Wenck Associates, Inc.
360 North Robert Street, Suite 711
St. Paul, MN 55101

(651) 228-1909
Fax (651) 228-1969
E-mail: wenckmp@wenck.com

Wenck

October 4, 2005

Mr. Wayne Sarappo, Project Manager
Minnesota Pollution Control Agency
VIC Program
520 Lafayette Road
St. Paul, Minnesota 55155-4194

Ms. Lynne Grigor, Hydrogeologist
Minnesota Pollution Control Agency
VIC Program
520 Lafayette Road
St. Paul, Minnesota 55155-4194

RE: Quality Assurance Project Plan Comment Response and Redlines
TCF Bank Stadium Site
University of Minnesota East Bank Campus
Wenck Project Number 0179-12

Dear Mr. Sarappo and Ms. Grigor:

Attached is the redlined text of the Quality Assurance Project Plan addressing the comments we received from the MPCA on August 23, 2005 (Attachment B). The following response address comments that we either disagree with or did not fully address in the redlines.

Comment 3: The historical data for the Site is referenced and available in the MPCA files. We do not believe a detailed discussion of the past clean up work and other issues are necessary for the QAPP.

Comment 4: Figure 3 presents the actual sampling locations and the sampling plan was submitted and approved separately.

Comment 8: The statement regarding natural attenuation does not imply that this is being proposed as a remedial option. It is only presented in the context of the need for surface water criteria to be used in the evaluation. It is premature in this document to state what will be done if data exceed the criteria. The purpose of the study is to support the FS as stated in the table.

Comment 9: The sampling and QC for the project are subject to MPCA approval. This addresses the adequacy of the sampling and the QC level of effort.

Comment 16: The sampling summary is presented in Table 3, which includes the sampling rationale. The sampling and analysis plan was submitted separately and was approved.

Comment 17: As stated in Appendix B, field equipment is being rented and the calibration will be subject to manufacturer standards. Since critical decisions do not hinge on the field parameters, this is adequate. The calibration itself will be recorded and documented in the field records. Lab SOPs and calibration are included in the complete laboratory QAPP included in the appendices.

Comment 20: Wenck does not believe a laboratory audit is necessary. Wenck has reviewed ESC's internal QAPP and have submitted it with the subject QAPP. ESC's state certifications are presented in the appendices. Unless the validation identifies an internal problem there is no need to perform an audit for the routine type of analyses required for the Site.

Comment 22: We believe lab data review is addressed in section 5.2 as written.

If there are any questions concerning these responses, please contact Dan Sola at (651) 294-4591 or me at (651) 294-4587. Once we have reached agreement on the reponses we will submit a final QAPP for approval and signature.

Sincerely,

WENCK ASSOCIATES, INC.

J. Joseph Otte, Team Leader
Real Estate Sector

Enclosure

C: Mr. Rick Kubler, Gray Plant Mooty
Mr. John Hawkinson, Environmental Science Corporation

ATTACHMENT 1

MPCA Comments

Minnesota Pollution Control Agency

August 29, 2005

Mr. Brian Swanson
University of Minnesota Project Coordinator
335 Morrill Hall, 100 Church Street SE
Minneapolis, MN 55455

RE: Gopher Football Stadium
NE corner of University Avenue SE and Oak Street SE, Minneapolis
MPCA Project Number VP20200
Quality Assurance Project Plan Comment Letter

Dear Mr. Swanson:

The Minnesota Pollution Control Agency staff in the Voluntary Investigation and Cleanup Program has reviewed "Quality Assurance Project Plan and Field Sampling Plan, Subsurface Investigation of Soil & Groundwater, TCF Bank Stadium Site", (QAAP and Field Sampling Plan) prepared by Wenck Associates, Inc. (Wenck), dated June 13, 2005 which was submitted for the Gopher Football Stadium site located at the above referenced location. The QAPP and Field Sampling Plan details the quality assurance measures and procedures for the field and analytical work for the additional investigation at the Site as described in "Subsurface Investigation Work Plan", prepared by Wenck, dated June 1, 2005.

The MPCA comments on the QAPP portion of the QAPP and Field Sampling Plan were faxed to Mr. Joe Otte, Wenck, on July 13, 2005, and are included in Attachment B. MPCA staff also verbally approved this portion of the QAPP and Field Sampling Plan in order to expedite the commencement of field work at the Site. The MPCA approval of and comments on the Field Sampling Plan were e-mailed to you on June 27, 2005. Therefore, the MPCA hereby requests that a revised QAPP and Field Sampling Plan be submitted for MPCA review and formal approval after incorporation of the comments in Attachment C into the revised version of the QAPP and Field Sampling Plan.

Standard disclaimers are included in Attachment A. Please contact me if you have any questions or concerns at (651) 296-7297 or Lynne Grigor at (651) 296-8572.

Sincerely,

Wayne F. Sarappo
Senior Project Manager
Voluntary Investigation and Cleanup Unit
Remediation Division
WFS:ais

Enclosures

cc: Joseph Otte, Wenck Associates
Rick Kubler, Gray, Plant, Mooty
Daniel Pena, Minnesota Department of Health
David Jaeger, Hennepin County

520 Lafayette Rd. N.; Saint Paul, MN 55155-4194; (651) 296-6300 (Voice); (651) 282-5332 (TTY); www.pca.state.mn.us
St. Paul • Brainerd • Detroit Lakes • Duluth • Mankato • Marshall • Rochester • Willmar

ATTACHMENT A
DISCLAIMERS
Gopher Football Stadium
MPCA Project Number VP20200

1. Reservation of Authorities

The MPCA Commissioner reserves the authority to take any appropriate actions with respect to any release, threatened release, or other conditions at the Site. The MPCA Commissioner also reserves the authority to take such actions if the voluntary party does not proceed in the manner described in this letter or if actions taken or omitted by the voluntary party with respect to the Site contribute to any release or threatened release, or creates an imminent and substantial danger to public health and welfare.

2. No MPCA Assumption of Liability

The MPCA, its Commissioner and staff do not assume any liability for any release, threatened release or other conditions at the Site or for any actions taken or omitted by the voluntary party with regard to the release, threatened release, or other conditions at the Site, whether the actions taken or omitted are in accordance with this letter or otherwise.

3. Letter Based on Current Information

All statements, conclusions and representations in this letter are based upon information known to the MPCA Commissioner and staff at the time this letter was issued. The MPCA Commissioner and staff reserve the authority to modify or rescind any such statement, conclusion or representation and to take any appropriate action under his authority if the MPCA Commissioner or staff acquires information after issuance of this letter that provides a basis for such modification or action.

4. Disclaimer Regarding Use or Development of the Property

The MPCA, its Commissioner and staff do not warrant that the Site is suitable or appropriate for any particular use.

5. Disclaimer Regarding Investigative or Response Action at the Property

Nothing in this letter is intended to authorize any response action under Minn. Stat. § 115B.17, subd. 12.

ATTACHMENT B
COMMENTS ON THE QAPP ANALYTICAL METHODS AND PROCEDURES
Gopher Football Stadium
MPCA Project Number VP20200

1. Section 2.1 – Add corrective actions approval to both of the project managers (PCA & Wenck) descriptions and approval by the QA Manager of Wenck as he must approve work to continue in the field.
2. Section 2.1 – State who does the field audit, laboratory audit, reports on corrective actions, and who actually does the field work as this is vague in this section. Also state the 10% of validation at a minimum WILL be done by Diane Short and Associates.
3. Section 2.2.2 – Be specific and state what has happened on site for remediation, give a map that shows where everything is located as far as old facilities go. State what the affect media is and how this impacts the public and environment.
4. Section 2.3 – Specify where soil samples will be taken. State the project schedule. Submit the actual sampling plan. State what type of site this is (RCRA, Superfund, VIC, etc.).
5. Table 2 – Step 1 – Identify the planning team, specify the decision maker, and state what resources are available for this project.
6. Table 2 – Step 3 – What existing data will be used on site? State the methods in Table 1 meet the reporting limits required on site. Discuss the use of secondary data.
7. Table 2 – Step 4 – Show the boundaries on a map and discuss depth of soils and ground water sampling on site. State the schedule of the study.
8. Table 2 – Step 5 – Has natural attenuation been agreed upon by the MPCA? If not, remove this language. If soils exceed levels, what will be done?
9. Table 2 – Step 6 – Are enough samples being taken to ensure error is low? Is adequate QC being taken for this study?
10. Table 6 – Add surrogates to all organic samples. Remove the TCAAP reference. Note blanks apply to SVOCs also.
11. Table 7 – Is 8021 being used? If not, remove it. Do not use method 8310 for PAHs. No recovery should be less than 30% and considered acceptable.
12. Table 2 – Step 7 - What further work will be done on the study?
13. Section 2.4 – Field duplicates shall be done with the RPD evaluated. Check field accuracy through verification of the calibration.
14. Section 2.5 – Reference the laboratory QAM for training.
15. Section 2.6 – Where does Wenck store data? Discuss data security.
16. Section 3.41 – Describe field sampling. This is missing. Discuss the how and why behind the sampling. Give frequency of sampling.
17. Section 3.7 – Submit field calibration and SOPs. These are missing and required. Discuss the traceability of standards. Lab information is missing, add it. Note a minimal description of calibration requirements of the main lab instruments is required here these include ICP, ICP/MS, GC/MS, and GC/ECD.
18. Section 3.8 – Reference laboratory information here.
19. Section 3.9 – What historical data is being used? What is the known quality of this data? Who generated it?
20. Section 4.1 – Remove DUR language unless DURs are actually being done on this site. Wenck must do a laboratory audit. Submit the lab audit check list and schedule. Submit the last audit done on the lab by a state or federal agency. Specify what states certify ESC. Give an example CAR report for ESC and Wenck (note, remove the reference to TCAAP on the Wenck tracking report for CA).

21. Section 4.2 – Remove DUR language unless they are being done. List what is reported here. State the QA will be reported to include PARRCC, as well as changes to the QAPP, personnel changes, corrective actions, and bias.
22. Section 5.2 – Laboratory data review process is needed here.
23. Section 5.3 – Specify what is considered a success on site.

ATTACHMENT C
COMMENTS ON THE QAPP FIELD METHODS AND PROCEDURES
Gopher Football Stadium
MPCA Project Number VP20200

1. Section 2.6, Fourth sentence, a verb is missing from this sentence.

2. Section 3.2, Third sentence, use contamination instead of contaminants.

3. Section 3.4, Last Paragraph, Fourth sentence, use resampling rather than resembling.

4. Section 3.5, QA Split Samples paragraph, First paragraph, change ....but is [to *are*] submitted to a different laboratory than ESC as a [delete *a*] separate, discrete sample [to samples].....

5. Section 4.1, Laboratory Audits paragraph, finish first sentence.

6. Table 8 and Table 9, take out TCAAP header.

7. Appendix B, Section 2.2, the Photoionization Detector needs to be calibrated on a daily basis and even more frequently if recommended by the manufacturer or site conditions warrant. Second to last sentence, change conducted to conducted.

8. Appendix B, Section 3.1, First sentence, the evaluation is also to determine the nature, extent, magnitude and potential risk of contaminated environmental media. This section should also include the equipment decontamination procedures.

9. Appendix B, Section 3.3.2, should also include a sheen test and observation for odors.

10. Appendix B, Section 3.5, the excavation bucket should be decontaminated following test pits/trenches that were used in soil that is suspected of being contaminated.

11. Appendix B, Section 4.1, the monitoring wells need to be stabilized prior to sampling and the stabilization data recorded.

ATTACHMENT 2

Redlined Text

Quality Assurance Project Plan and Field Sampling Plan

Subsurface Investigation of Soil and Groundwater

TCF Stadium Site

Wenck File #0179-12-4

Prepared for:

UNIVERSITY OF MINNESOTA
c/o Gray Plant Mooty
500 IDS Center
80 South Eighth Street
Minneapolis, MN 55402

Prepared by:

WENCK ASSOCIATES, INC.
360 North Robert Street, Suite 711
St. Paul, Minnesota 55101
(651) 228-1909

Revision 0
June 13, 2005

Wenck

QUALITY ASSURANCE PROJECT PLAN AND FIELD SAMPLING PLAN FOR TCF BANK STADIUM SITE

University of Minnesota

Document Approval

Wayne Sarappo, MPCA Manager	Date
(to be determined), University of Minnesota Representative	Date
Joe Otte, Wenck Associates, Inc. Project Manager	Date
Daniel Sola, Wenck Associates, Inc. QA Manager	Date
Judy Morgan, Environmental Science Corporation QA Director	Date

QUALITY ASSURANCE PROJECT PLAN AND FIELD SAMPLING PLAN FOR TCF BANK STADIUM SITE

REVISION 0 (June 13, 2005)

University of Minnesota

Distribution List

	Number of Copies
Minnesota Pollution Control Agency Wayne Sarappo	3
University of Minnesota (to be determined)	2
Wenck Associates, Inc. Joe Otte	2
Environmental Science Corporation Ms. Judy Morgan	2

QUALITY ASSURANCE PROJECT PLAN AND FIELD SAMPLING PLAN FOR TCF BANK STADIUM SITE

REVISION 0 (June 13, 2005)

University of Minnesota

Document Revision Summary

Revision Number	Revision Date	Summary of Revisions
0		

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TABLES

FIGURES

APPENDICES

Acronyms

AST	Aboveground Storage Tank
CAR	Corrective Action Report
CLP	Contract Laboratory Program
DSA	Diane Short & Associates
DQO	Data Quality Objective
DUR	Data Usability Report
ESC	Environmental Science Corporation
FS	Feasibility Study
HRL	Health Risk Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MPCA	Minnesota Pollution Control Agency
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
Peer	Peer Engineering, Inc.
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SDG	Sample Data Group
Site	TCF Bank Stadium Site
SOP	Standard Operating Procedure
SRV	Soil Reference Value
U of M	University of Minnesota
VIC	Voluntary Investigation Cleanup
Wenck	Wenck Associates, Inc.

1.0 Introduction

The Minnesota Pollution Control Agency ("MPCA") requires that collection of environmental data be in accordance with an agency-approved Quality Assurance Project Plan/Sampling and Analysis Plan ("QAPP/SAP"). Any party generating environmental data that is within the scope of this QAPP/SAP must follow the methods and procedures specified in this QAPP/SAP to ensure that data are of known and documented quality. This QAPP/SAP presents the project organization, data quality objectives ("DQOs"), sample collection and handling procedures, laboratory analytical procedures, and data verification/validation procedures to be utilized for a soil and groundwater subsurface investigation ("RI") that is being conducted at the TCF Bank Stadium Site on the University of Minnesota ("Site"). This QAPP/SAP describes the specific quality assurance ("QA") and quality control ("QC") activities that will be utilized to ensure that data are of known and documented quality.

This QAPP/SAP was prepared in general accordance with "USEPA Region 5 Instructions on the Preparation of a Superfund Division Quality Assurance Project Plan, Revision 0, June 2000." The Region 5 instructions were based on "EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, March 2001."

The scope of the investigation is described in: "Subsurface Investigation Work Plan, Proposed TCF Bank Stadium Site, University of Minnesota, Minneapolis, Minnesota," dated June 2005, by Wenck Associates, Inc.

2.0 Project Management

2.1 PROJECT/TASK ORGANIZATION

The MPCA Voluntary Investigation Cleanup ("VIC") Program is the lead regulatory agency for this site. The owner of the Site is the University of Minnesota ("U of M"), which has retained Wenck Associates, Inc. ("Wenck") to implement the investigation. A project organization chart is presented on Figure 1.

Samples collected from this site will be analyzed by Environmental Science Corporation ("ESC"), Mt. Joliet, Tennessee. An independent quality assurance review is provided primarily by the QA manager for Wenck. The QA manger has the authority to act independently of the project manager in all QA/QC matters, has the authority to order the project manager to suspend work for non-compliance with the QAPP/SAP, and has the authority to report directly to the corporate QA officer regarding non-compliances or unsatisfactory corrective actions.

Specific QA/QC tasks for key individuals include:

MPCA Project Manager (Wayne Sarappo)

- Review the QAPP/SAP and provide consistency, including subsequent revisions.
- Coordination with MPCA QA Manager (Luke Charpentier).
- Coordinate collection of MPCA QA split samples, as deemed necessary by the MPCA.
- Audit any field or laboratory work, as deemed necessary by the MPCA.
- Provide corrective actions approvals.

U of M Representative (to be determined)

- Provide overall program leadership and direction, having ultimate authority for Quality Assurance on the site.
- Review and approve the QAPP/SAP, including all subsequent revisions.
- Audit any field or laboratory work, as deemed necessary.

Project Manager (Joe Otte)

- Review and approve the QAPP/SAP, including subsequent revisions.
- Coordinate with the QA Manager on all QA/QC matters.
- Ensure compliance with the QAPP/SAP for all project work.
- Assign trained staff and resources to complete work in accordance with the QAPP/SAP.
- Provide document control on QAPP/SAP to ensure project team has the most current version.
- Provide correc.tive actions approvals

QA Manager (Daniel Sola)

- Review and approve the QAPP/SAP, including subsequent revisions.
- Prepare data verification reports, or review data verification reports if prepared by others under the QA manager's direction.
- Complete field audits and corrective action reports as necessary.

Field Technical Staff

- Ensure QAPP/SAP-specified sample collection/handling/shipping procedures are followed.
- Document sampling events and field observations.
- Identify and report field problems to the Project Manager.

Shane Waterman (Wenck) serves as the lead field staff, and if not conducting the sampling himself, will be the individual responsible for coordinating sampling events and reporting to the project manager. Mr. Waterman will be assisted by Mike Torres.

ESC Quality Assurance Director (Judy Morgan, Regulatory Affairs/Quality Assurance Officer)

- Monitor and evaluate laboratory QA/QC activities, reporting deficiencies and identifying resource requirements to the President.
- Conduct and document annual internal audits of laboratory procedures.
- Review laboratory Standard Operating Procedures ("SOPs") and ESC Quality Manual.
- Arrange the analysis of laboratory QC and performance evaluation samples.
- Maintain staff training records, reporting deficiencies to the President.
- Maintain the laboratory corrective action program.
- Review and approve the laboratory elements of this project QAPP/SAP.

ESC Project Manager (John Hawkins)

- Ensure timely and accurate communication between Wenck and ESC.
- Ensure that the requirements of the ESC Quality Manual, ESC SOPs, and the laboratory elements of this QAPP/SAP are implemented.
- Ensure timely response to Wenck requests for information and audits.
- Perform final review of analytical data reports to ensure that all requirements are met.

Data Validator (Diane Short~~ – to be determined~~)

- Prepare data validation reports.
- Provide support to the QA manager, as needed.
- Minimum of 10% of samples will be validated by Diane Short.

Other Technical Staff

Other technical staff will be assigned to the project, as necessary, to provide the expertise necessary to ensure that project objectives are met. Dan Sola (Wenck) is providing primary technical support for hydrogeology, and also for statistical analysis, as needed.

2.2 PROBLEM DEFINITION/BACKGROUND

2.2.1 Site Description

The Site is located on the U of M's East Bank Campus in Minneapolis, Hennepin County, Minnesota. The Site is approximately 36 acres in size and is generally located in the Southwest ¼ of the Southwest ¼ of Section 19, and the Northwest ¼ of the Northwest ¼ of Section 30, Township 29 North, and Range 23 West. The Site location is shown in Figure 2. The Site boundaries generally coincide with University Avenue to the south, Oak Street SE to the west, 5th Street NE to the north, and 23rd Street SE to the east. The majority of the Site is currently being used for surface parking. University-owned buildings used for various purposes currently occupy the southern portion of the Site along University Avenue. The general Site area is depicted in Figure 3. The Study boundary is shown on Figure 4.

2.2.2 Site History

Based on information gathered by Peer Engineering, Inc. ("Peer") summarized in a report entitled *"Phase I Environmental Site Assessment"* (October 2002) ("Peer Phase I"), the Site has had a number of past industrial uses, including a former wood treating facility, a rail yard, a bulk petroleum storage facility, a grain elevator, and an asphalt plant.

The Site has been the subject of several previous environmental projects. Environmental studies have also been conducted by the University and others regarding properties adjacent to or near

the Site. Reports documenting prior environmental studies are cited in Section 7.0, *References*. Many of these studies involved the collection of soil and/or groundwater samples at the Site.

Wenck has considered historical information and sampling data presented in these prior studies in developing the investigation work plan. The following is a brief summary of historical information regarding environmentally significant past land uses of the Site.

2.2.3 Former Creosoting Facility

The former Republic Creosoting facility operated from approximately 1903 to 1919. The facility occupied approximately 2.75 acres and included a creosote wood treating plant, a lumber processing plant, coal bins, storage buildings, and railroad loading areas. Also associated with the Republic Creosoting facility were several large aboveground storage tanks ("ASTs"). The ASTs ranged in size from approximately 25,000-gallons to 100,000-gallons and were used to store creosote oil. The facility also had a settling basin where wood was treated with the creosote oil.

The Republic Creosoting facility has been the subject of several prior environmental investigations. A voluntary response action was completed in 1995 regarding the settling basin. That response action was limited to settling basin soils and did not address other historical creosote releases to the Site soils or groundwater.

2.2.4 Former Bulk Petroleum Storage Facility

Standard Oil operated a bulk petroleum facility on the western portion of the Site from approximately the late 1800s through the mid-1960s. The Peer Phase I indicates that between approximately 1912 and 1952, the facility included thirteen (13) ASTs ranging in size from 10′ in diameter and 16′-10′ feet tall to 50′ in diameter by 30′ tall. All ASTs were removed from the Site by 1957. Some soil and groundwater testing were previously conducted in the early 1990s on a portion of the former petroleum storage facility, which identified a historical release of

petroleum. The University reported the release (Leak Site No. 6134) and conducted limited soil excavation in the vicinity of Oak Street and 5th Street. The MPCA issued a closure letter as to this Leak Site in 1998. Residual soil and groundwater contamination are understood to exist in connection with the former petroleum bulk storage facility.

2.2.5 Former Rail Yard

A majority (approximately 23.8 acres) of the Site was formerly operated as a railroad yard by Chicago Great Western Railway Company from approximately the 1880s through the mid-1960s. According to the Peer Phase I, buildings associated with the railroad yard operations included lumber and tool sheds. The former Republic Creosoting facility was located on railroad property. With the exception of the testing performed regarding Republic Creosoting, the railroad yard property has not, to Wenck's knowledge, been the focus of an environmental investigation.

2.2.6 Former Grain Elevator Site

A grain elevator facility was operated in the southeast portion of the Site by various entities, including Interstate Grain Company, from approximately 1889 through 1966. The grain elevator and associated structures were raised at some point between 1966 and 1974. Based upon the Peer Phase I and other available reports, it does not appear that any environmental testing has previously been conducted with respect to the former grain elevator facility.

2.2.7 Former Asphalt Plant Site

The Peer Phase I refer to an asphalt plant that was understood to have been located in the south central portion of the Site in the early 1900s. Very little historical information is extant relative to the former asphalt plant site.

2.3 PROJECT/TASKS DESCRIPTION AND SCHEDULE

The project involves a remedial investigation and feasibility study under the MPCA Voluntary Investigation Cleanup Program (VIC).

Work to be performed for this project includes the following items:

- Collect soil and groundwater samples according to the Work Plan (Wenck) and submit to ESC for analysis. Figure 3 shows the sampling locations.
- Analyze soil and groundwater samples (ESC) and submit analytical data reports to Wenck. Analytes, action levels, and project reporting limit goals are discussed in the next section. Analytical methods are discussed in Section 3.4 *Analytical Methods*. This information is also summarized in Table 1.
- Complete data verification and data validation reports. The term "data validation" as used in this QAPP/SAP refers to a more thorough review of an analytical data set that includes review of raw data, whereas "data verification" is a more abbreviated review that does not include review of raw data (see Section 5.0 *Data Validation and Usability* for detailed definitions of data verification and data validation). Data verification and validation reports are completed by the Wenck QA Manager (or under his direction) and by Diane Short & Associates ("DSA"), respectively.
- Conduct internal field audits (Wenck) and internal laboratory audits (ESC). QA assessments/audits of laboratory and/or field procedures are conducted by other project stakeholders on an as needed basis. Assessment and oversight is discussed in Section 4.0 *Assessment and Oversight*.

- Analyze and report the data collected to the MPCA in data tables attached to data verification/validation reports. Data management is discussed in Section 3.10 *Data Management*, and reporting is discussed in Section 4.2 *Reports to Management.*
- Project is planned to be completed (i.e. completion of FS) in the fall of 2005.

2.4 DATA QUALITY OBJECTIVES AND CRITERIA

Data Quality Objectives (DQOs) are qualitative and quantitative statements that clearly state the objective of the project; define the most appropriate type of data to collect; determine the most appropriate conditions for data collection; and specify acceptable decision error limits that establish the quantity and quality of data needed for decision-making. The DQO process is a series of seven sequential steps, comprising a strategic planning approach that is designed to ensure that the type, quantity, and quality of data used in decision-making are appropriate for the intended applications. Table 2 presents the Data Quality Objectives for the Site.

The screening levels used for selecting analytical methods are presented in Table 1. For this site, the screening levels are the State of Minnesota Soil Reference Values ("SRVs") and Health Risk Limits ("HRLs") that are applicable to soil and groundwater, respectively. The purpose of presenting these screening levels is to ascertain that analytical detection limits are sufficient to meet the DQOs.

For Steps 1 through 4 on Table 2, the overall goal of the Subsurface Investigation is to provide adequate delineation of the nature and extent of soil and groundwater contamination to support the Feasibility Study ("FS") of the Site property as identified by the U of M. The objective of the FS is to support a Remedial Action Plan ("RAP") that meets the requirements of the MPCA VIC program and is also consistent with the National Contingency Plan ("NCP").

For Step 5, the rationales for the two decision rules are based on MPCA VIC guidance and preliminary discussion with the MPCA project manger. The use of SRVs and HRLs are the threshold criteria for deciding if soil and groundwater need to be addressed in the FS. At this time, the final clean up criteria for the Site have not been determined.

For Step 6, where limits on decision errors are specified, a number of criteria are either specified or referenced, including the percentage of data verification/validation, control limits, and circumstances when the MPCA must be notified to discuss potential resampling. At the beginning of Step 6, the relative tolerance for error is discussed, which then leads to statements about the control limits and/or implementation of the above-listed criteria. In general, this project utilizes 100% data verification, with validation of at least 10%. The data validation rate of 10% will be applicable to all media sampled.

The control limits that will be used to evaluate the quality of analytical data are specified in Step 6 by referring to Table 4, which specifies the control limits for this project for data verification/validation, and by referring to Table 7, which specifies laboratory control limits. Table 4 specifies the data qualification procedures that are to be followed if any control limits are exceeded. Control limits are further discussed in Section 3.5 *Quality Control.*

Step 7 of the DQO table, optimization of the sampling design, summarizes the type of locations to be sampled and sampling frequency. A summary of the investigation plan is presented in Table 3, and the monitoring locations are presented in Figure 3.

The fundamental measurement performance criteria that are utilized to assess the quantitative and qualitative degree of quality in the environmental data generated are precision, accuracy, representativeness, completeness, and comparability ("PARCC"). Evaluation of precision, accuracy, and representativeness involve the use of field/analytical QC samples. The types and frequencies of QC samples utilized for this project are discussed in Section 3.5 *Quality Control*

and are summarized in Table 6. Evaluation of PARCC should be performed for each type of analysis conducted. The methods for evaluation of PARCC will be as described below:

Precision

Precision is the measure of agreement between repeated measurements of the same parameter under the same or similar conditions. Laboratory precision is assessed by comparing the analytical results between a matrix spike ("MS") and a matrix spike duplicate ("MSD") and between a parent sample and a laboratory duplicate. Field precision is assessed by comparing the analytical results between a parent sample and a field duplicate sample; however, the laboratory precision is also a factor in field duplicate precision (i.e., poor precision on a field duplicate could be related to field issues, laboratory issues, or both). In case of poor precision, the field accuracy will be determined by verifying the method calibration. -If the MPCA collects any split samples (not routinely scheduled), field/analytical precision can also be assessed between different laboratories. Precision of field parameters will not be routinely assessed, since no decisions are being made using this data. If an instrument appears to be giving erratic readings, multiple measurements will be made on the same sample to establish precision and to thus evaluate meter performance. Such evaluations will be recorded in the field logbook, but will not be routinely evaluated in the data verification/validation process. Precision is evaluated for all of the comparisons described above through determination of relative percent difference ("RPD"), which is calculated using the following equation:

$$RPD = \frac{|S - D|}{(S + D)/2} * 100$$

Where: S = First sample value (original or MS value)

D = Second sample value (duplicate or MSD value)

The control limits for precision are specified in Table 4 (control limits for data qualification) and Table 7 (laboratory control limits). The lower the RPD value, the greater the precision.

Accuracy

Accuracy is the extent of agreement between the analytical result obtained and the true value of the parameter being measured. Laboratory accuracy is assessed through the use of Laboratory Control Samples ("LCS") and MS/MSDs. The calibration spikes utilized for initial and continuing calibration verification also provide verification of laboratory accuracy.

Accuracy is evaluated through determination of percent recovery ("%R"), which is calculated using the following equation:

$$\%R = \frac{A - B}{C} * 100$$

Where: A = The analyte concentration determined experimentally from the spiked sample;

B = The background level determined by a separate analysis of the unspiked sample; and

C = The amount of the spike added.

For LCS and calibration spikes, the value of B in the above equation is zero. For MS/MSDs, the value of B is the unspiked analytical result for the parent sample, which could be a non-zero result, or could also be zero if the analyte was not detected in the parent sample. Percent Recovery is calculated for the MS and for the MSD. The control limits for accuracy are specified in Table 4 (control limits for data qualification) and in Table 7 (laboratory control limits). The closer the percent recovery is to 100%, the greater the accuracy. Recoveries of less than 100% suggest that analytical results could

be biased low, and recoveries of greater than 100% suggest that analytical results could be biased high.

Blanks also provide information regarding accuracy. If there are detections of an analyte in a blank, then detections of that analyte in any associated samples may be due to, or may have been influenced by, some form of field or laboratory contamination. The blanks utilized to assess any field sources of contamination are equipment rinsate blanks. The blanks utilized to assess any laboratory sources of contamination (and also any potential "drift" in the analytical instrument) are method/preparation blanks and calibration blanks. No blanks should have any detected analytes; however, any detected analytes should be handled as specified in Table 4 (control limits for data qualification) and in Table 7 (laboratory control limits).

Accuracy of field parameters will not be routinely assessed, other than through the normal meter calibration process, since no decisions are being made using this data. If an instrument appears to be giving unrealistic readings, the meter will be recalibrated and the problems/recalibration will be recorded in the field logbook. Field parameter accuracy will not be routinely evaluated in the data verification/validation process.

Representativeness

Representativeness is a qualitative measure of the degree to which the data accurately and precisely reflect the actual conditions in the matrix of interest, at the time and location that it was sampled. In the field, representativeness is produced by selecting QC sample locations, such as Matrix Spikes, that best represent the matrix being sampled and by ensuring that QAPP/SAP-specified procedures are followed. Representativeness is assessed by verifying that selected QC sample locations were analyzed, that QAPP/SAP-specified sampling procedures were followed (i.e., sample container types, sample preservation, sample labeling, equipment decontamination, etc.), and that QAPP/SAP-specified analytical procedures were followed (i.e., method numbers, holding times, QC