUARED

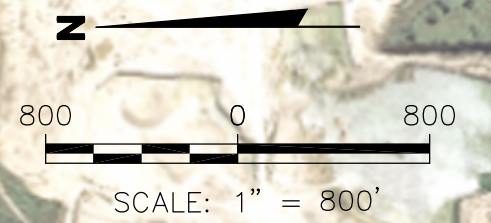
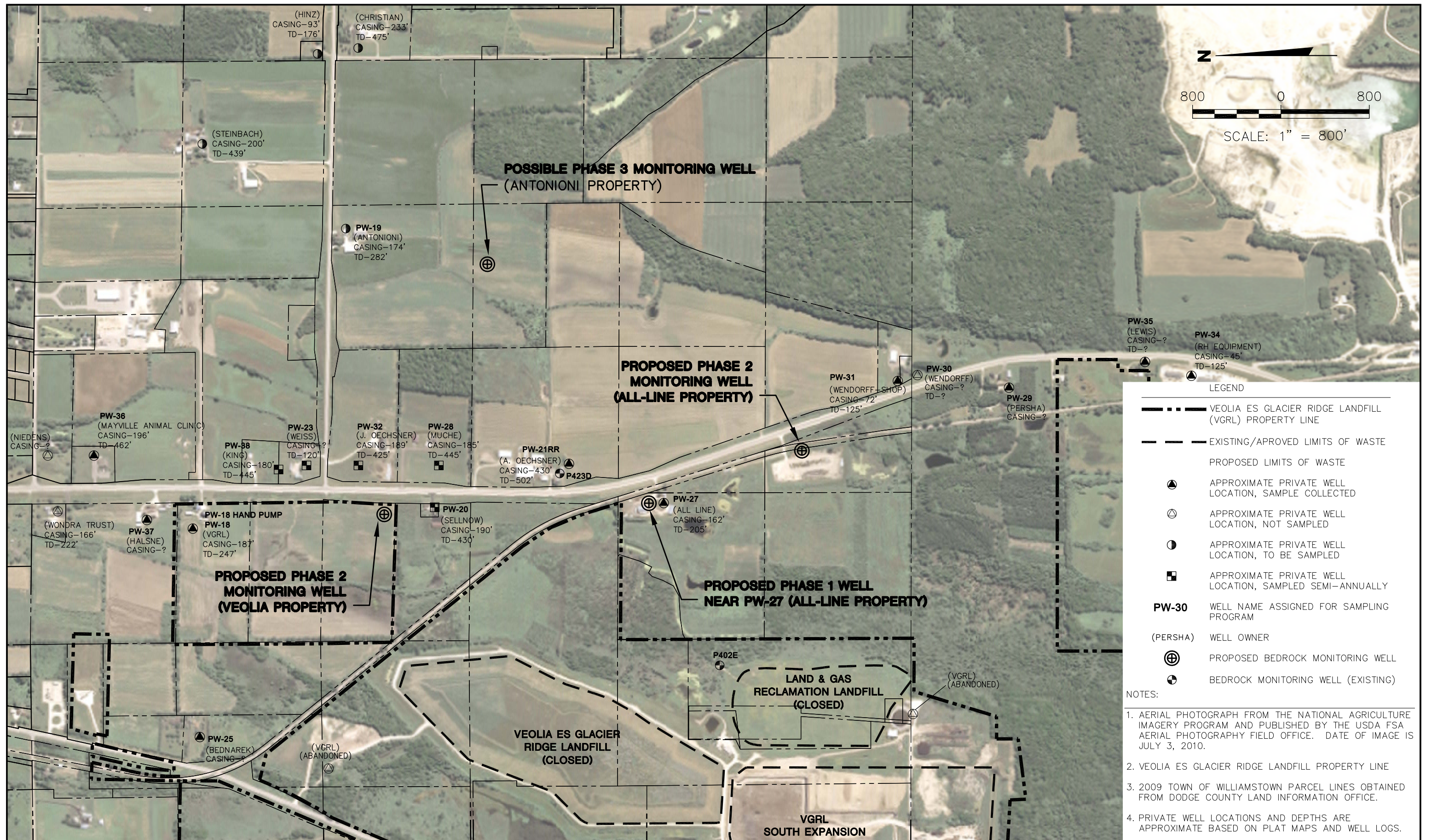


Eric Oelkers, PG
Senior Hydrogeologist
SCS BT SQUARED

EO/jsn/SC

cc via email: Adam Hogan, WDNR
Melissa Bachhuber, Veolia ES
Andi Gregg, Veolia ES
Jay Warzinski, Veolia ES

Enclosures: Figure 1 – Proposed Off-site Bedrock Monitoring Well Locations
Attachment A – Cross Section Sketch



- LEGEND**
- VEOLIA ES GLACIER RIDGE LANDFILL (VGRL) PROPERTY LINE
 - EXISTING/APPROVED LIMITS OF WASTE
 - PROPOSED LIMITS OF WASTE
 - APPROXIMATE PRIVATE WELL LOCATION, SAMPLE COLLECTED
 - APPROXIMATE PRIVATE WELL LOCATION, NOT SAMPLED
 - APPROXIMATE PRIVATE WELL LOCATION, TO BE SAMPLED
 - APPROXIMATE PRIVATE WELL LOCATION, SAMPLED SEMI-ANNUALLY
 - PW-30** WELL NAME ASSIGNED FOR SAMPLING PROGRAM
 - (PERSHA) WELL OWNER
 - PROPOSED BEDROCK MONITORING WELL
 - BEDROCK MONITORING WELL (EXISTING)

- NOTES:**
1. AERIAL PHOTOGRAPH FROM THE NATIONAL AGRICULTURE IMAGERY PROGRAM AND PUBLISHED BY THE USDA FSA AERIAL PHOTOGRAPHY FIELD OFFICE. DATE OF IMAGE IS JULY 3, 2010.
 2. VEOLIA ES GLACIER RIDGE LANDFILL PROPERTY LINE
 3. 2009 TOWN OF WILLIAMSTOWN PARCEL LINES OBTAINED FROM DODGE COUNTY LAND INFORMATION OFFICE.
 4. PRIVATE WELL LOCATIONS AND DEPTHS ARE APPROXIMATE BASED ON PLAT MAPS AND WELL LOGS.

PROJECT NO.	3744	DRAWN BY:	KP
DRAWN:	09/13/11	CHECKED BY:	EO
REVISED:	09/29/11	APPROVED BY:	SC 04/11/12

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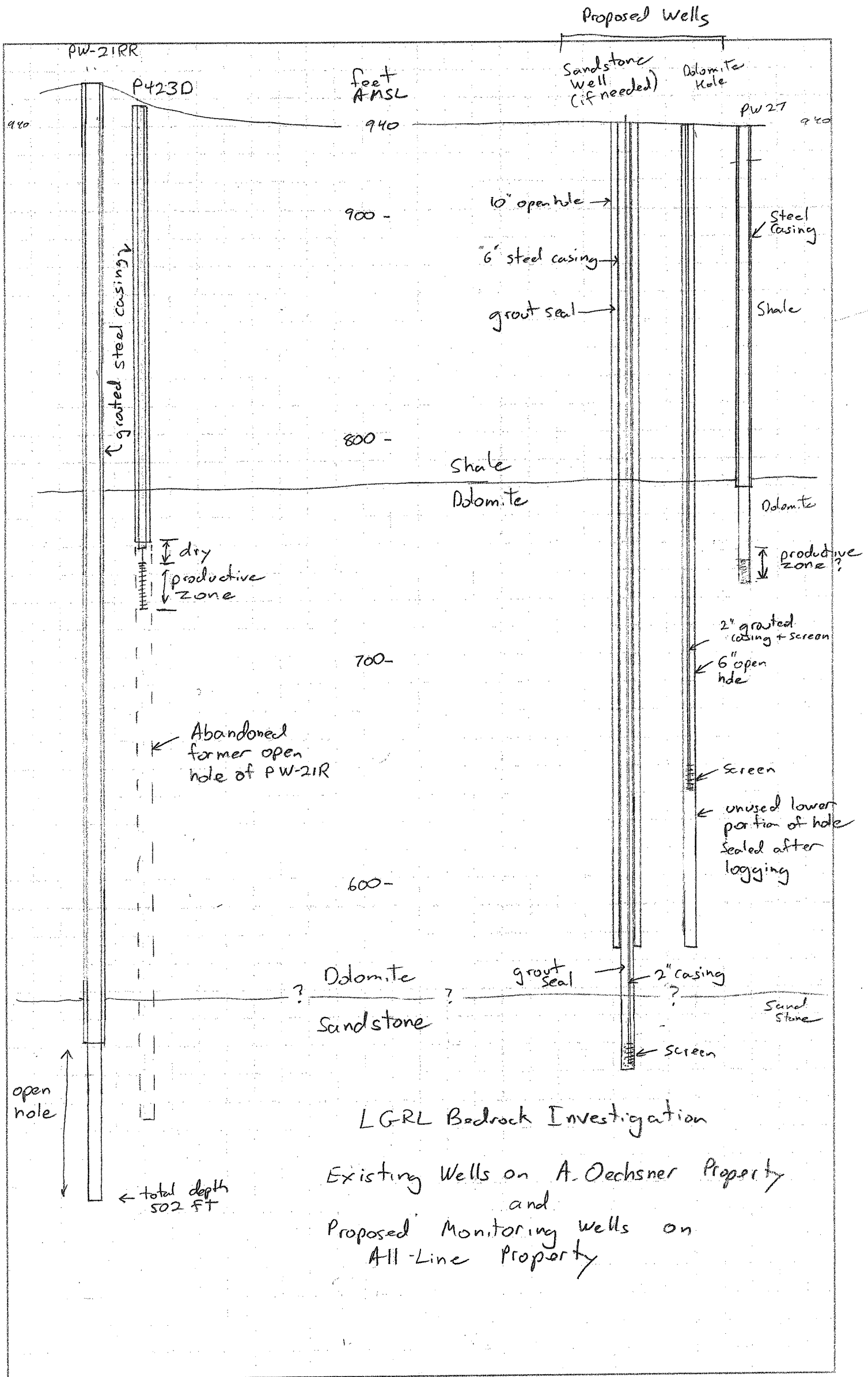
CLIENT **VEOLIA**
 VEOLIA ES GLACIER RIDGE LANDFILL, LLC.

SITE VOC INVESTIGATION
 LAND AND GAS RECLAMATION LANDFILL
 DODGE COUNTY, WISCONSIN

FIGURE	1
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ATTACHMENT A

Cross Section Sketch



LGRB Bedrock Investigation
 Existing Wells on A. Oechsner Property
 and
 Proposed Monitoring wells on
 All-Line Property