

**Cover Sheet
Standard Operating Procedure**

Operation Title: Monitoring Well Maintenance and Development

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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 may be utilized by other Divisions within MEDEP, as determined by the respective Division Directors or their designees.

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 the MEDEP/DR procedures for inspecting, maintaining, developing, and redeveloping groundwater monitoring wells (monitoring wells or wells) to support the collection of representative groundwater samples and, where applicable, to maintain wells that are retained for groundwater elevation monitoring only (i.e., depth-to-water measurements). This is best achieved by routine inspection (Section 5.2) and redevelopment (Section 5.3) when required.

Active monitoring wells that are part of an ongoing monitoring program (e.g. annual, semiannual, biennial) should be inspected at least annually, unless the site-specific monitoring plan specifies otherwise. Wells should generally be redeveloped when conditions indicate or if the well has not been sampled in two or more years.

Inactive monitoring wells that are not currently part of a sampling program but are maintained for groundwater elevation monitoring and/or potential future sample collection should be inspected at a frequency sufficient to keep the well viable for future use. It is recommended that these inspections occur annually, especially for sites with a limited monitoring network. Well redevelopment should be performed when site conditions warrant (e.g., blocked screen, poor recovery) or generally when a well has not been sampled for two or more years and sampling is required.

Groundwater monitoring wells that are not part of an active monitoring program or being maintained for future use must be sealed in accordance with the Bureau's Guidance for Well and Boring Abandonment (January 7, 2009). This is done to limit the potential for contaminant migration, especially for open boreholes. When a monitoring point is no longer needed or useful, it should be hydraulically sealed

(abandoned) to prevent the boring from serving as a conduit for contaminant migration. For more information, see SOP No. RWM-PP-020 Well and Boring Abandonment

Development procedures for newly installed monitoring wells are specified in SOP RWM-DR-009.

3.0 **Key Definitions**

Monitoring Well- A well installed for the purpose of monitoring groundwater quality at a facility regulated by the Department. Generally, a monitoring well consists of the following components:

- A screened interval, or section of the well surrounded by a filter pack silica sand to allow infiltration and monitoring of groundwater at a specific depth within an aquifer.
- A solid riser pipe extending from the top of the screened interval to the ground surface. Depending on the well design the riser pipe may terminate just below the ground surface or extend above the ground surface.
- A protective casing. For riser pipes ending just below the ground surface, the casing typically consists of a locking steel road box; for riser pipes extending above the ground surface, the casing generally consists of a steel pipe with a locking cap. Protective casings are sealed into the ground surface using cement or a mixture of bentonite and cement to prevent infiltration of surface water into the well.

Inactive Monitoring Well - A monitoring well that, pursuant to Department recommendation or approval, is not routinely sampled as part of an active groundwater monitoring program but is to be maintained for recording groundwater levels or potential sample collection at a future date.

Development- The process performed following installation of a new monitoring well to remove drilling fluids and fine-grained formation materials introduced during drilling, establish hydraulic communication between the well screen and surrounding formation, and prepare the well for representative groundwater sampling.

Redevelopment- Maintenance activities conducted on an existing monitoring well to remove accumulated sediment, biofouling, mineral encrustation, or other obstructions that impair hydraulic performance or sample representativeness, and

to restore the well to proper functioning condition.

4.0 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 SOP. MEDEP/DR staff reviewing data by outside parties should ensure that this SOP (or an equivalent) was followed, depending on the specific Data Quality Objectives (DQOs) of the task.

Other MEDEP SOPs may also apply when performing this task, including, but not limited to MEDEP/DR SOP *RWM-DR-014 - Development of a Sampling and Analysis Plan* (SAP). The SAP should consider quality assurance and quality control (QA/QC) samples and measures, the specifics of which will depend on the DQOs for the task. Types of QA/QC samples are discussed in more detail in the DR Quality Assurance Plan (QAP). SAP development includes provisions for creating a Health and Safety Plan (HASP) associated with the activity, including compliance with [Dig Safe](#) notifications when disturbing soil with powered equipment or tools (i.e., not hand tools). Dig Safe notification does not include public utility clearance requests which must be completed separately (e.g., sewer and water lines). These utility marking requests typically do not extend onto marking private property (i.e., they may only mark lines in the public right of way), so hiring a private utility marking company may be necessary, depending on site specifics. Fieldwork and data collection tasks must be properly documented in accordance with applicable MEDEP SOPs and policies.

5.0 Guidelines and Procedures

5.1 Health and Safety Considerations

All work should be following the applicable Health and Safety Plan for program or site. As monitoring wells may be contaminated above drinking water standards, protocol described in this SOP must be performed by personnel who are trained and certified to work on sites contaminated by hazardous substances. Appropriate personnel protective equipment must be used. Additional concerns to be aware of include, but are not limited to:

- Sealed monitoring wells may accumulate gases (e.g., methane, hydrogen sulfide, or site-related vapors) over time, which can create pressurized conditions and potential inhalation or fire hazards when opened. Stand upwind whenever possible when opening well caps

and loosen them slowly to allow pressure to dissipate before proceeding. If strong odors, audible pressure release, or other signs of gas buildup are observed, the well should be allowed to vent prior to further work. A photoionization detector (PID) or 4-gas meter may be used to assess site conditions when contaminants of concern (COCs) suggest the potential presence of hazardous vapors or gases.

Monitoring well casings may harbor insects, rodents, or other small animals. Use caution when opening well covers and avoid placing hands inside protective casings without visual inspection. If insects or animals are present, allow them to disperse before proceeding

5.2 Monitoring Well Inspection

All monitoring wells should be inspected annually and repaired as necessary to maintain their viability for possible future use. The following steps must be taken and documented as part of the annual inspection.

- Assess the ability to access and identify the well. The well must be kept unobscured by vegetation or other obstructions so that it can be easily found. The well cap or casing must be clearly marked to avoid any confusion as to its identity within the monitoring well network. The X, Y location of the well should mirror applicable database entries (e.g. EGAD, geographic information systems [GIS] records).
- Assess the condition of the protective casing including the surface seal and lock. Replace the lock if it is missing or broken and note any deficiencies in the protective casing. If the well casing and/or riser are damaged or loose, determine if repairs are feasible and if the well remains viable or should be abandoned.
- Measure and record the depth to water in the well and the total depth of the well. To avoid cross-contamination of other wells in the monitoring network, be sure to follow standard decontamination protocols when using non-dedicated equipment.

5.3 Monitoring Well Maintenance and Redevelopment

Monitoring well screens can become clogged with sediment, precipitation of dissolved inorganics, and/or by biologically mediated reactions if not used regularly. If a well has not been sampled in two or more years, it is required that re-development occur prior to the collection of a sample, unless DQOs indicate otherwise.

It is recommended that redevelopment occur well in advance of sample collection. **Sampling immediately after redevelopment may produce non-representative results**, particularly for metals, turbidity-sensitive parameters, and redox-dependent analytes. It is recommended that the site sampling plan or quality assurance program plan identify the appropriate waiting period based on geology and site-conditions.

In the absence of a defined waiting period, and depending on DQOs, wells should be allowed to re-equilibrate with the surrounding aquifer for a minimum of 24 hours prior to sample collection. In low-permeability formations, a rest period of at least 72 hours is preferred. For wells with slow recovery, samples should not be collected until the appropriate time has elapsed and water level has returned to static conditions.

It is also recommended that relevant documents are reviewed prior to redevelopment and maintenance activities, including well construction documentation and previous sampling records.

5.3.1 Recommended Equipment:

The following is a list of recommended equipment. The exact equipment needed is dependent on DQOs, well riser/casing diameter, and purge volume removal required:

- **Safety:** Personal-protective equipment required to meet health and safety standards for the site, such as safety glasses, high-visibility vest, nitrile gloves, work gloves, PID/4-gas meter, portable and cones/flashing lights if working near roads.
- **Access, Repair, and Inspection:** Measuring tape or engineer's ruler for collecting well measurements, ratchet/socket wrench set with a variety of sizes for flushmount wells, keys to well lock if present, pruning shears or similar to remove overgrown vegetation if present, replacement bolts, tap and die kit, new well cap, concrete patch, etc.
- **Record-Keeping:** field notebook, monitoring well redevelopment field data record, phone or camera, permanent marker or oil-based marker to re-label well if needed.
- **Measurement:** Cleaned and decontaminated water level measurement meter, interface probe if well has free product

- **Removal/Purging Equipment:** Dedicated or portable submersible pump and generator if needed, Inertial lift pump (e.g., Waterra-type), Stainless steel or disposable bailer, Surge block (if screen condition warrants surging), Air compressor and airline tubing (for airlift redevelopment), dedicated or new tubing
- **Monitoring Equipment:** Some data quality objectives (DQOs) may require monitoring of water quality parameters during redevelopment, and it can be a helpful tool in determining if redevelopment is successful. Examples include a multi-parameter unit and turbidity meter and graduated cylinder for measurement of flow rate.
- **Containerization:** Follow all applicable regulations for containerization of purge water. Even if not required, purging into a bucket, poly tote, or 55-gallon drum is also helpful for tracking volume removed. For management of petroleum contaminated groundwater, see SOP No. RWM-PP-012.

During redevelopment, it is important to take care not to introduce contaminants to the well by following standard decontamination procedures if using non-dedicated equipment, especially when developing multiple wells in one mobilization. Additionally, ensure that equipment is appropriate for COCs (e.g., PFAS-free materials if required).

5.3.2 Redevelopment

The following steps must be taken and documented as part of monitoring well maintenance to keep the well screens in hydraulic connection with the groundwater surrounding the well.

1. Record any observations about the integrity of the well, such as if water or product is present in the annular space and whether the monitoring well was secured upon arrival. Measure and record the depth to water in the well and the total depth of the well prior to redevelopment and confirm that the monitoring well is accurately labeled by comparing well information to historical records. Recording depth to bottom of well is also an important step as it can be used to compare total sediment removed. A weighted tape works best in determining if the well bottom feels “solid” or “soft” with accumulated fines.

2. Aggressively purge the required amount of water to meet DQOs. Typically, this is a minimum of three well volumes of water from the well, purging the well dry and letting it recharge to 80% several times, or until a turbidity standard is met. When possible, it is recommended that purge water is containerized for accurate volume removal calculation. Adjust the submersible pump depth while purging to dislodge accumulated fines across the well screen and near the well bottom. Do not force a submersible pump downward, as too many fines can clog the intake, especially for certain types of submersible pumps. A surge block can also be used to dislodge fines prior to using a bailer or submersible pump. Take care not to introduce contaminants to the well by following standard decontamination procedures if using non-dedicated equipment. Note the amount of water purged, final water level and any indication of contamination, such as color, odor or foaming.
3. Measure and record the depth to water in the well and the total depth of the well. Consider collecting recharge rate over time and comparing it to previous data.
4. Secure the well and document its final condition, including re-recording important measurements such as ground to top of riser, top of casing to top of riser, well diameter, etc. Complete any necessary well maintenance if included within scope of work.

6.0 References

- None