

# **Work Plan**

## **Monitoring Water Levels Under Reduced Extraction Rates Evergreen System (LB-1, LB-3, and AE-3)**

### **BACKGROUND**

This Work Plan outlines Pall Life Sciences' (PLS) plan for monitoring water levels under temporarily reduced extraction rates from extraction wells LB-1, LB-3, and AE-3 (Evergreen Area). This testing was recommended by the Michigan Department of Environmental Quality (MDEQ) as a means to assess the effect of PLS' proposal to modify the extraction rates of the Evergreen System wells on groundwater flow in the area and the significance of any such changes.

PLS currently operates the Evergreen System extraction wells at a combined extraction rate of approximately 200 gallons per minutes (gpm). PLS is proposing to reduce these rates to accommodate additional flow from the Maple Road extraction well, which would be conveyed by a new transmission pipeline PLS has proposed to install. The proposed pipeline would connect the Maple Road extraction system to Evergreen System and the deep transmission line that currently conveys water from the Evergreen System to the Wagner Road facility for treatment. The deep transmission line has a capacity of approximately 200 gpm. Consequently, PLS would have to reduce purging from the Evergreen wells before water from the Maple Road system could be added. This primary purpose of this work is to identify whether reduced extraction rates would result in significant changes in groundwater flow directions currently observed in the Evergreen System area.

### **WORK PLAN**

#### **Testing Procedure**

PLS proposes to install the transducers in certain monitoring wells to measure the effects of reduced extraction from the Evergreen System wells (the wells to be monitored are identified below). The water levels will be measured and recorded using pressure transducers and data logging devices. The recorder times will be synchronized with the clock used to note when flow rates in the extraction wells are changed.

PLS will initially collect background water level data for a minimum of three days from the specified well locations. PLS will then instantaneously reduce the flow rates in LB-1 and LB-3 to 50 gpm each and terminate pumping of AE-3. The time of the flow rate reductions will be noted. Water levels will be recorded for a period of five days or more at these flow rates. After the five days, data from the loggers will be downloaded and reviewed. If it appears there is still significant water level recovery at a given well, PLS will extend the data collection process for that well until it appears a majority of the water level changes attributable to extraction rate reductions has been observed. The pressure transducers will remain in the well during the entire monitoring period.

Once the first phase of testing (reduced flow) is completed, PLS will terminate all water extraction from the Evergreen extraction wells. The time when extraction is terminated will be recorded. PLS will then record water levels from each of the approved wells for another five days or more. Then, the data from the loggers will be downloaded and reviewed. If it appears there is still significant water level recovery at a given well, PLS will extend the data collection process for that well until it appears a majority of the water level changes attributable to extraction rate reductions has been observed. The pressure transducers will remain in the well during the entire monitoring period.

Following completion of this test, PLS will resume groundwater extraction at the previous rates.

PLS will augment the aforementioned information with water level collected from additional wells. These measurements will be collected from these wells before changing flow rates, at the end of the first stage and at the end of the second stage.

### **Monitoring Wells to be Used**

Wells to be used for the testing are shown on Attachment 1. PLS proposes to install pressure transducers in certain designated wells and periodically collect water levels using an electric tape from various other wells during the testing period. The following table indicates the wells and types of measurement:

<b>Transducer Measured</b>	<b>Electric Tape Measured</b>
MW-122s – Kuehnle and Dexter	MW-47s
MW-122d – Kuehnle and Dexter	MW-54s&d
MW-120s – Kuehnle and Sequoia	MW-55
MW-120d – Kuehnle and Sequoia	MW-91
New Well(s) – Dexter and Landings Blvd.	MW-100
MW-KD-1d	MW-107
MW-BE-1s	MW-117
MW-92	MW-KD-1s
MW-47d	MW-KZ-1
MW-77	MW-BE-1d
MW-113	MW-400 Clarendon
373 Pinewood – Shallow	MW-81
LBOW-1	MW-91
LB-1	MW-101
LB-3	MW-104
AE-3	MW-110
MW-98s (for background purposes)	

Note: MW-98s is not shown on Attachment 1.

## **DATA ANALYSIS**

PLS will collect the water level data and prepare hydrographs using said data. The data will be compared to the timing of the flow rate reductions to determine if there are any relationships.

Barometric pressure data for the area will be monitored during the testing period. These data will also be plotted and compared to water level trends.

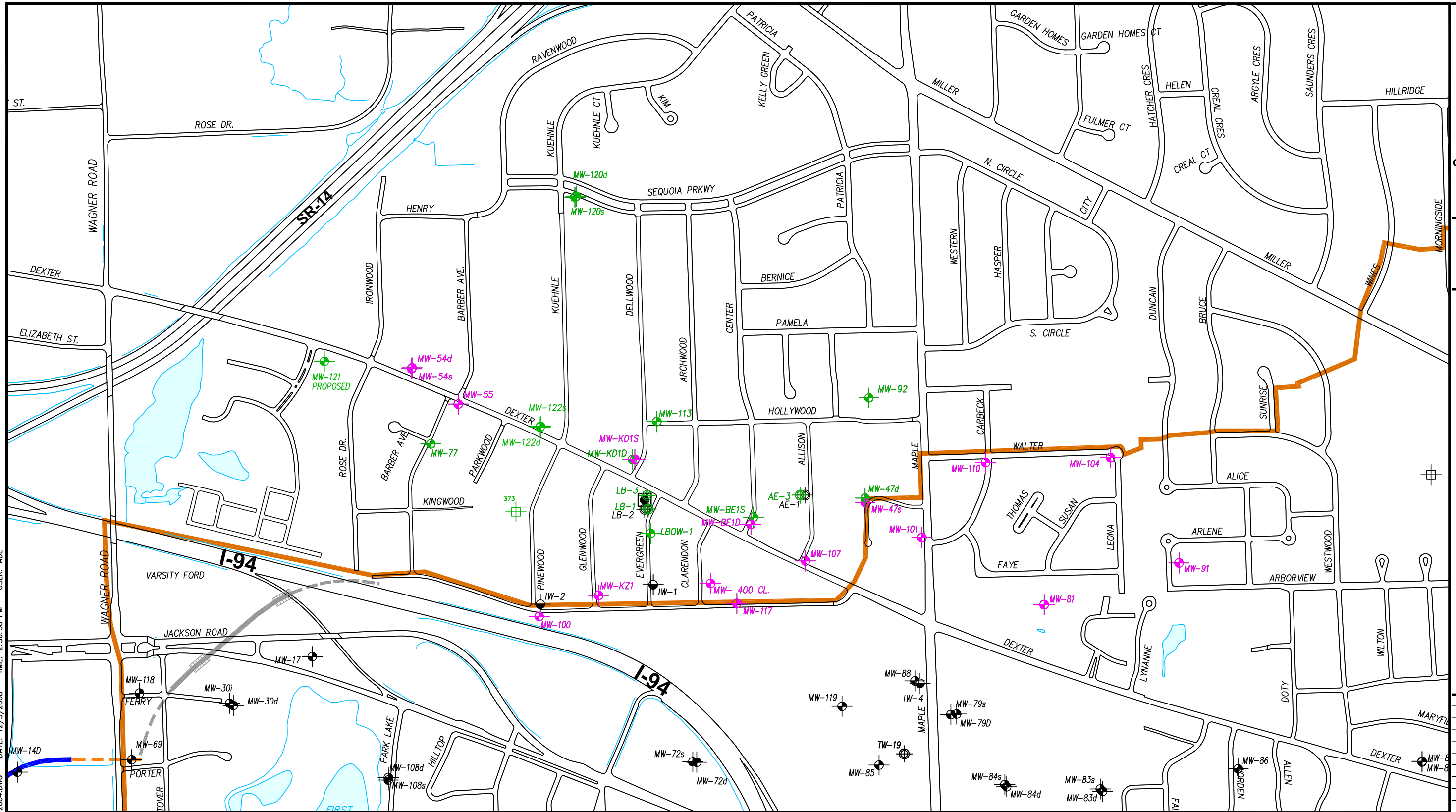
Potentiometric surface maps will be prepared using data collected before pumping rates are adjusted and after the two testing stages.

## **DELIVERABLES**



PLS will provide hydrographs for all wells, the potentiometric surface maps, and a report of the findings from the testing.

## **PROJECT SCHEDULE**

PLS proposes to initiate this testing within three weeks of completing installation of all proposed new Evergreen area monitoring wells (MW-120, MW-121, MW-122). One month after completion of the study, PLS will provide a report to the MDEQ.



**LEGEND**

-  - WATER LEVELS MEASURED PERIODICALLY WITH ELECTRIC TAPE
-  - WATER LEVELS MEASURED CONTINUOUSLY WITH PRESSURE TRANSDUCER



**WATER TABLE LEVEL  
MONITORING LOCATIONS**

BASE MAP ADAPTED FROM USGS 7.5' TOPOGRAPHIC QUADRANGLE  
ANN ARBOR WEST, MICHIGAN  
WASHTENAW COUNTY AND THE CITY OF ANN ARBOR  
AERIAL PHOTOS PROVIDED BY WASHTENAW COUNTY - 1999 AND THE CITY OF ANN ARBOR - 1997  
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