U. S. Army Corps of Engineers Environmental Monitoring Checklist

Installation Name	_____
Site Name / I.D.	_____
Evaluation Team	_____
Site Visit Date	_____

This checklist is provided as an aid in evaluating environmental monitoring programs for ground water and soil gas. The checklist is composed of the following sections:

1. Evaluation team composition
2. References
3. Review of the objectives and sampling design of the monitoring program
4. Preliminary data review
5. Evaluation of monitoring points
6. Evaluation of current monitoring program
7. Potential optimization of the monitoring program
8. Cost savings from potential optimizations
9. Summary of Recommendations and Cost Estimates for Implementation
10. Supplemental notes and data

The checklist provides suggestions for information gathering. Data and notes may be recorded in the spaces provided. If additional space is required, the supplementary information should be provided as an attachment and numbered to correspond to the appropriate checklist section.

1) Evaluation Team Composition

The following disciplines should be represented on the evaluation team for the environmental monitoring program:

- Chemist
- Hydrogeologist
- Risk assessor
- Regulatory specialist
- Statistician.

2) References

Additional guidance and background information for conducting this review are available in the following documents:

- *Guidance for Data Quality Assessment, Practical Methods for Data Analysis,* EPA /600/R-96/084, EPA QA/G-9, January 1998
- *Guidance for the Data Quality Objective's Process,* EPA 600/R-96/055, EPA QA/G-4, September 1994
- *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations,* EPA QA/R-5 Draft Final, November 1997
- *Guidance for Quality Assurance Plans,* EPA/600R/R-98/018, EPA QA/G-5, February 1998
- *Data Quality Objectives Decision Error Feasibility Trials (DQO/DEFT), Users Guide,* Version 4.0, EPA QA/G-4D, September 1994
- *Data Quality Evaluation Statistical Toolbox (DataQUEST) User's Guide,* EPA QA/G-9D, QA96 version
- *Technical Project Planning (TPP) Process,* USACE EM 200-1-2, 31 August 1998.
- *Requirements for the Preparation of Sampling and Analysis Plans,* USACE EM 200-1-3, 1 September 1994

References to additional guidance documents may be found on the following government Internet sites:

- http://www.epa.gov
- http://www.nfesc.navy.mil
- http://www.afcee.brooks.af.mil
- http://www.usace.army.mil/inet/usace-docs/

3) Review of the Objectives and Sampling Design of the Environmental Monitoring Program

a) Has the data quality objective (DQO) approach prescribed by EPA and/or the appropriate service branch been used to develop the Environmental Monitoring Program? Cite the guidance document used in developing the DQOs.

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b) If DQO outputs are available, determine if the objective is clearly defined and still applicable to the Environmental Monitoring Program. Are contaminant concentration goals based on ARARs (Applicable or Relevant and Appropriate Requirements) current and still appropriate? Document the original DQO process outputs as well as any changes that should be made to update the outputs.

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c) If DQOs have not been developed, define and document the statistical hypothesis and specify the tolerable limits on the decision error.

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d) Is there a comprehensive Sampling and Analysis Plan (SAP) for long term monitoring at the site? If so, review the sampling design for consistency with the DQOs. Note any inconsistencies.

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e) Does the Record of Decision (ROD) or comparable document prescribe a sampling program? If so, review the sampling design for consistency with DQOs. Note any inconsistencies.

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f) Review the documentation related to data collection for consistency with the DQOs. Note any inconsistencies.

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g) Is there a defined rule or procedure to determine when to discontinue monitoring, or if a monitoring location can be eliminated from the program? Cite where this rule may be found.

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h) If decision rules are not defined, propose a process for modifying the environmental monitoring program through consultation with the stakeholders.

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4) Preliminary Data Review

a) Review the quality assurance (QA) reports for environmental monitoring program data. Is the level of quality control (QC) in conformance with the SAP and appropriate for the monitoring program?

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b) Review the sampling reports to verify proper use and maintenance of sampling equipment.

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c) Review the project records to verify adequate training and supervision of sampling and analytical personnel is provided.

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d) Review the project records to verify the frequency and thoroughness of QA oversight of the monitoring programs. If available, review QA audit reports for both field and laboratory operations.

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e) Review internal data validation reports. What percentage of the data is internally validated? Does the validation consider all matrices and methods for each sampling event? Are the data validated and flagged using appropriate data assessment procedures?

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f) What percentage of the data is subjected to third-party validation? Do the data validated by a third party represent all matrices and methods for each sampling event?

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g) Did the review of the QA, data validation reports or other project records show any major deficiencies in data acquisition or reporting? If so, briefly note the source of this information as well as the suspected cause of the deficiencies. Identify any data points affected by the deficiencies.

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h) Note any inconsistencies between the third-party reports and internally-generated validation reports.

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i) Were proper corrective actions prescribed to correct deficiencies? Were the prescribed corrective actions implemented to correct deficiencies? Are additional corrective actions needed? Provide a short summary of any additional corrective action that is needed.

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5) Evaluation of Monitoring Points

Evaluate each sampling location in the current monitoring program for compliance with the program objectives. Consider the following:

a) Evaluate each location for its suitability to help determine the plume extent, evaluate remediation progress, or observe hydrogeological units.

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b) Evaluate the sampling frequency for each well relative to plume migration, proximity to receptors, historical contaminant concentration changes, and the frequency of operational changes in the remediation.

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e) Review records to verify that the monitoring devices were properly constructed and maintained. Consider whether any monitoring device might provide a conduit for contaminant transfer between hydrogeologic units.

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c) Review the trend of each contaminant over time. Identify and attach historical concentration graphs for any sampling point that is no longer needed or that shows anomalous results.

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d) Based on the preliminary data review (in Section 4) and the evaluation of the individual monitoring points, identify any potential data anomalies. Identify any suspect data points and provide a brief explanation of the anomaly.

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6) Evaluation of the Current Monitoring Program

a) Are data entered into an electronic retrieval system (e.g., Geographic Information System (GIS), Environmental Restoration Program Information Management System (ERPIMS)?)

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b) Are the data available in a form that enhances usability? (Consider providing graphical presentations of historical data, contour maps, and reports that conform with regulatory formats.)

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c) Are the data archived in an organized and consistent manner that protects their integrity yet allows unencumbered access by authorized individuals?

_____

d) Identify and apply the appropriate statistical tests to determine if the program data meet the DQOs.

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e) Graph the data to help identify patterns in concentrations of analytes or any relationships of the data to time/weather/hydrogeologic conditions. Summarize any patterns or relationships that are noted.

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f) Are field parameters being measured during groundwater sampling? During purging, is a consistent procedure being used to determine when to collect samples? *(The reproducibility of the chemical data may be in question unless field parameters have stabilized before samples are*

collected. There is evidence that stabilized field parameters, especially dissolved oxygen, leads to more reproducible chemical data.)

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7) Potential Optimization of the Monitoring Program

a) Determine whether any monitoring points can be eliminated because of redundancy, unreliability, or changes in program objectives. If monitoring points are eliminated, do statistical tests confirm that DQOs can still be met? Identify and apply the statistical tests that confirm compliance with DQOs. *(Wells not needed for monitoring now or in the future should be abandoned in accordance with state requirements.)*

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b) Are additional monitoring points needed to properly meet monitoring objectives? Identify existing wells that may be used for this purpose.

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c) Identify any sampling locations that may be candidates for reduced monitoring frequency. *(refer to Ridley, Maureen, 1995, "Cost-Effective Sampling of Groundwater Monitoring Wells," Proceedings of HAZMACON '95, Hazardous Materials Management Conference and Exhibition, April 4-6, 1995, San Jose.)*

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d) Should monitoring frequency be increased to provide protection of receptors? Identify any sampling locations at which sampling frequency should be increased.

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e) Identify any laboratory analyses that could be replaced by less expensive field methods performed in conjunction with confirmatory laboratory analyses.

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f) Can the current analytical methods be replaced with less expensive analyses and still meet the DQOs? (Compare the practical quantitation limits for the analyses to the permitted concentration levels?) Can composite samples be analyzed and still meet the DQOs? Identify candidates for less expensive analyses, and sample locations which may be suited to composite sampling.

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g) Can the analyte list be shortened to focus on the known contaminants of interest?

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h) Can on-site laboratory analyses be replaced with less expensive off-site analysis?

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i) Can a less expensive (but approved, validated, and competent) laboratory be employed? *(Review of procurement records may provide information necessary to perform this assessment.)*

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j) Can the level of QA/QC be reduced (reduced frequency of matrix spikes and matrix spike duplicates or limited list of analytes in the lab control sample)?

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8) Cost Savings from Potential Optimizations

a) Examine the costs to implement low-flow sampling and compare them to the status quo.

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b) Examine the costs for extending the use of dedicated sampling and compare them to the status quo.

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c) Examine the savings from eliminating the monitoring point(s) identified in Section 7a from the current program and compare them to the status quo.

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d) Estimate the costs for using existing well(s) for additional monitoring point(s) for the program.

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e) Examine the costs for installation, and sampling and analysis of the additional monitoring point(s) identified in Section 7b and compare them to the status quo.

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f) Examine the costs for replacing laboratory analyses with less expensive field methods performed in conjunction with confirmatory laboratory analyses and compare to the status quo.

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g) Examine the costs from reducing/increasing the monitoring frequency at the locations identified in Sections 7c and 7d and compare them to the status quo.

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h) Examine the costs for using less expensive analysis and compare them to the status quo.

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i) Examine the costs for analyzing composite samples and compare them to the status quo. *(Compositing is usually not applicable to samples that will be tested for volatile analytes.)*

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j) Examine the costs for substituting a shortened analyte list and compare them to the status quo.

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k) Examine the costs for substituting off-site analysis for more expensive on-site analysis and compare them to the status quo.

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l) Examine the costs for procuring analysis from a less expensive (but approved/validated and competent) laboratory and compare them to the status quo.

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9) Summary of Recommendations and Cost Estimates for Implementation

Provide a list of recommendations based on the evaluation of the monitoring program and the estimated cost reduction or increase associated with each recommendation.

10) Supplemental Notes and Data

There are _____ pages of supplemental notes and data attached to this checklist.