Site Monitoring Report Guidance
for Leaking Underground Storage Tanks Sites

Underground Storage Tank Section
Iowa Department of Natural Resources
502 E 9th St
Des Moines, IA 50319-0034
515-725-8200

December 2023

Table of Contents

INSTRUCTIONS

IMPORTANT: This document provides instructions for conducting monitoring and preparing Site Monitoring Reports (SMR) for sites which have been evaluated using the Risk-Based Corrective Action (RBCA) process. Specifically, this includes sites classified low risk, high risk: interim, and exempt granular bedrock. This guidance is to be used in conjunction with the Tier 2 application which includes an SMR component. Read all instructions before completing the form. The guidance documents for Tier 1 and Tier 2 should be referenced for acceptable sampling and assessment procedures. If a monitoring well which is part of a monitoring plan cannot be sampled (i.e., the well is dry, cannot be found, is damaged, etc.), it must be replaced unless adequate justification can be provided for substituting an existing monitoring well or an explanation given as to why sampling at that location is no longer required.

MONITORING SUMMARY

Low risk and high risk: interim monitoring must be conducted at least annually (typically required in the third calendar quarter) until the site is classified No Action Required. More frequent sampling may be conducted, but in order to meet exit monitoring criteria for groundwater pathways, sampling events must be at least six months apart; for soil leaching pathways, sampling events must be at least one year apart. For groundwater pathways, groundwater samples must be collected from the source well(s), transition well, and guard well for each receptor (Table 1). Each source, transition, and guard well for a receptor must continue to be monitored until all have met exit monitoring criteria. Refer to the Tier 2 Site Cleanup Report Guidance for detailed instructions about developing a monitoring plan.

Table 1. Types of Wells.

Symbol	Description	Required for Which Receptors	When (Minimum)
I. Always Required for Groundwater Receptors			
S	**S**ource well (groundwater maximum)	All High & Low Risk Receptors	Annually
T	**T**ransition well (monitoring well with detected levels of contamination closest to the leading edge of the groundwater plume as defined to the pathway-specific target level and between the source and the receptor)		
G	**G**uard well (monitoring well between the source and the point of exposure with concentrations less than the SSTL line value at that point)		
II. Always Required for Soil Leaching Receptors			
SL	**S**ource well (maximum groundwater inside the soil plume defined to the soil SSTL; may be different than groundwater maximum)	All High & Low Risk Receptors	Annually
III. Additional Required Monitoring Wells for Groundwater			
X	Monitoring wells which e**X**ceed the SSTL line value at that point	Actual Receptors Only	Annually
P	**P**rimary area well which exceeds the smallest applicable source SSTL for the site		
L	**L**ow risk actual receptors: monitoring wells which exceed the simulation line value (but not the SSTL line value at that point)		
E	Monitoring wells which **E**xceed the target level. Target level is: • SSTL line value at that point—if institutional control • Tier 2 default levels for vapor pathways or Tier 1 level for other pathways - if no institutional control	Potential Receptors Only	At Least Once; Must Meet Target Level at NAR

Exceptions: If any required monitoring wells are not included in the monitoring plan, justification must be provided. For example, if the guard well is less than 50 feet from the source well, no transition well is required. If the receptor is less than 50 feet from the transition well, no guard well is required. If the receptor is less than 50 feet from the source well, neither a transition well nor guard well is required.

Submerged Screens and Groundwater Sampling at LUST Sites

To keep sites moving to closure the DNR will consider accepting the groundwater data for samples collected from wells

with submerged screens for monitoring/evaluation when the following conditions are met:

- The monitoring well has a history of most of the groundwater data collected within the screened interval.
- The monitoring well with a submerged screen is adequately purged prior to sampling.
- Justification for the validity of groundwater data collected from wells with submerged screens is provided in a report.

If you have questions regarding collecting groundwater samples when the well screen is submerged, please contact the DNR LUST Site Project Manager.

High Risk: Interim Monitoring

Interim monitoring begins once a Tier 2 Site Cleanup Report is submitted and continues until the site is classified as no action required. A source, transition, and guard well for each receptor must be sampled at least annually. Although different than remediation monitoring, high risk: interim monitoring is conducted before, during, and after operation of a remediation system.

Low Risk Monitoring

For sites classified as low risk, the purpose of monitoring is to determine if concentrations are decreasing such that reclassification to no action required may be appropriate, or if concentrations are increasing above the site-specific target level line such that reclassification to high risk is necessary. Monitoring is necessary to evaluate impacts to actual receptors and assess the status of potential receptor conditions (survey potential receptor areas for new actual receptors). A Best Management Practices Plan must be provided in the initial SMR.

Groundwater monitoring for potential receptors (i.e., groundwater ingestion and groundwater vapor to enclosed space pathways) is required at least annually at a source, transition, and guard well between the source and receptor of concern (i.e., property boundaries). The entire plume is considered a potential receptor and monitoring of source, transition, and guard wells is required at least in the downgradient direction. In addition to downgradient, any properties (cross- or up-gradient) which are inside the receptor identification (ID) plume must be evaluated. In this case, each of the site property boundaries is designated as a line receptor. A transition well in the direction of the property boundary with the most limiting SSTL must also be monitored. If a guard well is less than 50 feet from the source well, no transition well is required.

For the soil leaching to groundwater ingestion pathway, potential receptors, annual groundwater monitoring is required for a minimum of three years. The well with the maximum groundwater concentration located within the soil plume (defined to the soil leaching SSTL) must be used to monitor soil leaching.

Although all monitoring wells which exceed a Tier 1 level are not required to be monitored annually for potential receptors, they should be properly maintained because they must be sampled and meet target levels before requesting to reclassify the site as no action required (i.e., 'E' wells - Table 1).

Potential receptors for soil vapor to enclosed space: If an institutional control is not in place, soil gas monitoring must be conducted at a minimum of once per year at the soil source in area(s) of expected maximum vapor concentration. If an institutional control is in place covering the entire soil plume (defined to the appropriate target level plus 50 ft buffer), the pathway is classified no action required, and soil gas monitoring is not needed. Refer to the Tier 2 Guidance for soil gas sampling procedures.

Exit Monitoring Criteria

Exit monitoring criteria for groundwater pathways have been met when:

1. concentrations from the three most recent consecutive groundwater samples from all monitoring wells show a steady or declining trend; and
2. the most recent levels are below the SSTL line; and
3. concentrations from the first of three samples for source and transition wells are greater than detection limits; and
4. concentrations have not increased more than 20 percent from the first of three samples to the third sample;

and

5. concentrations have not increased more than 20 percent from the previous sample; and
6. sampling events are separated by at least six months.
7. If the low risk site has maintained less than the applicable target level for four consecutive sampling events separated by at least six months as defined in the monitoring plan regardless of exit monitoring criteria and guidance.

Monitoring Plan Clarification

When all monitoring wells (e.g., S, T & G wells) for a receptor meet exit monitoring criteria, the monitoring wells utilized for that specific receptor may be removed from the monitoring plan if they are not being used to monitor additional receptors.

The application handles this situation by placing monitoring wells in the "NFA" category located at the bottom of the monitoring plan. The NFA category is receptor specific, meaning a monitoring well located in the category may not have met exit monitoring criteria for a different receptor(s). Accordingly, a monitoring well may be listed in both the active monitoring plan section and the NFA section. If such is the case, the monitoring well should be sampled until it meets exit monitoring criteria for all receptors for which it is being monitored.

For soil leaching to groundwater pathways - potential receptors, annual groundwater monitoring is required for a minimum of three years. If groundwater concentrations are below the applicable target level for all three years the pathway may be reclassified as no action required.

Reclassification

Any site or pathway which is classified as high risk may be reclassified to low risk if in the course of corrective action, the criteria for low risk classification are established. Any site or pathway which is classified as low risk may be reclassified to high risk if in the course of monitoring, the conditions for high risk classification are identified.

All actual and potential receptors must be evaluated at least annually. Actual receptors must be evaluated to ensure contaminant concentrations are not above the SSTL line for that receptor. Potential receptor areas of concern must be evaluated and the presence of no actual receptors confirmed. If new actual receptors are present or are reasonably expected to be brought into existence, they must be reported to the department as soon as this information is obtained.

For the soil leaching to groundwater ingestion pathway, potential receptors, if groundwater concentrations exceed the applicable target level in any of the three years of monitoring, corrective action is required to reduce soil concentrations to below the target level for soil leaching to groundwater. Target level refers to the Tier 1 level when there are no current or anticipated on-site institutional controls. Target level refers to the SSTL line if there is an on-site institutional control or if the property boundaries are being evaluated in anticipation of an on-site institutional control.

When to Rerun the Tier 2 Model

If concentrations of chemicals of concern are increasing or it appears the groundwater plume is migrating, the following actions are required:

1. A new receptor ID plume must be generated to determine which additional receptors may need evaluation if either of the following conditions occur:
   a. the source concentration(s) increases by more than 20% (above the concentration used during the Tier 2 evaluation) for two consecutive sampling events; or
   b. concentrations in any of the monitoring wells (included in the monitoring plan) have increased more than 20% **and** exceed the simulation value for that point.
2. Evaluate any new receptor which is within the new receptor plume even if it was no further action required for the pathway at Tier 2. Refer to the RBCA Tier 2 and Site Monitoring Report Application User's Manual.

In some cases it may not be necessary to re-evaluate all receptors if the source concentration increases. However, the groundwater professional must provide justification with supporting documentation for not re-evaluating receptors (e.g., source well concentrations have increased, but concentrations in all other wells in the monitoring plan have

decreased; there were no actual receptors at Tier 2, and there are no new receptors within the newly generated receptors ID plumes; and new receptors have been identified by the newly-generated receptor ID plumes, which are not the most controlling, and corrective action is being taken to meet the more stringent SSTLs).

A **no action required** site classification may be proposed if the criteria for pathway clearance have been met for all pathways. Note: all corrective actions necessary to satisfy the criteria for pathway clearance must be conducted prior to submittal of an SMR which requests a no action required site classification. All corrective action supporting documentation must be submitted as attachments to the SMR, if not submitted previously. Documentation may include any of the following:

- Proof of institutional controls (environmental covenants, ordinance, certification letters, etc.)
- Copies of notices to the DNR Water Supply Section
- Copies of notices to county authorities who issue private water supply construction permits
- Report of soil excavation activities
- Report of water line replacement or relocation
- Copies of notices to utility companies who supply water to the area of concern
- Copies of notices to authorities responsible for sanitary sewer construction

REPORT SUBMITTAL AND REVIEW PROCESS

Report submittal: For annual monitoring, the SMR due date is October 30th of each year. Monitoring must be conducted in accordance with the approved Tier 2 monitoring plan. Reports not submitted in the format required are considered to be incomplete and will be rejected.

The groundwater professional must complete the form using the SMR application and the SMR Signature Page and Checklist form. The SMR must be submitted in the application and a hardcopy of the completed SMR must be provided to the department.

REPORT PREPARATION

The completed SMR form must be accompanied by the maps and appendices listed in the "Requirements for Report Maps and Appendices" section at the end of this guidance. Title and number each appendix as listed in bold. Attach the appendices in the same order as listed. Ensure all maps are legible, have a north arrow, scale, and legend. If possible, maps should either be prepared on 8½ x 11-inch paper or reduced to that size by a single fold, preferably with north at the top of the page.

Cover Page

Fully complete the cover page of the SMR. Check the appropriate box describing the type of monitoring performed at the site and indicate if this is an exempt granular bedrock site. Indicate whether site reclassification is recommended, and if so, check the box for the **new** classification.

Checklist Page

A checklist is included with the form to assist with report compilation. Please place the attachments in the same order as listed on the checklist page. It is the responsibility of the groundwater professional to determine what site-specific information must be included to produce a complete report.

SMR Receptor Summary Tables

The Summary Tables (e.g., pages 3-6) are completed and printed using the application. Separate Summary Tables are generated for the groundwater source, soil leaching, soil vapor, and soil water line.

Each receptor classified low or high risk **at Tier 2** appears in these tables. Because the SMR module is linked to the "Current Risk" column of the Tier 2 Receptor Summary pages to obtain these receptors, it is critical the "Current Risk" column is correctly completed for each receptor on the **Tier 2 Receptor Summary** screens. Any receptor marked "NFA" is **not** inserted into the SMR Summary Tables. Receptors for which the box is left blank in the "Current Risk" column will be carried over to the SMR Receptor Summary.

If new receptors are identified during the course of site monitoring activities, these can be evaluated using the SMR module. Refer to the Iowa's web based RBCA Tier 2 and Site Monitoring Report Application User's Manual. You will have to add the receptor in the Tier 2 application. Create a revised Tier 2 and enter new receptors and relevant information. You must complete the evaluation of the new receptor in the Tier 2 and submit the revised Tier 2 application prior to creating a new SMR. After the revised Tier 2 is submitted, the newly created SMR will recognize receptor changes and changes in the monitoring plan. Refer to the order of report submission discussed earlier in this document

The "Tier 2 Risk" column responses are fixed and based on the Tier 2 evaluation. The "Last Risk" column shows the risk calculated by the application based on the previous monitoring event results. "Computed Risk" is determined by the application and is based on the most recent monitoring results for each chemical. The user must indicate whether corrective actions have been taken since the submittal of the Tier 2 SCR. If corrective action has been taken, the corresponding number should be entered in the Corrective Action column for the receptor. Therefore, "Current Risk" is either the computed risk or risk selected by the user based on corrective action measures taken.

Table 2. Example: SMR Groundwater Source Receptor Summary Table

* = Tier 2 Calculated Risk

Receptor Type	Receptor	Tier2 Risk	Last Risk	Benzene	Toluene	Ethylb.	Xylene	TEH-D	TEH-WO	CorrectiveAction	Current Risk
WLB	WLB3	High Risk	High Risk	N	H*	N	N	N	N/A	13	High Risk
PCS	No-IC	Low Risk	Low Risk	L	N*	N (PE)*	N/A	N (PE)*	N/A		Low Risk
PSS	No-IC	Low Risk	Low Risk	L*	N (PE)*	N (PE)*	N/A	N (PE)*	N/A	5	Low Risk

Potential Receptor Summary

Potential receptor areas of concern must be evaluated at least annually and the presence of no actual receptors confirmed. Surveys for new, removed, and replaced receptors must be conducted within the larger area of either of the following: 1) the receptor ID plume for the applicable receptor type, or 2) the receptor-specific distance from the source listed in the brackets after each question. Answer the questions as either "yes" or "no". Provide the names of all people contacted, the company names and addresses, phone numbers and the dates of contact. For the first two questions, regarding new drinking and non-drinking water wells, the certified groundwater professionals only need to report well information from public entities (i.e., county health or zoning departments, DNR Water Supply Section, Well Search within Facility Explorer, GeoSam, and water well owners). Provide documentation, if applicable (i.e., well plugging forms, utility maps, etc.), as an attachment. For those receptors which require an on-site survey (i.e., those dealing with buildings), the name of the person performing the survey should be listed as the contact name. If actual receptors are present or reasonably expected to be brought into existence, report this fact to the department as soon as practicable.

Table 3. Example: Potential Receptor Summary

Potential Receptor Summary

SMR Back

Surveys for new, removed, and replaced receptors must be conducted within the larger area of either 1) the receptor identification plume for the appropriate receptor type; or 2) the receptor-specific distance listed in the brackets below.

Receptor	Any Changes?	Date	Contact Name/Entity Name/Address	Contact Phone
New drinking water well(s)? [1,000']	No	09/09/2021	John Smith, Water Operator City of Cloud P.O. Box 000 Cloud, IA, 50000	(000) 000-0000
New drinking water well(s)? [1,000']	No	09/08/2021	Geological Survey Bureau IDNR 109 Trowbridge Hall Iowa City , IA, 52242	(000) 000-0000
New drinking water well(s)? [1,000']	No	08/05/2021	Dan Geologist (300 ft well survey) Environmental Testing P.O. Box 00 Earth, IA, 00000	(000) 000-0000
New non-drinking water well(s)? [1,000']	No	09/09/2021	https://facilityexplorer.iowadnr.gov/FacilityExplorer/WellSearch.aspx , ,	

Receptors: Status Change

List and describe all receptors whose status has changed since the previous receptor evaluation (e.g., "Private Well A

was plugged, a new housing development was built adjacent to the property", etc.). Clearly label and show the location of any new receptors or removed receptors on the Site Vicinity Map. The annual 300 ft pedestrian water well survey results should be provided in this section.

Site Reclassification

Mark whether the **site** should be reclassified. If yes, mark the current site classification. Provide justification for the reclassification. If a no action required site classification is being proposed, all corrective actions and any applicable confirmation sampling or exit monitoring must be completed and summarized here. Provide all necessary documentation and additional justification in Appendix 13.

SMR Groundwater Data

After new monitoring data are entered and sorted, this table must be printed from the application. Refer to the Tier 2/SMR application manual. Provide the boring or monitoring well number and analytical data in the appropriate columns. Analytical results for groundwater samples must be expressed in micrograms per liter (ug/L). All elevations are to be reported as feet above sea level (ASL); ground surface, and top of screen (TOS) measured to the nearest 0.1 foot; top of casing (TOC) and static water level (SWL) measured to the nearest 0.01 foot.

SMR Soil Gas Data

Complete the table with any new soil gas data collected since the submittal of the Tier 2 SCR. Refer to the Tier 2/SMR application manual. Provide the vapor sample identification number, sampling date, ground surface and sample depth elevation in feet above sea level (ASL) measured to the nearest 0.1 foot, and static water level elevation (SWL) in feet ASL measured to the nearest 0.01 foot. Analytical results for soil gas must be expressed in ug/m^3. The Sampling Methods and Sampling Justification sections must also be completed.

Soil Leaching SSTL Table

The Soil Leaching SSTL Table is a summary of SSTLs calculated at Tier 2 for the soil leaching pathway. This table is printed from the application.

Groundwater / Soil Leaching Monitoring Plan Summary

Provide the Groundwater / Soil Leaching Monitoring Plan Summary, which is generated in the SMR module. This is the updated monitoring plan. When concentrations in guard wells (G) exceed the SSTL for a receptor, these are flagged with asterisks (**). If flagged wells appear in the monitoring plan summary, the groundwater professional must consider whether receptor re-evaluation is necessary and whether a guard well needs to be replaced. Provide an explanation for any changes made to the monitoring plan in Appendix 1 - Evaluation of Analytical Data.

Soil Gas Monitoring Plan Summary

Provide the monitoring plan from the application. If necessary, note any changes to the plan (e.g., "soil gas and confirmation samples were collected during the previous monitoring event. Soil gas results have cleared the soil vapor to enclosed space pathway, so additional soil gas sampling is no longer required").

REQUIREMENTS FOR REPORT MAPS AND APPENDICES

Attach the following appendices to the end of the Site Monitoring Report form in the order listed. Title each appendix consistent with the bold print below:

1. **Evaluation of Analytical Data.** Provide a comprehensive evaluation of the most recent sampling data. Discuss whether reclassification for the site is appropriate. If the concentrations are increasing in any wells which are being monitored, the groundwater professional must determine whether re-running the Tier 2 model and re-evaluating receptors is necessary (refer to page 120 of the Tier2/SMR Manual). Provide a detailed summary and conclusions of the re-evaluation. If the monitoring plan has been modified since the approval of the Tier 2 SCR, explain what was changed and provide a justification for the changes (e.g., "the plume has migrated downgradient, so a new guard well needed to be installed. The new guard well, MW13, replaces the old guard well, MW10").
2. **Site Plan Map.** Provide a scaled map (scale 1 inch = 20 to 50 feet) for the site and the immediate surrounding area. It must show, but is not limited to, the following: location and content of existing and removed USTs;

product lines and dispensers; pertinent site features (i.e., buildings, property boundaries, roads, wells, waterways, sinkholes, etc.); location of subsurface utilities; and any evaluated receptors including new, removed, and Tier 2 receptors. Label the street names.

3. **Site Vicinity Map.** Provide a scaled vicinity map (scale 1 inch = 200 to 500 feet) showing the site in relation to surrounding general features. It must show, but is not limited to, the following pertinent general features: roads; waterways; sinkholes; **property boundaries**; existing structures such as schools, hospitals, child care facilities, and other buildings; any new or removed receptors not identified on the Site Plan Map. It must also show which areas are zoned for residential use.
4. **Soil Summary Corrective Action Map.** If soil pathways have been classified high risk at Tier 2, provide a copy of the Soil Summary Corrective Action Map submitted with the Tier 2 SCR.
5. **Soil Contamination Map(s).** Provide a copy of the Soil Contamination Map from the Tier 2 SCR for the most-limiting chemicals.
6. **Soil Gas Map(s). Provide the map generated by the SMR application illustrating the most recent monitoring results for soil gas.**
7. **Groundwater Summary Corrective Action Maps.** Provide copies of the Groundwater Summary Corrective Action Maps from the Tier 2 SCR.
8. **Groundwater Monitoring Results Map.** Provide the map(s) generated by the SMR application illustrating the most recent monitoring results for groundwater. The application allows the user to include receptors on this map.
9. **Groundwater Contamination Map.** Provide the map(s) generated by the SMR application.
10. **Groundwater Flow Direction Map.** Provide a groundwater flow map using the most recent static water levels at the site. A minimum of three points must be used. Indicate the groundwater flow direction with an arrow. Groundwater contours and elevations at each data point used for contouring must be labeled. Contours must be consistent with observed water elevations.
11. **Analytical Data Sheets.** Provide copies of laboratory data reports. Provide copies of Chain-of-Custody forms.
12. **Boring Logs/ Monitoring Well Construction Diagrams.** If additional borings/ monitoring wells have been placed at the site since the submittal of the previous report, complete DNR Form 542- 1392 for each boring/monitoring well.
13. **Documentation.** If applicable. Provide any documentation for reclassifying a pathway or receptor (e.g., well plugging records, institutional control, environmental covenant.). The Well Search Report should be included in this appendix.
14. **Best Management Practices Plan.** Provide a Best Management Practices Plan in the initial SMR. The plan must include maintenance procedures, schedule of activities, prohibition of practices, and other management practices, or a combination thereof, which, after problem assessment, are determined to be the most effective means of monitoring and preventing additional contamination of the groundwater and soil. The plan must also include a monitoring proposal containing sufficient sampling points to ensure the detection of any significant movement of or increase in contaminant concentration.

APPENDIX A – REVISION DATES

12/2023 - General updates and Groundwater Professional Bulletin Board postings inserted