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| Minnesota Pollution Control Agency (MPCA), 520 Lafayette Road North, St. Paul, MN 55155-4194 | Remediation system operation monitoring (RSOM) report  Petroleum Remediation Program  Guidance document 7-08  *Doc Type: Corrective Action Design* |

**Instructions:** Complete this report to document installation and operation of a remediation system or other in situ remediation technology. See [Corrective action design and implementation](https://www.pca.state.mn.us/sites/default/files/c-prp7-01.pdf) for more information and requirements found on the Minnesota Pollution Control Agency’s (MPCA) website at <https://www.pca.state.mn.us/waste/cleanup-guidance>. The initial RSOM should be submitted within 30 days of system startup. Subsequent RSOMs should be submitted on a quarterly schedule unless otherwise requested by the MPCA. The RSOM must include the results of any other site work completed during the reporting period, such as additional site investigation, site monitoring, ongoing interim corrective actions, or complementary corrective actions. Do not revise or delete any text or questions from this report form. Items may be added if they are needed to support operation results. If an item is not applicable, provide a brief explanation.

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| --- | --- | --- | --- |
| **MPCA Site ID:** | LS00 | **Date (mm/dd/yyyy):** |  |

Responsible party information

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Individual or corporate name: | | | |  | | | | | |
| Mailing address: | | |  | | | | | | |
| City: |  | | | | | State: |  | Zip code: |  |
| Email: | |  | | | | | | Phone: |  |
| Alternative contact name (if any): | | | | |  | | | Phone: |  |

Leak site information

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name: | |  | | | | | Phone: |  | |
| Leak site address: | | | |  | | | | | |
| City: |  | | | | State: |  | Zip code: | |  |
| County: | | |  | |  | | |  | |

Environmental professional information

*By signing this document, I/we acknowledge that we are submitting this document on behalf of and as agents of the responsible person or volunteer for this leak site. I/we acknowledge that if information in this document is inaccurate or incomplete, it will delay the completion of remediation and may harm the environment and may result in a reduction in Petrofund reimbursement. In addition, I/we acknowledge on behalf of the responsible person or volunteer for this leak site that if this document is determined to contain a false material statement, representation, or certification, or if it omits material information, the responsible person or volunteer may be found to be in violation of Minn. Stat. § 115.075 or Minn. R. 7000.0300 (Duty of Candor), and that the responsible person or volunteer may be liable for civil penalties.*

***By typing/signing my name below,*** *I certify the above statements to be true and correct, to the best of my knowledge, and that this information can be used for the purpose of processing this form.*

**Signatures**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Report author(s)** | | | | |  | **Report reviewer(s)** | | | |
| Signature: | |  | | |  | Signature | |  | |
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| Title: |  | | | |  | Title: |  | | |
| Date (mm/dd/yyyy): | | |  | |  | Date (mm/dd/yyyy): | | |  |
| Signature: | |  | | |  | Signature | |  | |
|  | | *(This document has been electronically signed.)* | | |  |  | | *(This document has been electronically signed.)* | |
| Title: |  | | | |  | Title: |  | | |
| Date (mm/dd/yyyy): | | |  | |  | Date (mm/dd/yyyy): | | |  |
| Name(s) of field technician(s): | | | |  | | | | | |

**Company information**:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name: | |  | | | | | Phone: | |  |
| Mailing address: | | |  | | | | | | |
| City: |  | | | State: |  | Zip code: | |  | |

**Project manager information**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name: |  | | | |
| Phone: |  | Email: |  |  |

## Section 1: General information

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| 1. | Specify the start-up date of the full-scale remediation system. |
| 2. | Identify the person responsible for overseeing operation of the remediation system. |
| 3. | Describe any ongoing interim corrective actions or complementary corrective actions that have been completed since submittal of [Remediation system detailed corrective action design (SDCAD) report](https://www.pca.state.mn.us/sites/default/files/c-prp7-07a.docx) or the previous RSOM. Reference and attach any data and associated documentation generated during these activities in Appendix A. |
| 4. | Describe and evaluate any additional site investigation and/or site monitoring that has been completed since submittal of the SDCAD or the previous RSOM. Reference and attach any data and associated documentation in Appendix B. |

## Section 2: System installation

Complete this section when submitting the initial RSOM. Subsequent RSOM submittals must include the responses to this section as they appear in the initial RSOM; however, installation documentation does not need to be included in subsequent RSOMs.

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| 1. | Identify the person responsible for overseeing installation of the remediation system. |
| 2. | Describe all system installation-related activities completed up to system startup since the SDCAD was approved. Describe any problems that delayed system startup and how they were resolved. |
| 3. | Describe waste disposal permits, approvals, and related documentation acquired prior to system installation and startup. Include copies of completed applications and acquired permits, approvals, variances, and other pertinent correspondence not included in the SDCAD in Appendix C. |
| 4. | Describe remediation and monitoring point locations, installation, development, and sampling. Provide methods and procedures in Appendix D, construction diagrams and boring logs in Appendix E, and an updated remediation and monitoring point construction summary in Section 9. |
| 5. | Describe as-built remediation system major equipment, instrumentation, and process flow. Provide a process and instrumentation diagram (P&ID) in Section 8 representing the as-built remediation system and configuration. Include excerpts from manufacturer- or vendor-supplied manuals, if different than described in the SDCAD, in Appendix F. |
| 6. | If the installed remediation system is different than approved by the MPCA, identify the differences and explain why. |
| 7. | Describe equipment testing and troubleshooting performed to determine system readiness prior to full-scale system startup. Include testing results completed at remediation points, conveyance lines, manifolds, and equipment. Describe any major problems encountered and their resolution. Describe equipment testing and methods and procedures in Appendix D. |
| 8. | Describe any baseline data collected prior to system startup to be used for evaluating system effectiveness. Describe methods and procedures and include associated documentation in Appendix D. |

## Section 3: Operation monitoring

Complete this section to document monitoring activities completed over the current reporting period. Reference applicable data tables and documents to describe operation monitoring. Update the RSOM submittal history table as needed to reflect each RSOM submittal. Describe operation monitoring methods and procedures and include associated documentation in Appendix G.

|  |  |  |
| --- | --- | --- |
| 1. | This reporting period is from       to       (dates), totaling       days in duration. | |
| 2. | If there were any changes to the system equipment during this reporting period, describe those changes below and update the process and instrumentation diagram (P&ID) in Section 8. | |
| 3. | For each event, such as site visits, telemetry, system checks, etc., listed in the event tracking table that was completed in this reporting period, discuss the event in terms of the following items: | |
| a. | Describe the system configuration and control settings at the beginning of the event and whether the system was operating as intended. |
|  | b. | Describe any system operation problems encountered and indicate how and when each problem was resolved. |
|  | c. | Present and describe operation monitoring data collected during each event, referencing attached data summary tables in Section 9 and operation monitoring documentation in Appendix G. |
|  | d. | Describe operation monitoring data relative to any system adjustment, reconfiguration, maintenance, repair, restart, or other system change. |
|  | e. | Describe the system configuration and control settings upon departure and whether the system was operating as intended. |

## Section 4: System performance evaluation

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| 1. | Complete this section to present an overall evaluation of system performance to date. System performance must be evaluated relative to the operation strategy described in the SDCAD. The evaluation should include any complementary corrective actions completed during the reporting period. All calculations, including airflow and mass balance calculations, must be explained in Appendix H and should be consistent with the approved SDCAD. Reference attached figures and tables in Sections 8 and 9, respectively, as applicable in responses to the following items. |
| 2. | Indicate the number of days from the system start-up date to the end of this reporting period. |
| 3. | Identify the operation period from the operation strategy schedule table that the system was operating under at the end of this reporting period. |
| 4. | Based on operation results to date, describe the rationale for the system configuration and control settings, any adjustments made during the reporting period, and how the system configuration and any adjustments made correlate to the operation strategy. |
| 5. | Evaluate system efficiency for each completed operation period, the current operation period, the current reporting period, and over the life of the system to date. |
| 6. | Evaluate process material, such as groundwater or air, physical and chemical parameters collected during the reporting period. |
| 7. | Provide the calculated volume of the light non-aqueous phase liquid (LNAPL) recovered and the chemicals-of-concern mass removed, such as aqueous and vapor phases, during this reporting period. |
| 8. | Evaluate subsurface response data collected at monitoring points during the reporting period. |
| 9. | Describe waste streams generated during the reporting period and whether the system is in compliance with any permits or requirements for each type of waste. Evaluate on-site waste treatment performance. Present the quantity, such as volume or mass, and quality, such as chemistry, of each waste stream in attached tables, figures, and calculations. Attach copies of applications for or issuance of new and renewed permits and approvals, correspondence, or notifications from the waste regulating authority; air emissions screening results; and any LNAPL disposal receipts in Appendix C. |
| 10. | Evaluate system performance during the reporting period based on the operation strategy. Compare actual operation results as of the end of the reporting period with the schedule for achieving efficiency and effectiveness objectives for the operation period(s). Evaluate progress towards achieving the operation strategy’s remediation endpoints, including the prospects for achieving them on schedule. |
| 11. | The life-cycle cost estimate provided in the SDCAD was based on a system operation life, system startup to permanent shutdown, of       days (from the operation strategy schedule table). |
| 12. | Summarize the estimated and the actual incurred costs in the implementation phase costs-to-date table. Explain the reason(s) for any difference between actual and estimated costs to date. Discuss whether continued operation of the system is justified based on cost effectiveness. |

## Section 5: Post-shutdown monitoring

Complete this section to present post-shutdown monitoring activities and results. Include data summary tables in Section 9. Describe post-shutdown monitoring methods and procedures and include associated documentation in Appendix I. Reference attached tables, figures, and calculations as applicable in responses to the following items.

|  |  |
| --- | --- |
| 1. | Specify the date that the remediation system was shut down.       (mm/dd/yyyy) |
| 2. | The active operation life of the system was       days. |
| 3. | Provide a summary of the post-shutdown monitoring plan and describe any deviation from that proposed in the SDCAD. |
| 4. | Describe post-shutdown monitoring activities completed during the reporting period and list those activities in the event tracking table. |
| 5. | Evaluate post-shutdown monitoring data collected during the reporting period. |

## Section 6: Site conceptual model update

The site conceptual model (SCM) must be updated to integrate the degree of risk reduction achieved by system operation and completed interim and complementary corrective actions relative to the corrective action reason and corrective action goal. The updated SCM must also integrate the results of any additional site investigation and site monitoring completed during the reporting period. The SCM must provide conclusions regarding risk reduction efforts to date in order to adequately support all of the recommendations in Section 7, including site closure. If site closure is recommended, the SCM must include a description of site investigation and monitoring events and how the results demonstrate that all exposure pathways have been adequately investigated and evaluated. Include updated cumulative tables and figures from [Investigation report](https://www.pca.state.mn.us/sites/default/files/c-prp4-06.docx) in Appendix J. Also include copies of figures, tables, or other information from the focused investigation and pilot test if relevant to the site conceptual model in Appendix K.

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| 1. | Provide an updated and comprehensive SCM. |

## Section 7: Recommendations

**Double click checkboxes to select *Checked* and select *OK*.**

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| --- | --- | --- |
| 1. | Recommendation: | |
|  |  | Continued system operation |
|  |  | System shutdown and post-shutdown monitoring |
|  |  | Permanent system shutdown and dismantlement |
|  |  | System restart |
|  |  | Additional site investigation or site monitoring not directly related to system operation |
|  |  | Other: |
|  |  | Site closure |
| 2. | If site closure is not recommended, describe each recommendation separately. Provide a rationale for all proposed activities, the schedule for their completion, the type of report to document activities, and the proposed report submittal date. | |

## Section 8: Figures

Attach new figures specific to this report in order of discussion in the text. All figures must include a north arrow, scale, and legend as applicable. Approximate scales are not acceptable. Figures required in Appendix J should not be included in this section. New figures must include those listed below. Attach additional figures as needed and list below.

|  |  |
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|  | One or more site maps showing (as applicable):   1. Structures 2. Boring and well locations (including any drinking water wells on site) 3. Suspected source(s) of LNAPL 4. Locations and depths of on-site buried utilities 5. All past and present petroleum storage tanks, piping, dispensers, and transfer areas 6. Horizontal extent of LNAPL 7. Horizontal extent of the target zone 8. Remediation and monitoring points, conveyance lines, equipment shed, and waste discharge locations   Distinguish sequential elements of investigations by dates, symbols, etc. in the legend. |
|  | Process and instrumentation diagram |

## Section 9: Tables

Attach new tables specific to this report in order of discussion in the text. Tables required in Appendix J should not be included in this section. New tables must include those listed below. Attach additional tables as needed and list below, renumbering in order of discussion in the text.

|  |  |  |
| --- | --- | --- |
|  | Table 1 | Remediation and monitoring point construction summary |
|  | Table 2 | RSOM submittal history |
|  | Table 3 | Event tracking |
|  | Table 4 | Operation strategy schedule (as presented in the SDCAD) |
|  | Table 5 | Implementation phase costs-to-date |

## Section 10: Appendices

Attach all required or applicable appendices in the following order. Indicate those appendices that are included in this report by marking the check box. All reproduced data must be legible. Attach additional appendices as needed and list below.

|  |  |  |
| --- | --- | --- |
|  | Appendix A | Interim and complementary corrective action data, methods and procedures, and associated documentation, such as boring logs, sampling information forms, laboratory analytical reports, etc., requested in Section 1. |
|  | Appendix B | Additional site investigation and site monitoring methods and procedures and associated documentation, such as boring logs, sampling information forms, laboratory analytical reports, etc., requested in Section 1. |
|  | Appendix C | Waste handling and disposal documentation, required permit/approval applications and/or acquired permit/approvals, and air emissions [Risk assessment screening spreadsheet (RASS)](https://www.pca.state.mn.us/sites/default/files/aq9-22.xlsx) documentation. |
|  | Appendix D | System installation methods and procedures and associated documentation, such as sampling information forms, laboratory analytical reports, etc., requested in Section 2. |
|  | Appendix E | Construction diagrams and associated boring logs and Minnesota Department of Health well and boring records for all remediation and monitoring points. |
|  | Appendix F | Excerpts from manufacturer- or vendor-supplied equipment and instrumentation manuals. |
|  | Appendix G | Operation monitoring methods and procedures and associated documentation, such as sampling information forms, laboratory analytical reports, etc., requested in Section 3. |
|  | Appendix H | Calculations requested in Section 4. |
|  | Appendix I | Post-shutdown monitoring methods and procedures and associated documentation, such as sampling information forms, laboratory analytical reports, etc., requested in Section 5. |
|  | Appendix J | Cumulative and updated tables and figures from [Investigation report](https://www.pca.state.mn.us/sites/default/files/c-prp4-06.docx). |
|  | Appendix K | Focused investigation and/or pilot test tables, figures, and other information if applicable. |

Section 4: Tables (Add additional rows as needed.)

Table 2

RSOM submittal history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **RSOM report number** | **Report date (mm/dd/yyyy)** | **Reporting period** | | **Reporting period duration (days)** |
| **From date (mm/dd/yyyy)** | **To date (mm/dd/yyyy)** |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
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| 12 |  |  |  |  |
| 13 |  |  |  |  |

**Notes:**

Enter any notes here.

## Section 4: Tables - ***Continued*** (Add additional rows as needed.)

Table 3

Event tracking

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Event description** | **Event date (mm/dd/yyyy)** | **System operating upon arrival?** | **Activities completed during event**1 | **System operating upon departure?** |
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1 List activities in the order they were completed during a given event.

**Notes:**

Enter any notes here.

## Section 4: Tables - ***Continued*** (Add additional rows as needed.)

Table 4

Operation strategy schedule

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Operation period** | **Configuration and control settings** | **Schedule (day “x” to day “y”)** | **Period duration (days)** | **Measurable objectives1** |
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1Measurable objectives must include both efficiency and effectiveness objectives derived from the operation strategy with remediation endpoints as measureable objectives for the final operation period.

**Notes:**

Enter any notes here.

## Section 4: Tables - ***Continued*** (Add additional rows as needed.)

Table 5

Implementation phase costs-to-date

|  |  |  |  |
| --- | --- | --- | --- |
| **Stage** | **Life-cycle cost estimate**1 | **Actual costs Incurred as of (*date*)**2 | **Difference**3 |
| Installation | $ | $ | $ |
| Operation | $ | $ | $ |
| Post-shutdown | $ | $ | $ |
| Dismantlement | $ | $ | $ |
| **Total** | **$** | **$** | **$** |

1 From SDCAD.

2 As of the RSOM reporting period end-date.

3 Subtract actual costs from life-cycle cost estimate.

**Notes:**

Enter any notes here.