COVER SHEET
STANDARD OPERATING PROCEDURE

OPERATION TITLE: **MICROWELL INSTALLATION PROTOCOL**

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1.0 APPLICABILITY

This Standard Operating Procedure (SOP) applies to all programs in the Maine Department of Environmental Protection's (MEDEP) Division of Remediation (DR). It is also applicable to all parties that may submit data that will be used by the MEDEP/DR.

This SOP is not a rule and is not intended to have the force of law, nor does it create or affect any legal rights of any individual, all of which are determined by applicable statutes and law. This SOP does not supersede statutes or rules.

2.0 PURPOSE

The purpose of this document is to describe MEDEP/DR procedure for installation of microwells.

3.0 RESPONSIBILITIES

All MEDEP/DR Staff must follow this procedure when performing this task. All Managers and Supervisors are responsible for ensuring that their staff are familiar with and adhere to this procedure. MEDEP/DR staff reviewing data by outside parties are responsible for assuring that the procedure (or an equivalent) was utilized appropriately.

4.0 DEFINITIONS

4.1 GEOPROBE® – A method of obtaining soil borings utilizing Geoprobe Systems direct push technology.
4.2 BOREHOLE – The hole created in the ground after using the Large Bore Soil Sampler for collecting soil borings, or the Large Bore Pre – Probe designed specifically for creating a hole for installation of a Microwell, or for continued soil sampling at depth.
4.3 ANNULUS – Space in the borehole between Microwell screen or casing and the borehole wall.
4.4 RISER – Threaded 3/4-inch ID pipe constructed of polyvinyl chloride (PVC) plastic, available in various lengths.
4.5 SLOTTED SCREEN – Threaded, 3/4-inch ID PVC casing constructed with 0.010-inch slots to allow water to enter the microwell from the surrounding formation.
4.6 FILTER SAND - Clean, well rounded screened sand that is placed in the annulus between the borehole wall and the well screen to keep formation material from entering the completed microwell.
4.7 BENTONITE - a hydrous aluminum silicate available in powder, chip, granular, or pellet form, that is used to provide a tight seal between the borehole wall and the well casing.

5.0 GUIDELINES AND PROCDURES

5.1 INTRODUCTION

Microwells provide an inexpensive, yet effective method for obtaining overburden groundwater samples. Microwells can be installed for collection of groundwater samples on a temporary basis, or when placed in secured, out of the way locations. They can also be effective as long-term monitoring points.

5.2 EQUIPMENT

Equipment required for installation of microwell include:

- Direct push type boring system, such as Geoprobe® Systems soil boring system;
- ¾ inch PVC Riser;
- ¾ inch PVC 0.010-inch slotted screen;
- ¾ inch PVC threaded end caps;
- Geoprobe® 1.1-inch OD expendable point;
- filter sand; and
- Granular bentonite.

5.3 MICROWELL INSTALLATION PROCEDURE

1) Using the boring system, construct a borehole to the depth desired for the microwell (refer to the manufacturer's operations manual for use of the boring system). In microwells over 15 feet deep, it is sometimes prudent to bore one or two feet deeper than desired. After reaching the depth desired, leave soil borer or probe in borehole (to prevent premature borehole collapse), and proceed to Step 2.

2) Construct the microwell using the PVC riser, slotted screen, and end cap or disposal tip. Length of Screen and Riser will vary, depending on the formation to be sampled and depth of the individual well. For shallow wells (less than 15 feet), a blunt end cap will usually suffice. In deeper wells or easily collapsible formations, construct a "modified screen" by sawing off the threads to the riser with a hacksaw (approximately one inch off of the tip), and hammer a Geoprobe Expendable Point into the end of the riser by banging the riser and tip on a truck tailgate or other sturdy object. Deeper wells may also require the construction of the well in sections while installing the well in the borehole; use best field judgement to determine the technique.

3) Remove the soil Borer or pre-probe from the borehole and install the microwell immediately after withdrawal. If the well does not finish into the borehole to the required depth, utilize a hammer to provide extra force in pushing the well into the borehole. Be careful not to apply enough force to crush the slotted screen.

4) If the well still does not advance to the appropriate depth, remove the well, and re-drill the borehole with the soil borer or blunt probe. It is sometimes helpful to clean out collapsed material from the borehole by "resampling" with the soil borer several times. Reinstall the microwell when re–drilling is completed.

5) Carefully pour filter sand into the annulus around the casing to ensure that the well screen is surrounded by the filter sand. The level of filter sand should rise above the top of the screen by a minimum of 1 foot.

6) Pour bentonite into the annulus to seal the well against surface water infiltration. A minimum of two feet of bentonite is sufficient to seal a microwell. Filter sand or native fill should be used to fill at least the top foot of the annulus.

Once the microwell has been installed, it should be properly surveyed (if it will be used for water level information), capped with an appropriate end cap, and permanently marked with the correct well designation. The appropriate security measure (such as a road box, or locking outer casing), if required, can then be installed over the microwell. The well should then be developed (see Section 5.5).

5.4 WELL INSTALLATION EVALUATION

If the microwell does not install into the borehole after repeated attempts to clean out collapsed material, the formation may not allow for installation of a microwell with this method. It may be necessary to utilize a temporary well point system, or installation of a monitoring well with a rotary drilling rig.

5.5 MICROWELL DEVELOPMENT

Development is necessary in order to remove fines from the vicinity of the well screen and remove silt that has accumulated in the well during its installation. Development is also necessary to develop the filter sand in the annulus around the well. Fine particles are drawn into the pore spaces of the sand pack to block other fine material from entering. Microwells can be developed by over-pumping, or a combination of surging and over-pumping. Microwell development is a skill which is developed over time, as each well is unique in its development requirements.

5.5.1 DEVELOPMENT PROCEDURE

Using a peristaltic pump and ¼ inch polyethylene tubing, pump the wells while agitating the well with the tubing to stir up fine sand and silt, and allow this material to flow out with the purged water. Allow the tubing to reach the bottom of the well to remove as much settled material as possible. It may be necessary to completely evacuate the well several times in order to fully remove all of the fines and settled material.

If water from the microwell is still turbid, it may be necessary to surge the well with a surge block to remove sediment. (A device which works very well for this is a chimney brush extension rod with threaded ends.) After surging the well with the device to flush water in and out of the well

through the slots and the sand pack, continue pumping the well as described above until the water is generally silt free.

While developing the well, records regarding flow rates and recharge rates should be kept in order to fully evaluate the well and the formation in which it is screened. This information will also be used in developing purge rates for future sampling.

The well should then have ¼ inch tubing dedicated to the well. The ideal location for the tubing intake is directly in the middle of the screen. However, if the screen is not fully saturated (not ideal, but acceptable), then the intake should be placed halfway between the lowest expected water level and the bottom of the screen.

After development, the microwell can be sampled. Sampling the microwell should be conducted following MEDEP/DR SOP# RWM-DR-002 – Groundwater Sample Collection For Site Investigation and Assessment Monitoring.

6.0 DOCUMENTATION

Documentation of well installation and subsequent sampling should be conducted following MEDEP/DR SOP# RWM-DR-013 – Documentation of Field Activities and Development of a Trip Report. Sample custody must be followed as outlined in MEDEP/DR SOP# RWM-DR-012 – Chain of Custody Protocol.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of this procedure. However, all field work should be conducted following “standard field procedures” for sampling, decontamination, and safety and health issues, as described in this task’s specific MEDEP/DR SOP.

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