SOP S-7

STANDARD OPERATING PROCEDURE FOR MONITORING WELL INSTALLATION AT THE WEST KINGSTON TOWN DUMP/ URI DISPOSAL AREA SITE

Woodard & Curran, Inc.

MONITORING WELL INSTALLATION AND DEVELOPMENT PROCEDURES

Monitoring wells are installed to provide access to groundwater for collecting samples, as well as for obtaining water-level and other field data. Because monitoring wells are used to collect samples, it is important that construction materials not interfere with sample quality either by contributing contaminants or by sorbing contaminants already present. Further, construction materials must be compatible with (i.e., not degraded by) contaminants present in soils or groundwater.

Monitoring wells are potential contaminant migration routes between aquifers or from the surface to the subsurface. Construction procedures and standards must ensure that neither passive nor active introduction of contaminants can occur. Properly installed hydraulic seals and locking well covers reduce the potential for cross-contamination of monitoring wells.

Equipment needed:

- Drilling or auguring equipment appropriate to site conditions, drilling depth, and other project requirements.
- Drill bits appropriate for the expected soil and rock type(s) to be encountered.
- Sufficient threaded flush-joint riser pipe of an approved material [stainless steel, polyvinyl chloride (PVC), Teflon] in convenient lengths. **(NOTE: No glues are permitted.)**
- Sufficient threaded flush-joint slotted screen of an approved material (stainless steel, PVC, Teflon) to meet design criteria. **(NOTE: No glues are permitted.)**
- Properly sized and washed filter pack material (quartz sand) in sufficient volume to meet well design criteria.
- Powdered bentonite.
- Photoionization detector.
- Explosimeter (if applicable).
- Steel surface casing (if required).
- Steel protective casing with locking cap.
- Tremie pump and pipe.
- Protective clothing, as required.
- Weighted measuring tape.

NOTE: American National Standards Institute Schedule 5, Type 304, stainless steel or Schedule 40 PVC has sufficient tensile and compressive strength for most monitoring well installations.

The following steps will be followed when installing monitor wells:

1. Advance the borehole to the required depth using a bit or auger flight of a diameter sufficient to allow for insertion of the tremie pipe when the casing is centered. It is preferred that the borehole be at least 2 inches in diameter larger than the casing diameter. The borehole should be drilled slightly deeper than required for the combined length of casing and screen. The final completion depth should be sounded with a decontaminated, weighted tape before continuance of well placement.

2. Make up the screen for installation. The casing and screen must be decontaminated. Tighten joints.

3. Withdraw the drill rods and bit through the auger flights. Check the borehole depth with a weighted surveyor's tape.

4. Lower the casing string into the drill casing.

5. Install the filter pack. Six inches or more of filter pack material should be spotted at the bottom of the hole, under the screen. Filter pack will be installed to 2 to 3 feet above the top of the screen.

6. Check the depth to the top of the filter pack with a weighted tape.

7. Tremie, or for shallow wells (<35 feet), gravity feed bentonite onto the top of the filter pack.

8. Pure bentonite grout (Volclay or equivalent) will be used as the annular seal, grout will be mechanically mixed with the appropriate amount of water. For shallow wells (<35 feet) granular bentonite may be substituted for grout.

9. Tremie the grout into the annulus using a tremie. Slowly withdraw the tremie pipe as the annulus fills. Grout the well to within 2 to 3 feet of the surface but not higher than the average frost line. Compare actual volume of grout placed with calculated volume. Both should be annotated in the field logbook.

10. After installing grout, dismantle and clean tremie equipment.

11. Finish the concrete pad so that it slopes away from the wellhead in all directions with a minimum thickness of 4 inches. If weather conditions warrant, cover the concrete until cured. Lock the well cover.

12. If the well design specified guard posts, dig the holes and set the guard posts in concrete separate from the concrete pad. Posts and concrete must extend to a depth of 2 feet.

13. Record the appropriate construction/completion information in the field logbook and on the appropriate monitoring well installation.

14. If a form was used for the concrete pad, return to the well site after the concrete has cured for at least 24 hours and remove the form. Backfill around the pad with native soil. Drill a weep hole for protective casing and just above the concrete pad.

15. The well identification should be marked on the protective casing and PVC cap. Paint the well cover and posts, if required.

WELL DEVELOPMENT

Monitor wells are developed to remove skin (i.e., near-well-bore formation damage) and to settle and remove fines from the filter pack. Wells should not be developed for 24 hours after completion when a bentonite grout is used to seal the annular space. However, wells may be developed before grouting if conditions warrant. Wells are purged immediately before groundwater sampling to remove stagnant water and a sample representative of groundwater conditions. Wells should be sampled within 3 hours of purging (optimum) to 24 hours after purging (maximum, for low recharge conditions).

Equipment needed:

- Pump, pump tubing, or bailer and rope or wire line.
- Water-level meter or weighted surveyor's tape.
- Temperature, conductivity and pH meters.
- Personnel protective equipment as specified in the site-specific HASP.
- Decontamination supplies.
- Disposal drums, if required.
- Photoionization Detector

Procedures. The following steps will be followed when developing wells:

1. Put on personnel protective clothing and equipment as specified in the site-specific HASP.

2. Open and check the condition of the wellhead, including the condition of the surveyed reference mark, if any. Use photoionization detector at wellhead to determine the presence of VOCs (if applicable).

3. Determine the depth to static water level and depth to bottom of the casing.

4. Prepare the necessary equipment for developing the well. There are a number of techniques that can be used to develop a well. Some of the more common methods are bailing, surging and purge, and overpumping.

5. Continue well development until produced water is clear and free of suspended solids.

6. Remove the pump assembly or bailers from the well, decontaminate, and cleanup the site.

7. Lock the well cover before leaving. Dispose of produced water as required by the project work plan.