

Performance Monitoring Plan

Wagner Road Extraction

December 22, 2005

Background

A Performance Monitoring Plan (PMP) for the Wagner Road extraction system was submitted to the Michigan Department of Environmental Quality (MDEQ) on August 1, 2005 as part of PLS Life Sciences (PLS) Work Plan for Groundwater Extraction. In a November 18, 2005 response, MDEQ requested additional information. This revised response has been prepared to fulfill that request.

Listing of Wells to be used in the PMP

MDEQ has requested a revised listing of the wells to be used as part of the PMP. This listing is provided as Attachment 1. A monitoring schedule is also provided in Attachment 1. Wells used in the PMP have been categorized into one of three groups: wells with specific performance criteria assigned, wells to be used for water level monitoring, and extraction wells to be monitored.

Proposed Plan for Installation of Additional Wells

PLS proposes to install one or more wells at two locations. One well, positioned east/northwest of TW-18, will be installed as a performance monitoring well. A second well, south of TW-18, will be installed to further investigate the extent of 1,4-dioxane south of TW-18. . Proposed areas for the installation of these wells are shown on Attachment 2 and are described below.

East/Northeast Well Site

Potential locations for wells in the area east of TW-18 are severely limited due to difficult access (Dolph Park), heavy vegetation, and a complex wetland/marsh system. Due to access limitations, it is necessary to install a well closer to TW-18 than ideal. Since this area is likely to be within the capture of TW-18, water quality data from this well site would be unlikely to provide a good indication of the performance of TW-18. However, if the well were to be installed further north/northeast, then water quality data from this well cannot be used to assess the intended objectives of the Wagner Road system. This is because operation of TW-18 has the potential to pull some water from the Unit D2 plume toward the well from the north. As such, it will be extremely difficult to determine if a well positioned north/northeast of TW-18 would be monitoring the Unit E plume or the Unit D2 plume to the north.

MDEQ has commented there is a potential Groundwater Surfacewater Interface (GSI) concern related to the Unit E plume and First/Second Sister Lakes. Data collected by PLS

clearly demonstrates that GSI is not a pathway of concern. Some support for this interpretation includes:

- The water level on First/Second Sister Lakes is approximately 910 feet above mean sea level (amsl). The potentiometric surface of the Unit E in the lake area is approximately 873 feet amsl. As such, the lake levels are approximately 37 feet higher than water levels in Unit E. It is not physically possible for water in the Unit E to discharge into the lakes. The lakes appear to be interacting with shallower water-bearing deposits above the Unit E.
- Water quality data collected by PLS strongly suggest the Unit E plume is moving under and passing by the lakes.
- Aquifer testing at TW-18 indicate the aquifer is confined to slightly semi-confined. This finding is supported by the geological information in TW-18 which indicates the aquifer has multiple fine-grained deposits overlying it. These deposits minimize interaction between the lakes and Unit E.

PLS does not intend to further investigate the GSI pathway in relationship to the Unit E plume in the Wagner Road area.

Southern Well Site

MDEQ has questioned PLSs interpretation of the southern boundary of the Unit E plume, specifically the area between TW-18 and TW-12. PLS has proposed to investigate this area to further the understanding of the Unit E plume in this area.

PLS is proposing the installation of a well(s) in the area shown on Attachment 2. Data from this boring/well(s) will be used to assess conditions in this area and to evaluate the potential need for adjustments to the purge system.

Well Boring/Well Installation Methods

The proposed wells will be drilled using hollow-stem auger drilling methods to depths sufficient to encounter bedrock.

The proposed sampling methods are split-spoon and Simulprobe for collection of soil and soil/groundwater, respectively. Soil samples will be collected as split-spoon samples at 10-foot intervals, beginning at ground surface. Starting at a depth of approximately 10 feet below the uppermost water-bearing zone, soil/groundwater samples will be collected using Simulprobe techniques and continue through the aquifer(s) to the total depth of the boring/well. All soil samples will be described/classified based on their physical characteristics during the drilling of each boring by an onsite geologist. In water-bearing units, Simulprobe sampling will be performed at a maximum frequency of every 10 feet.

Split-spoon sampling will not be collected at the Simulprobe intervals, as the Simulprobe will account for the soil sampling. If it is not possible to collect a representative groundwater sample (i.e., not able to drive the Simulprobe sampler into undisturbed soil), a temporary well constructed of galvanized riser and stainless steel screen will be installed. The temporary well screen will be set into the aquifer and a K packer assembly will be used to allow for the collection of a representative groundwater sample.

The groundwater samples will be analyzed for 1,4-dioxane by PLS.

Upon reaching the total depth of the boring, as determined by the onsite geologist, the borehole will be geophysically logged using a natural gamma tool. This data will supplement the formation samples and provide additional information regarding site geological conditions.

A monitoring well (or wells) will be installed at the soil boring location for the primary purpose of obtaining representative water-level data and water-quality data (1,4-dioxane concentrations). This may involve installing a nested well or one strategically positioned well. PLS will discuss all well installation plans with the MDEQ. Water quality data will also be considered in the selection of a representative screen zone.

Well(s) will be constructed of either 2-inch polyvinyl chloride or galvanized-steel casing, equipped with a 5-foot stainless-steel well screen. The well will be gravel packed and grouted. The wells will likely be completed as flush mounts, equipped with locking caps and locks.

Soil cuttings derived from the drilling and development water will be transported to PLS for appropriate management.

Data Evaluation Plan

The performance of the Wagner Road system will be judged by an evaluation of water level and water quality data from selected wells (Attachment 1). PLS will submit PMP monitoring data as part of the current quarterly reporting process.

Water level data will be used to prepare potentiometric surface maps. Previous analysis by PLS has shown that the existing network of wells along with the additional proposed wells will provide sufficient data to contour the flow field around TW-18. The potentiometric surface maps will be compared to the capture zone estimates made by PLS and presented in its August 1, 2005 work plan. Any sufficient discrepancies between the capture zone estimates and the measured flow field will be reported to MDEQ and will be used to evaluate potential changes to the operation of TW-18 to meet system objectives.

Water quality data collected as part of the PMP will be tabulated and graphed by PLS. The data will be reviewed to establish water quality trends. Appropriate statistical methods such as the Mann-Kendall Test will be employed as necessary to quantify water quality trends.

Performance Standards

PLS proposes the following performance standards for the Wagner Road extraction.

MW-70 – Concentrations of 1,4-dioxane in groundwater samples from this well remain below 85 ug/L.

MW-71 – interpreted to be positioned south of the longitudinal axis of the Unit E plume, downgradient of TW-18. PLS believes this well is well positioned to monitoring groundwater quality trends downgradient of the Wagner Road area. Water level data from the TW-18 area and MW-71 show a flat hydraulic gradient. As such, groundwater velocities in this area may be slow. PLS has done some flow and transport modeling to estimate the time it will take for 1,4-dioxane concentrations at MW-71 to decline after capture is established along Wagner Road. PLS estimates this time will be at least 3-5 years, but it could be longer. PLS will provide MDEQ with supporting information for a performance standard for MW-71. At this time, PLS anticipates that the proposed standard will be a water quality standard that is based on a decline in 1,4-dioxane levels starting at least 5 years after implementation of the Wagner Road system.

New Well East/Northeast of TW-18 in the area of Rhea Street – Hydraulic gradients measured between this well and the operating well indicate a flow toward TW-18.

Well south of TW-18 – This well is not being installed specifically as a performance-monitoring well. PLS may identify a performance standard for this well once it is installed and preliminary information from the boring/well has been evaluated.

Wagner Road Interim Response Implementation Schedule

December 22, 2005

Action Item	Schedule	Comments
Submit revised performance monitoring plan	December 22, 2005	
Complete installation of pipeline from TW-18 to plant	Week of December 26, 2006	
Submittal of Leak Detection Plan	January 9, 2006	
Finalize connections of TW-18 to the treatment system and initiate groundwater extraction and performance monitoring	January 15, 2006	
Submit analysis regarding performance criteria for MW-71	February 1, 2006	
Installation of two monitoring wells (east/northeast and south of TW-18)	February 28, 2006	Access Dependent
Provide a report on the new well south of TW-18, including an assessment of 1,4-dioxane concentrations at that location. If 1,4-dioxane exceeds 85 ug/L at the well site, determine if the well area is within or outside the capture zone of TW-18, and what adjustments to TW-18 (or possibly TW-12), if any, are appropriate.	Two months after the installation of the well	

**ATTACHMENT 1
PERFORMANCE MONITORING - WAGNER RD
UNIT E AQUIFER**

Well I.D	Groundwater Quality Frequency	Water Level Frequency
Wells with specific performance criteria assigned		
MW-71	Quarterly	Quarterly
MW-70	Semi-Annual	Semi-Annual
New wells east of TW-18	Quarterly	Quarterly
Wells to be used in water level monitoring		
TW-18		1
MW-30d		1
MW-64		1
MW-65s		1
MW-65i		1
MW-65d		1
MW-69		1
MW-71		1
MW-70		1
MW-72		1
MW-68		1
MW-94s		1
MW-94d		1
MW-95		1
MW-96		1
New wells east of TW-18	Monthly During Extraction	
Saginaw Forest Cabin #1 or #2	Monthly During Extraction	
Extraction wells to be monitored		
TW-18	1 = one month after startup, quarterly thereafter until extent of capture is defined.	
TW-12 (if used)	1 = one month after startup, quarterly thereafter until extent of capture is defined.	

