STS CONSULTANTS, LTD.

APPENDIX B

Amended Removal Action Work Plan
Documentation

Completion Report Time-Critical
Removal Action
Lindsay Light II Site/
(OU3/North McClurg Court)
341 East Ohio Street
Chicago, Illinois

Teachers' Retirement System of the State of Illinois

STS Project No. 1-25585-XJ
January 27, 2003

EPA Region 5 Records Ctr.
231467

AMENDED REMOVAL ACTION WORK PLAN DOCUMENTATION
341 East Ohio Street
Chicago, Illinois
STS Project No. 1-25585-XJ

1. Amended Removal Action Work Plan, dated March 13, 2002, by STS Consultants, Ltd. *Note: The following elements are bound within the Amended Removal Action Work Plan:*

   - Amended Removal Action Work Plan Sections 1 through 3.
   - Attachment 1 - Construction Quality Assurance Plan, Rev. 0.
   - Attachment 2 - Quality Assurance Project Plan, Rev. 3, dated June 13, 2002.
   - Attachment 3 - Health and Safety Plan, Rev. 2, dated February 14, 2002.
   - Attachment 4 - Pesticide Investigation Report, February 25, 2002.
   - Appendix 1 - Transportation Logistics Plan, Rev. 0.
   - Appendix 2 - Permitting and Access Requirement Plan, Rev. 0.
   - Appendix 3 - Traffic Control Plan, Rev. 0.
   - Appendix 4 - Emergency Contingency Plan, Rev. 0.
   - Appendix 5 - Verification Sampling Plan, Rev. 0.
   - Appendix 6 - Site Security Plan, Rev. 0.
   - Appendix 7 - Project Training Plan, Rev. 0.
   - Appendix 8 - Air Monitoring Plan, Rev. 0.
   - Appendix 9 - Field Sampling Plan, Rev. 1, September 13, 2001.
   - Appendix 10 - Dust Control Plan, Rev. 0.

2. Letter dated May 4, 2001 from Timothy Ramsey of Piper Marbury Rudnick & Wolfe to Mary Fulghum of USEPA transmitting the Removal Action Work Plan dated May 1, 2001. *Note: Such Removal Action Work Plan dated May 1, 2001 was subsequently revised and amended. The documents comprising the final Amended Removal Action Work Plan as approved by USEPA are included in tab 1 in this Appendix B.*

3. Letter dated June 5, 2001 from USEPA to STS Consultants, re: Teacher's Retirement System Removal Action Work Plan (341 East Ohio, Chicago, Illinois) - Quality Assurance Project Plan.

4. Letter dated July 11, 2001 from USEPA to STS Consultants, re: 341 East Ohio Street Workplan, Lindsay Light II Site/RV 3 North McClurg Court.

5. Letter dated July 18, 2001 from STS Consultants to USEPA, re: Environmental Gamma Radiation Survey, 341 East Ohio Street, Chicago, Illinois - STS Project No. 1-25585-XG.

6. Letter dated July 26, 2001 from STS Consultants to USEPA, re: Response to Comments regarding 341 East Ohio Street Workplan - STS Project No. 1-25585-XG. *Note: these revisions, except to the extent superseded by later submissions to USEPA, are incorporated into the Amended Removal Action Work Plan.*

7. Letter dated August 17, 2002 from USEPA to STS Consultants, re: Lindsay Light II Site - North McClurg Court. *Note: Provides approval to perimeter boring/gamma radiation survey.*

8. Letter dated August 28, 2001 from STS Consultants to USEPA, re: 341 East Ohio Street Site Work Plan - STS Project No. 1-25585-XG, Correspondence No. 004. *Note: Pertains to use of truck scales.*

9. Letter dated September 12, 2001 from USEPA to STS Consultants, re: 341 East Ohio Street Workplan, Lindsay Light II Site/RV 3 North McClurg Court. *Note: Provides provisional approval of Work Plan.*

10. Letter dated September 21, 2001 from STS Consultants to USEPA, re: Response to Comments regarding 341 East Ohio Street Site Quality Assurance Project Plan – STS Project No. 1-25585-XG, Correspondence No. 012.

11. Letter dated October 17, 2001 from USEPA to STS Consultants, re: USEPA Comments on Quality Assurance Project Plan.

12. Letter dated December 21, 2001 from James Montana of Piper Marbury Rudnick & Wolfe to Renee Cipriano, Director of IEPA re: GMO Site, 341 East Ohio Street, Chicago, Illinois

13. Letter dated January 14, 2002 from STS Consultants to USEPA, re: Response to Comments regarding 341 East Ohio Street Site Quality Assurance Project Plan - STS Project No. 1-25585-XG, Correspondence No. 043.

14. Letter dated January 18, 2002 from STS Consultants to USEPA, re: Response to Comments Regarding 341 East Ohio Street Site Quality Assurance Project Plan - STS Project No. 1-25585-XG, Correspondence No. 046. *Note: This transmitted QAPP Rev. 2 which was subsequently replaced by Rev. 3.*

15. Letter dated January 29, 2002 from Timothy Ramsey of Piper Marbury Rudnick & Wolfe to William Ingersoll at IEPA (and the enclosure with that letter consisting of the letter dated January 18, 2002 from STS to Timothy Ramsey of Piper Marbury Rudnick & Wolfe) relating to the proposed method of addressing pesticide-impacted soils at the GMO Site.

16. Letter dated February 6, 2002 from STS Consultants to Piper Marbury Rudnick & Wolfe, re: Perimeter Drilling Results, 341 East Ohio Street, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 041.

17. Letter dated February 8, 2002 from Piper Marbury Rudnick & Wolfe to USEPA, re: GMO Site, 341 East Ohio Street, Chicago, Illinois. *Note: Transmits the STS letter dated February 6, 2002 to USEPA.*

18. Letter dated March 8, 2002 from STS Consultants to USEPA, re: Fire Insurance Map of 341 East Ohio Street Site – STS Project No. 1-25585-XG, Correspondence No. 058.

19. Letter dated March 15, 2002 from Piper Marbury Rudnick & Wolfe to USEPA, re: GMO Site, 341 East Ohio Street, Chicago, Illinois. *Note: Transmits the Amended Removal Action Work Plan to USEPA.*

20. Letter dated March 18, 2002 from Timothy Ramsey of Piper Marbury Rudnick & Wolfe to Mary Fulghum of USEPA, along with the enclosure consisting of the letter dated March 15, 2002 from Renee Cipriano, Director of IEPA, to James S. Montana, Jr. of Piper Marbury Rudnick & Wolfe.

21. Letter dated April 1, 2002 from STS Consultants to USEPA, re: Request for Approval of Field Laboratory Procedure, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 069.

22. Letter dated May 15, 2002 from Fredrick Micke of USEPA to Richard Berggreen of STS re: 341 East Ohio Workplan, Lindsay Light II Site/RV3 North McClurg Court (approving the Work Plan).

23. Letter dated May 31, 2002 from Fredrick Micke of USEPA to Richard Berggreen of STS re: Lindsay Light II Site – North McClurg Court (relating to the radiation survey perimeter drilling results report dated February 6, 2002).

24. Letter dated June 4, 2002 from USEPA to STS re: Lindsay Light II Site – North McClurg Court (conditionally approving the QAPP).

25. Quality Assurance Project Plan, Revision 3, dated June 13, 2002, as submitted to USEPA by STS with its letter dated July 12, 2002, and as supplemented by STS' letter dated July 16, 2002 submitting a corrected Appendix C thereto. Included in Item 1, above.

26. Letter dated June 25, 2002 from STS Consultants to USEPA, re: Request for Removal Action Work Plan Change, 341 East Ohio Street Site, Chicago, Illinois – STS Project No. 1-25585-XI, Correspondence No. 090. *Note: Pertains to change in sequencing of work.*

27. Letter dated July 8, 2002 from STS Consultants to USEPA, re: Work Plan Revision Request – STS Project No. 1-25585-XI, Correspondence No. 093. *Note: Amends STS letter dated June 25, 2002.*

28. Letter dated July 12, 2002 from STS Consultants to USEPA, re: Response to USEPA Comments on QAPP, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 096. *Note: This letter transmitted 4 copies of QAPP, Rev. 3 to USEPA. QAPP, Rev. 3 is Attachment 2 or the Amended Remedial Action Work Plan.*

29. Letter dated July 16, 2002 from STS Consultants to USEPA, re: Corrected Version of Field Sampling Plan for QAPP Revision 3, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 098. *Note: This letter transmitted 4 copies of corrected FSP to replace those in the July 12 transmittal.*

30. Letter dated July 18, 2002 from USEPA to STS Consultants, re: 341 East Ohio Work Plan, Lindsay Light II Site/North McClurg Court. *Note Response to STS letter dated July 8, 2002.*

31. Letter dated July 31, 2002 from STS Consultants to USEPA, re: Pesticide Excavation and Verification Sampling, 341 E. Ohio Street Site, Chicago, Illinois – STS Project No. 1-25585-XI, Task 2300, Correspondence No. 103. *Note: The letter transmitted an STS internal memorandum dated July 26, 2002 that provided details to field team regarding verification sampling procedures for pesticide-impacted soil removal.*

32. Letter dated July (*sic*) 7, 2002 from Verneta Simon of USEPA to Richard Berggreen of STS re: Pesticide Excavation and Verification Sampling, 341 East Ohio, Chicago, Illinois, Lindsay Light II Site/North McClurg Court (responding to STS' letter dated July 31, 2002 relating to pesticide verification sampling).

33. Letter dated August 1, 2002 from STS Consultants to USEPA, re: Signature Page from Argonne National Laboratory for QAPP, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 106.

34. Letter dated August 16, 2002 from STS Consultants to USEPA, re: Proposed Revision to Approved Amended Removal Action Work Plan, 341 East Ohio Street Site, Chicago, Illinois – STS Project No. 1-25585-XG, Correspondence No. 110. *Note: Pertains to change in sequencing of work.*

35. Letter dated August 22, 2002 from USEPA to STS Consultants, re: 341 East Ohio Work Plan, Chicago, Illinois, Lindsay Light II Site/North McClurg Court. *Note: Approves sequencing described in STS letter dated August 16, 2002.*

36. Letter dated September 27, 2002 from STS Consultants to USEPA, re: Work Plan Change Request, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 25585-XI, Correspondence No. 122. *Note: Pertains to concrete wall along north property line and concrete pile caps in Area 4.*

37. Letter dated October 3, 2002 from Verneta Simon of USEPA to Richard Berggreen of STS re: 341 East Ohio Work Plan, Lindsay Light II Site/North McClurg Court (relating to dust control measures).

38. Letter dated October 8, 2002 from STS Consultants to USEPA, re: Change to Work Plan Request. Additional Information – STS Project No. 1-25585-XI, Correspondence No. 127. *Note: Provides additional information in support of September 27, 2002 letter.*

39. Letter dated October 8, 2002 from STS Consultants to USEPA, re: Cessation of Air Monitoring, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XI, Correspondence No. 128.

40. Letter dated October 9, 2002 from USEPA to STS Consultants, re: Lindsay Light II Site - North McClurg Court - QAPP. *Note: Final approval of QAPP, Rev.3.*

41. Letter dated October 15, 2002 from USEPA to STS Consultants, re: 341 East Ohio Work Plan, Lindsay Light II Site/North McClurg Court. *Note: Approves Work Plan changes described in STS letters dated September 27 and October 8, 2002.*

42. Letter dated October 17, 2002 from STS Consultants to USEPA, re: Post-Remediation Site Restoration, 341 E. Ohio Street Site, Chicago, Illinois – STS Project No. 1-25585-XI, Correspondence No. 131.

43. Letter dated October 24, 2002 from USEPA to STS Consultants, re: 341 East Ohio Street, Lindsay Light II Site/North McClurg Court. *Note: Approves site restoration measures described in STS letter dated October 17, 2002.*

44. Letter dated November 1, 2002 from John Esser and Richard Berggreen of STS to Fred Micke and Verneta Simon of USEPA re: 341 E. Ohio Street, Radiation Survey of Adjacent Sidewalk Area – STS Project No. 1-25585-XI, Correspondence No. 136.

45. Weekly status reports from STS to USEPA in the form of letters dated as follows. Note: This is for information only. The documents are not provided in this report.

August 20, 2001	December 5, 2001	March 20, 2002	July 17, 2002
August 27, 2001	December 11, 2001	March 28, 2002	July 24, 2002
September 4, 2001	December 20, 2001	April 4, 2002	July 30, 2002
September 12, 2001	January 3, 2002	April 18, 2002	August 5, 2002
September 19, 2001	January 11, 2002	April 26, 2002	August 22, 2002
September 26, 2001	January 17, 2002	May 3, 2002	August 28, 2002
October 2, 2001	January 24, 2002	May 22, 2002	September 9, 2002
October 9, 2001	January 31, 202	Mary 31, 2002	September 13, 2002
October 18, 2001	February 4, 2002	June 7, 2002	September 20, 2002
October 22, 2001	February 13, 2002	June 10, 2002	October 2, 2002
October 31, 2001	February 19, 2002	June 21, 2002	October 11, 2002
November 7, 2001	February 25, 2002	June 27, 2002	October 28, 2002
November 14, 2001	March 6, 2002	July 3, 2002	
November 29, 2001	March 13, 2002	July 11, 2002	

46 Monthly status reports from STS to USEPA in the form of letters dated as follows. Note: This is for information only. The documents are not provided in this report.

October 10, 2001	February 13, 2002	June 13, 2002	October 17, 2002
November 26, 2001	March 8, 2002	July 11, 2002	November 6, 2002
December 12, 2001	April 5, 2002	August 22, 2002	
January 11, 2002	May 14, 2002	September 13, 2002	

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STS CONSULTANTS, LTD.

Amended Removal Action Work Plan
341 East Ohio Street
Chicago, Illinois

Teachers' Retirement System of the
State of Illinois

STS Project No. 1-25585-XG
March 13, 2002

THE INFRASTRUCTURE IMPERATIVE

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APPENDICES

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Teachers' Retirement System of the State of Illinois
STS Project No. 1-25585-XG
March 13, 2002

TEACHERS' RETIREMENT - GMO SITE
AMENDED REMOVAL ACTION WORK PLAN
MARCH 13, 2002

1.0 SCOPE AND OBJECTIVES

The subject site for this Removal Action Work Plan (the "site" or the "subject site") at 341 East Ohio Street, Chicago, Illinois, is a vacant parcel of approximately 2.16 acres located at the northwest corner of McClurg Court and East Grand Avenue, Chicago, Illinois and is depicted on Figure 1-1. The site is currently a vacant, at-grade paved parking lot; however, the site is not presently being used for parking. Teachers' Retirement System of the State of Illinois ("TRS") previously made a mortgage loan secured by the site. After such mortgage went into default, TRS acquired the site by deeds in lieu of foreclosure.

The site has historically been used for several different purposes, including buildings used to support supply and wholesale distributors; shipping and receiving operations; an experimental lab, a machine shop, printing and lithography operations and a waxed paper manufacturer. Velsicol Chemical Corporation (Velsicol) used all of the site buildings constructed by the previous occupants as their corporate headquarters and as research and development laboratories for herbicides, insecticides and plant growth regulators from as early as 1917. Foundations and basements from these buildings are expected to be found on the property during the excavation and removal action process.

The site is across the street (north of East Grand Avenue) from the site at 316 East Illinois, Chicago, Illinois which is owned by River East, LLC, and on which radiologically impacted soils were previously detected by the U. S. Environmental Protection Agency ("USEPA"). USEPA determined that the radiologically impacted soil at the 316 East Illinois Street site was associated with the former operations of Lindsay Light Company at 316 East Illinois Street and 161 East Grand Avenue. On June 6, 1996, USEPA issued a unilateral administrative order ("UAO") pursuant to Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") to the Chicago Dock and Canal Trust (now known as River East LLC) and to Kerr-McGee Chemical Company (the corporate successor of Lindsay Light Company and now known as Kerr-McGee Chemical, LLC) requiring River East and Kerr-McGee to perform a removal action with respect to the radiologically impacted soil on the 316 East Illinois Street site (which USEPA designated "Lindsay Light II") and on any areas off the Lindsay Light II site on which such radiologically impacted soils were found. Subsequently, radiological impacts were discovered

at the site which was owned by Grand Pier Center, LLC immediately to the west of (and across Columbus Drive from) Lindsay Light II and which was designated by USEPA as "Lindsay Light II/RV3 North Columbus Drive". USEPA determined that the radiological impacts at Lindsay Light II/RV3 North Columbus Drive were associated with the former operations of Lindsay Light Company.

On March 29, 2000, USEPA amended the UAO to require Kerr-McGee, River East and Grand Pier to perform removal action at Lindsay LightII/RV3 North Columbus Drive.

TRS has previously entered into a contract to sell the subject site to a third party purchaser which engaged environmental consultants to perform environmental investigations of the site. B. Koh & Associates, Inc. ("Koh") performed a radiological investigation of the site including surface gamma radiation readings, down-hole radiation readings and soil sampling and analysis. Koh's report dated May 2000 documented its findings of elevated gamma radiation and radiological concentrations at the site. TRS reported the findings in the Koh report to USEPA. On March 1, 2001, USEPA issued an Action Memorandum Amendment setting forth determinations by USEPA that, among other things, (1) the radiological impacts at the site are associated with the former operations of Lindsay Light Company and (2) the UAO requires Kerr-McGee to proceed with a removal action with respect to the radiological impacts at the site. TRS has made demand on Kerr-McGee to perform all removal actions required at the site, but Kerr-McGee has not agreed to perform all such removal actions. In order to provide for the performance of the removal actions, TRS and Kerr-McGee have agreed that (A) TRS will perform excavation, screening and sampling at the site as described in this Work Plan, (B) Kerr-McGee will transport and dispose of the radiologically impacted soils removed from the site, and (C) each of TRS and Kerr-McGee reserve their rights to, among other things, recover their costs with respect to their respective work activities which they will perform with respect to the site.

TRS has also determined that a portion of the site in the vicinity of the building formerly located on the site at 330 East Grand Avenue has been impacted by pesticides. TRS has obtained a report from STS entitled Pesticide Investigation dated February 12, 2002 (the Pesticide Investigation Report) which sets forth the results of the investigation for pesticides in such portion of the site (referred to as the "Pesticide Impact Area"). A copy of the Pesticide Investigation Report is attached to this Work Plan as Attachment 4.

This Work Plan:

(a) describes the survey methods which are proposed for identifying the radiologically impacted materials

(b) proposes excavation procedures for eliminating the radiologically-impacted soils from the site

(c) proposes excavation and sampling procedures for removing certain pesticide-impacted soils from the Pesticide Impact Area.

(d) details the radiological screening methodology

(e) describes the air monitoring and health and safety plan

(f) outlines closure documentation and material disposal.

It is the intent of this Work Plan that the work activities described will be consistent with the National Contingency Plan at 40 CFR Part 300 and that such work activities constitute a time critical removal action under 40 CFR Section 300.415. TRS requests that USEPA confirm that the work provided in this Work Plan constitutes a time-critical removal action consistent with the NCP.

It is the intention of this Work Plan, upon approval by USEPA, to perform the site survey, identify radiologically impacted soil and materials, remove all radiologically impacted soil and materials above the proposed cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228), and remove all soils and fill material with pesticide concentrations in excess of the TACO Tier 1 residential standards for inhalation and ingestion as set forth in 35 Ill. Admin. Code Part 742, Appendix B, Table A from the Pesticide Impact Area. Upon completion of all required excavation and removal of all identified radiologically impacted materials above the proposed cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) and of all pesticide-impacted materials above the TACO Tier 1 residential standards for inhalation and ingestion, TRS will request a closure document from USEPA to the effect that (i) all such work has been completed in accordance with this Work Plan, (ii) no further radiological investigation or removal action is required at this site, (iii) there is no evidence of any radiologically impacted material remaining at the site, and (iv) construction and development work on the site may proceed without further regulatory requirements relating to radiological impacts.

2.0 MANAGEMENT STRATEGY AND KEY PERSONNEL

This section of the work plan describes the management structure that TRS and its consultants will use to accomplish the excavation and removal activities.

2.1 Project Overview

There are three phases of work which comprise this Work Plan. These consist of the Investigation and Delineation Phase, the Initial Contaminant Removal Phase, and the Site-wide Excavation, Monitoring and Removal Phase. The Investigation and Delineation Phase was begun with the survey and sampling work previously completed by Koh and Associates, as reported in their May 2000 report. This phase will continue with the site surveys to be conducted as the asphalt pavement is removed. The Initial Contaminant Removal Phase will consist of the removal of the radiologically impacted zones identified in Phase 1, as well as the removal of pesticide-impacted soils in the pesticide impact area. Finally, the Site-wide Excavation, Monitoring and Removal Phase will involve the surveying of all fill soils on site, and the segregation and removal for disposal of all radiologically impacted soils encountered in excess of the radiological cleanup standard of 7.1 pCi/g total radium. A more complete description of these activities is presented in Section 3.0, Methodology.

2.2 Project Execution

Project execution consists of the three phases described above in Section 2.1, Project Overview. The following activities will be required by TRS to enable the project to begin.

- Finalize a contract with Kerr-McGee regarding its role to transport and dispose of the excavated materials, or obtain necessary authorizations to move excavated materials to EnviroCare of Utah, Inc. for permanent disposal.

- Enter into a contract with a qualified contractor for the excavation services. Arrange appropriate logistical support services such as fencing and site security, office and equipment trailers.

- Notify and obtain appropriate permits for the implementation. This includes City of Chicago, USEPA and State of Utah authorities.

The following activities must be accomplished to complete the project:

- All identified radiologically impacted material above the proposed cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) has been removed from the site.

- All identified pesticide-impacted soils above the cleanup threshold of Illinois EPA Site Remediation Program TACO Tier 1 residential standards for ingestion and inhalation have been removed from the Pesticide Impact Area.

- TRS has received USEPA verification sign-off that all radiologically impacted materials above such cleanup threshold have been removed from the site.

- Equipment and personnel have been demobilized from the site.

- TRS has submitted the required documentation to USEPA for closure of the site.

- USEPA has responded acknowledging the sufficiency of the removal and documentation, in accordance with the UAO and Amendments.

2.3 Project Management Structure

The management structure under which the project will be accomplished is illustrated in Figure 2-1 of this Work Plan. The Project Team consists of USEPA and its support organizations, TRS and its consultants, the construction teams comprised of TRS' consultants, contractors and subcontractors, and Kerr-McGee and its contractors involved in the transportation and disposal tasks. The TRS Project Team consists of the following members:

- TRS Project Manager, Mr. Tom Pabian
- STS Project Coordinator, Mr. Richard Berggreen
- Quality Assurance Manager, Mr. Ron Palmieri
- STS Project Manager, Mr. John Esser
- STS Field Team Leader, Mr. Dumas Guerrier
- Health and Safety Officer, Mr. Keith Carlson
- Kerr-McGee, Mr. Mark Krippel
- Health Physicist Supervisor, Mr. Glen Huber

The duties and responsibilities of these positions and organizations are summarized below.

USEPA will be represented by its On-Scene Coordinators (OSCs), whom we understand will be Mr. Fred Micke and Ms. Verneta Simon. Mr. Larry Jensen, Radiation Health Physicist and other support staff will assist the OSCs. Argonne National Laboratory will provide laboratory subcontract services for radiological analysis of samples from this project.

TRS will be represented by its project manager who will be responsible for communications between TRS and the project team. The TRS project manager will review project documents, plans, and progress reports to confirm the plans and implementation are consistent with TRS objectives.

The Project Team Project Coordinator will have overall responsibility for coordination of project communications and resources. These responsibilities include communications between the project team and USEPA, and among the various members of the project team, including Kerr-McGee, the Health Physics subcontractor, the excavation contractors, and other subcontractors on the project. The position description is included in the QAPP.

The STS Project Manager will be responsible for day-to-day implementation of this Work Plan. This will include coordination of schedules with the contractors and subcontractors, planning and scheduling activities with the USEPA to provide for verification of remediated locations, and documentation of activities as provided for in this Work Plan.

The Field Team Leader is responsible for coordinating the field activities, in particular coordinating the excavation and health physics technician subcontractors. The Field Team Leader will be responsible for day-to-day communications with the USEPA's OSCs whenever the OSCs are on site.

The Project Quality Assurance Manager will provide guidance on quality assurance/quality control (QA/QC) issues. This includes but is not limited to guidance regarding sampling, data validation and chain of custody procedures. The Quality Assurance Manager will provide the Project Coordinator copies of reports pertaining to QA/QC.

The Quality Assurance Manager functions independently from the personnel directly responsible for accomplishing the excavation and removal. He/she reports to the Project Coordinator and the TRS Project Manager and has access to higher levels of management with whom he/she can consult to resolve quality related project issues.

Kerr-McGee will be responsible for transportation and disposal of the radiologically impacted materials excavated and removed from the site. That responsibility includes health physics personnel to survey the transport containers, subcontractor transportation and logistics personnel, and documentation for shipping and disposal. The disposal is proposed to be under an existing contract with EnviroCare of Utah, Inc. In the event Kerr-McGee is unable to fulfill this role, a logistics subcontractor will be available to complete this work. The anticipated scope of this work is presented in Appendix 1 of this Work Plan.

2.4 Delineation and Design

Delineation of the radiologically impacted materials was initiated through an investigation completed by B. Koh and Associates, Inc. as documented in its report dated May 2000, "Summary of Radiological Survey, Time-Life Property, Chicago, Illinois". The delineation will be further developed in the initial stages of removal as the pavement is removed from the site and the ground is surveyed. This is described below in Section 3.1.3, Site Survey and Section 3.1.5, Excavation Work.

The removal work scope will require sloping of the excavation side slopes up to the property line. The wedge of material remaining unexcavated on-site will be sloped as steeply as can be safely accomplished without endangering the adjacent right-of-way, likely on the order of 1 V:1.5 H. Prior to excavation, this wedge of material was surveyed for elevated gamma radiation utilizing a series of borings on a 2-meter square grid as described in the letter report dated February 6, 2002 prepared by STS entitled "Perimeter Drilling Results", 341 East Ohio Street, Chicago, Illinois – STS Project No. 1-25585-XG, Correspondence No. 041" (the "Perimeter Drilling Report") which was submitted to USEPA on February 8, 2002. Any radiologically impacted material in excess of the radiological cleanup standard of 7.1 pCi/g total radium as identified in the Perimeter Drilling Report will be removed to the property line during the excavation phase of the project. In addition, following completion of the excavation, the surface of the sloping wedge of material remaining in place will also be surveyed.

The slope design will be submitted for review and will conform to the requirements of the appropriate public agency or governmental oversight unit.

The delineation of the pesticide-impacted soils to be removed was initiated in the GaiaTech Phase II Soil and Groundwater Investigation, May 11, 2000 ("GaiaTech"). The delineation was further developed through the Pesticide Investigation Report attached as Attachment 4 to this Work Plan. The delineation

will be further refined in the initial stages of the excavation following the removal of the known radiologically-impacted soils in the Pesticide Impact Area.

2.5 Construction

Excavation and removal activities will be completed in accordance with the terms of the UAO, the specifications of the Construction Quality Assurance Plan (CQA Plan) and this Work Plan. The CQA Plan is Attachment 1 to this Work Plan.

Excavation will be scheduled so that activities will proceed expeditiously. Activities will normally be scheduled during daylight hours, Monday through Friday. Exceptions to this may be made where, for example, the Field Team Leader determines that extended work hours will allow a work item to be completed or secured before a weekend or before inclement weather. It is proposed to the extent possible to transport containers at night to avoid traffic congestion. The USEPA will be advised as soon as practical before working during extended hours.

2.6 Maintenance

Following completion of the removal, it is proposed to continue the site security, i.e., fencing the entire perimeter and maintain the site as at the completion of the removal and replacement of the clean excavated spoil. Environmental Remediation Caution signs will be removed from the site perimeter upon receipt of notice from USEPA that all radiologically impacted material has been removed from the site. Any additional work beyond the completion of the removal and replacement of the clean spoil will be in accordance with the construction permit specifications from the City of Chicago.

2.7 Monitoring

Air monitoring will be conducted at two levels. Site perimeter monitoring will be conducted at the four sides of the site (north, south, east, and west). This air monitoring is for the purpose of documenting, and if detected, initiating measures to control off-site airborne contamination. Air monitoring will be conducted in accordance with the Air Monitoring Procedure, SOP 212.

Personal air monitoring will be required for workers in an exclusion zone. Procedures for personal air monitoring are presented in the Health and Safety Plan included in Attachment 3.

2.8 Reporting

Monthly progress reports will be submitted to USEPA beginning 30 days after USEPA's approval of this Work Plan, and will be submitted monthly by the 15th of each month until termination of the UAO as applicable to this site, unless otherwise directed by the OSC. These monthly reports will describe all significant developments during the preceding period, including the work performed, and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period, including a schedule of work to be performed, anticipated problems, and planned resolutions.

A closure report will be prepared upon completion of the removal of all identified impacted material from the site, and acknowledgement from USEPA that the removal work is complete and the closure report is due. The closure documentation report will provide a summary of the locations remediated, the volumes of all materials removed and their disposal locations, resources allocated and costs for the removal, analytical results, field data documenting the clean closure, and a certification in accordance with the requirements of the UAO. This closure documentation report will be provided within 60 days of the completion of the removal of all identified radiologically-impacted soil.

2.9 Existing Data

The following reports of previous environmental investigations were provided by TRS for the preparation of this Work Plan.

- Letter dated August 22, 1990 from OHM Corporation to GMO Limited Partnership
- Environmental Site Assessment dated August 28, 1990 prepared by Professional Service Industries, Inc.
- Visual Site Inspection dated December 30, 1993 prepared by USEPA, Region V, with attached Preliminary Assessment/Visual Site Inspection Report dated December 16, 1993 prepared by PRC Environmental Management, Inc.
- Preliminary Environmental Review dated March 8, 2000, prepared by GaiaTech, Inc.

- A Phase II Soil and Groundwater Investigation Report Time-Life Property, Grand Avenue and McClurg Court, Chicago, Illinois, dated May 11, 2000, prepared by GaiaTech, Inc.

- Summary of Radiological Survey Time-Life Property, Chicago, Illinois, dated May 2000, prepared by B. Koh & Associates, Inc.

- Scanner Van Survey of the Chicago, Illinois Streeterville Area dated July 12, 2000 prepared by USEPA Radiation and Indoor Environments National Laboratory.

3.0 METHODOLOGY

3.1 Description of Work Activities

3.1.1 Site Preparation

The site is currently a vacant, out of service, paved parking lot. There are no structures on the property. A traffic guardrail surrounds most of the site and will require removal. The existing light poles on the site will also require removal. Storm drains are present on-site and will require removal as work proceeds. They will likely be removed as part of excavation rather than in the utility abandonment task. Structures/foundations from Velsicol should be expected. Prior to beginning the removal of the pavement, no other demolition activities are anticipated as part of site preparation.

A 5 meter by 5 meter site grid will be established for the site. Grid lines will be alphabetic from north to south, and numeric from west to east. Site locations will be referenced to this alpha-numeric grid during the remediation and closure documentation.

Other site preparation efforts such as fencing, utility closure, logistical support facilities, and pavement removal in preparation for surveys and removal efforts are discussed below.

3.1.2 Permits

All necessary permits and sign-offs will be secured for the implementation of the site excavation, survey, and remediation work. Permit applications will reflect the exemption available for work on CERCLA-directed project sites. Permits and sign-offs for work at this site may include but are not limited to the following:

- excavation permit;
- Board of Underground review;
- street closure/sidewalk closure permit;
- consultation with the Sewer Department;
- meetings with utilities; and
- consultation with the City of Chicago Department of Environment.

Details of the permit process, the necessary permits, permitting agencies, and utility protection are provided in the Permitting and Access Requirements Plan, Appendix 2.

3.1.3 Site Survey

Prior to any work at the site including demolition or removal of any pavement or features at the site, the following will be documented by the Field Team Leader, his designee, or a licensed surveyor.

- The site grid at 5 meter spacing will be established.
- The site boundaries will be located and marked.
- The location of all surface features such as the guard rail, storm drain catch basins, utility vaults, light standards, etc.
- A photographic record of the site will be made and retained in the project files.

The beginning of the removal work task will be to begin removal of the asphalt pavement cover in stages. Once the asphalt paving is removed from each area of the site, as shown in Figure 3-1, 100% of the soil surface in each such area will be surveyed for elevated gamma readings. This survey work will be part of the Investigation and Delineation Phase that was begun with the Koh investigation as documented in its report dated May 2000. The survey will cover the exposed soil on survey lines spaced 5 meters. Gamma count values shall be taken at intervals spaced 5 meters (5 x 5 meter grid). The site grid will be marked by stakes and flagging at the edges of the property and by paint on the ground surface on the interior of the site. The areas between the grid points will be scanned following Documents SOP 210 so as to cover the intra-grid areas.

3.1.4 Utilities

For this project, "utilities" include natural gas, water, sewer, communication, cable television lines, and electrical power distribution systems. Prior to the physical site survey, city and utility company records concerning location and construction of utilities on and in the general vicinity will be reviewed and consolidated on a single Utility Plan Drawing. This drawing will be based on City of Chicago maps. The appropriate utility companies or their designees will be asked to verify the location by originating a

request through the Chicago Utility Alert Network (DIGGER) phone number: 312-744-7000, and through application to the Chicago Board of Underground.

During the physical site survey, the locations of the identified utilities will be "ground-truthed" by observing the locations of power and phone poles, above-ground transformers (where electrical distribution lines are below ground), manholes, water meters, natural gas meters, phone boxes, surface indications such as utility vaults, catch basins, and surface depressions which can occur over utility trenches, and the locations marked by the utility companies or their representatives.

The locations of these utility indicators will be plotted on the Utility Plan Drawing, and compared with indicated locations. Discrepancies of more than 1 meter (about 3 feet) will be noted. Procedures for working in the vicinity of utilities and repair to damaged utilities will be discussed with the excavation contractor crews. All work on and in the vicinity of utilities will be in accordance with City and utility company specifications.

3.1.5 Excavation Work

Excavation will proceed in two phases, the initial contaminant removal phase and the site-wide excavation, monitoring, and removal phase, with the first phase being completed before beginning the second phase. The initial removal will be of the radiologically-impacted soils identified through the site walk-over gamma survey following removal of the asphalt cover. Those soils will be removed to apparently clean limits, at or below 7.1 pCi/g total radium. Excavation will utilize an excavator with a maximum 1 cubic yard (C.Y.) bucket. This bucket size will facilitate loading the transport containers without spilling and spreading the contamination. The excavations will be designated exclusion zones for purposes of health and safety requirements.

The removal of pesticide-contaminated soils from the Pesticide Impact Area will be coordinated with the removal of the radiologically-impacted soil. The radiologically-impacted soil in the Pesticide Impact Area will be removed to clean limits below 7.1 pCi/g. Some of the radiologically-impacted soils in the Pesticide Impact Area are known to have pesticide concentrations, and any such radiologically-impacted soils (including those containing pesticides) will be excavated and placed in boxes for transport and delivery to EnviroCare in Utah. The limits of the pesticide-impacted soils in the Pesticide Impact Area will be laid out on the basis of the previously completed borings. The pesticide-impacted soils in the Pesticide Impact Area will be marginally over-excavated in order to leave soils that are clean to the pesticide limits listed in TACO Tier 1 residential standards for ingestion or inhalation (whichever is lower) in 35 Ill. Admin. Code

Part 742, Appendix B, Table A for the following pesticides identified on-site: chlordane, aldrin, alpha-BHC, lindane, dieldrin, heptachlor, and heptachlor epoxide.

As the pesticide excavations are made, the soil will be screened for radioactivity in 18-inch lifts. Upon completion of the removal of all apparent pesticide-impacted soils in the Pesticide Impact Area, the limits of the excavations will be sampled and tested using the immunoassay field tests (Envirogard Soil Test Kit and Sample Extraction Kit protocols are included in the QAPP as SOP 500). The sampling frequency will take place every 100 square meters. The immunoassay tests will be run using a 3x dilution to match the TACO Tier 1 residential standard for inhalation and ingestion. Cleanup to this standard will allow for unrestricted development of the site.

Additionally, soil will be removed as needed from the Pesticide Impact Area to achieve compliance with the stipulated pesticide cleanup objectives. All pesticide-impacted soils which are not radiologically-impacted over the radiological cleanup standard will be disposed of at a landfill permitted to accept such soils. Pesticide-impacted soils will not be stockpiled on site but will be loaded into trucks for transport and off-site disposal on the day of excavation. Any soils temporarily stockpiled during the day prior to transport will be stockpiled in the interior of the site, avoiding the site margins.

Laboratory analysis will be provided to confirm the total concentrations of pesticides to document compliance with the pesticide cleanup levels once the apparent clean closure of the pesticide removal is demonstrated by field testing. Following receipt of the laboratory results indicating removal of all pesticide-impacted soil in the Pesticide Impact Area in excess of the stipulated cleanup objectives, the pesticide cleanup work in the Pesticide Impact Area will be considered completed and the excavation and screening for radiologically-impacted soil will continue.

The second phase of excavation will be to excavate and radiologically screen all of the fill soil within the site perimeter (except in the perimeter areas which have previously been radiologically cleared through soil borings as described in the Perimeter Drilling Report), and any of the underlying native soils which exhibit levels of radioactivity requiring removal and off-site management. This second phase will involve staging of non-radiologically impacted soil for use as backfill as the excavation progresses. Radiologically-impacted soil will be loaded into Supersacks and temporarily stored on-site until sufficient material is accumulated to warrant bringing a transport container to the site. Arrangements for the use of "Baker Boxes" will be made before construction starts; site mobilization will include provisions for the staging of these boxes as soon as they are needed. Staged material in Supersacks will be maintained in a secure location, on pavement or a membrane and covered to protect from wind and precipitation.

At present it is anticipated that the excavation will progress from the west end toward the east. This progression is anticipated based on the fact that it appears from current information that there is a larger area of impacted soil at the west end of the site. Therefore, this area may already have significant areas excavated and disrupted as a result of the first phase excavation. Excavating and screening the remaining portion of the west end of the site will allow this area to be released, regraded, and used as the temporary staging areas for non-radiologically impacted overburden and fill from the remainder of the project. Phase 2 material which is below the 7.1 pCi/g cleanup criteria and is used as backfill on-site will be spread, compacted and graded to provide a stable driving surface for staging soil and loading containers. Fill material will not be imported to bring the site back to its original grade.

Excavation will be limited to not more than 18 inches per lift followed by a survey for elevated gamma readings. This restriction is due to the shielding provided by soil which could preclude detecting impacted soil beneath a soil cover of 18 inches or more.

Excavation will proceed through all fill soils within the subject site except in the perimeter areas which have previously been radiologically cleared through soil borings as described in the Perimeter Drilling Report. The fill soils are underlain by natural soils consisting of medium to coarse sand and fine gravel. This natural soil will be screened to confirm no radiological impacts and will be subject to verification surveys and sampling by USEPA, in accordance with Section 3.1.7 of this Work Plan. Where floor slabs are present at the base of the fill, the slab will be broken and removed and the soil beneath the slab screened for verification and closure by USEPA. Concrete slabs, footings or walls encountered during the excavation will be cleaned of adhering contamination and after release as non-contaminated, will either be removed from the site or stockpiled on-site for subsequent management in connection with site development work. It is not proposed to bury these oversize pieces in the backfill.

In the deepest parts of the excavation, depths of 15 feet or more may be reached. These depths may encounter groundwater at a depth of 13 to 14 feet, based on previous borings. The potential for having to manage groundwater will be addressed through permitting from the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). Notice to and discharge permits from the MWRDGC and Chicago Department of Sewers will be provided prior to discharge of any water off site. It may be possible to manage the water on-site without the need to discharge to the city sewer system. Available information indicates that only a small part of the site, near the northeast corner, will have an excavation as deep as 15 to 16 feet. It may be possible to lower the water through excavated sumps, and pump the water to the west end of the site and use it as dust control, or simply let it infiltrate through the site fill soil.

3.1.6 Materials Management

Actions to manage removed material include all actions taken from the time the material is excavated until it reaches its final destination. Materials that are removed from the property may be replaced in their original locations, placed in another location on the property, salvaged, or sent to a local landfill if the materials meet the radiological clean-up criteria of 7.1 pCi/g total radium. Materials that do not meet the cleanup criteria will be sent to an approved disposal facility. At present, it is anticipated the radiologically-impacted material will be sent to EnviroCare of Utah, located in Clive, Utah. It is anticipated that all pesticide-impacted non-radiological materials will be disposed of at Waste Management CID landfill in Calumet City, Illinois.

Any trash and debris which TRS elects to remove from the site and which are not radiologically-impacted or pesticide-impacted will typically be placed into clean roll-off containers provided and collected by licensed trash removal and disposal companies. Radiologically-impacted and pesticide-impacted materials will be transported between the Site and the approved disposal facility according to DOT regulations. Procedures which will be used with respect to radiologically-impacted and pesticide-impacted materials to minimize the potential for and effects of spills and accidents during transport of such radiologically-impacted materials include but are not limited to the following:

- Drivers will have the proper licenses, training, and certifications for transporting potentially radioactive materials.

- Trucks transporting low-level radioactive materials in excess of 7.1 pCi/g total radium will have sealed or lined containment. Covers for the roll-off containers will be placed over the load prior to exiting the contaminated area. Covers will be fastened down tightly to prevent materials from being blown out of the containers. This will minimize the escape of materials should an accident occur. Empty containers returning to the site will also have covers. Trucks will carry all necessary papers and placarding. Containers will be inspected prior to loading to determine suitability.

- Trucks transporting pesticide-impacted soil will have covers. Covers for the trucks will be placed over the load prior to exiting the site. Covers will be fastened down tightly to prevent materials from being blown out of the trucks. Trucks will carry all necessary papers and placarding.

- Contaminated vehicles and equipment will be decontaminated first using broom cleaning to remove all adhering surface dirt. As needed, pressurized water spray will be used for further decontamination. Water generated during decontamination will be contained and evaporated or used for dust control, or possibly for disposal at an approved disposal facility.

- Prior to transporting excavated soils or other materials, all transport equipment will be frisked. Frisking will include tires and fenders and the sides and back of the bed. Frisking the cabs of trucks will not be necessary unless loading has been over the front of the truck.

- Travel between the property and the rail terminal will be only on specified routes selected to minimize the potential for and the effects of any accidents. Criteria used to select routes and Traffic Control procedures are described in Section 3.2 and Appendix 3 of this Work Plan.

- An Emergency Contingency Plan (Appendix 4) has been prepared for this project. This plan includes procedures to be implemented in the case of an accident. All truck drivers will be trained in and familiar with these procedures.

Three types of material will be distinguished in the excavated material:

- Radiologically-impacted soil exceeding the clean-up threshold of 7.1 pCi/g total radium,

- Non-radiological pesticide-impacted soil exceeding the pesticide clean-up threshold of the TACO Tier 1 residential standards for ingestion or inhalation

- Excavated soil suitable for backfill which is neither radiologically impacted in excess of 7.1 pCi/g total radium nor impacted by pesticides in excess of the TACO Tier 1 residential levels for inhalation and ingestion as specified in 35 Ill. Admin. Code Part 742, Appendix B, Table A.

There may be materials that will be specified by the owner as unsuitable for backfill, based on engineering properties, non-radiologic impacts, or other specifications. For this Work Plan, a distinction is proposed for radiologically-impacted materials and pesticide-impacted materials. Any disposal of non-radiologically impacted materials at any off-site location will comply with all applicable laws and regulations.

Soils which, based on visual or olfactory observations, are suspected to be grossly impacted by non-radiological contamination, will be temporarily staged at an interior location on-site to allow for sampling and characterization to provide for disposal permitting. These soils will be placed on liners and will be covered to minimize potential for erosion and spread of the material. To the extent possible the materials will be staged on pavement to minimize potential to impact underlying soils. The proposed staging area is shown on Figure 3-1.

Radiologically-impacted soil and pesticide-impacted soil excavated in Phase 1 will be loaded directly into containers. In Phase 2, it is anticipated the excavated quantities of material exceeding the radiological cleanup standard at individual locations will not fill a container. Where that is found to be the case, soil exceeding the radiological cleanup level will be temporarily stored in Supersacks until enough has accumulated to warrant delivery of a container. Where locations are encountered during Phase 2 where significant quantities of radiological material require removal, direct loading of containers will be resumed.

3.1.7 Verification Sampling

Soil exhibiting contamination above the clean-up threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) will be removed, placed in transport boxes as specified in the S&P documents, and shipped to Envirocare of Utah.

In order to demonstrate that the floors and sides of soil excavations meet cleanup criteria described in the UAO, a verification/field sampling program must be implemented following the excavation of the radiologically-impacted materials. The verification survey and sampling program will be conducted in general accordance with SOP-223.

Initial field demonstration that the location has been excavated to clean limits will be made with a 2 x 2 NaI detector which has been calibrated against the calibration blocks at the Kerr-McGee West Chicago facility. Pre-verification samples will then be collected and analyzed at an on-site laboratory using NUTRANL software and gamma spec analyses. Excavated locations will be screened in accordance with SOP-210.

Upon completion of the removal of all apparent pesticide-impacted soils from the Pesticide Impact Area, the limits of the excavations will be sampled and tested using the immunoassay field test methodology described in SOP 500. Samples will be taken every 100 square meters. The immunoassay tests will be run using a 3x dilution to match the TACO Tier 1 residential standard for inhalation or ingestion,

whichever is lower. Laboratory analysis will be provided to confirm the total concentrations of pesticides to document the cleanup levels once the apparent clean closure of the pesticide removal is demonstrated by field testing.

Detailed descriptions of the radiological verification sampling, analyses, and comparisons which will be done for this sampling are provided in Appendix 5 of this Work Plan. The excavations will not be backfilled until a signed radiological verification closure form is received from USEPA.

3.1.8 Description of Crews and Production Schedules

Construction activities have been identified in the previous sections of this Work Plan. These activities include surveying, radiological surveying and removal, pesticide removal, general excavation, and transportation. Personnel required to complete each of these activities have been grouped into crews, and the crews are described below. Subcontractors may be used for some work, such as fencing, concrete and paving work.

Personnel in addition to those described above will be necessary for this work. These personnel include health and safety personnel, quality inspectors, supervisors, and other management personnel. These personnel are described in the QAPP.

3.1.9 Survey Crew

A physical survey of the site has been previously been developed by a licensed land surveyor, including utilities, structures, property limits on both the site and the adjacent rights-of-way. Additionally, the Field Team Leader will locate and mark with signs, flagging, stakes, etc. the site 5 meter grids along the margins of the site.

3.1.10 Radiological and Pesticide Survey Crews

The radiological survey crew will be responsible for the initial site survey, surveys as the soil is excavated, surveys prior to the USEPA verification surveys and the surveys of equipment prior to leaving the site. The pesticide survey crew will delineate the Pesticide Impact Area, based on previous borings and monitor the removal to these limits. This crew will conduct the immunoassay field tests to assess whether the excavation has reached clean limits. This crew will take the verification samples for laboratory confirmation. These radiological and pesticide survey crews will typically be comprised of two persons,

and are required to have a minimum of two persons when working in exclusion zones, in accordance with the Health and Safety Plan.

3.1.11 General Excavation Crew

The general excavation crew will consist of the contractor's excavation personnel, and is anticipated to include as a minimum, the excavator operator, a laborer, and a truck driver. As excavation proceeds, additional operators, laborers and drivers may be added. As grading of non-radiologically impacted soil proceeds following the removal of the impacted soil, additional personnel will be present on site for that grading work. The size of the crew will depend on the size of the work area and the complexity of the work.

3.1.12 Production and Schedules

Work is proposed to be conducted during the 2002 construction season, and be completed before August 2002. An anticipated construction schedule is included as Figure 3-2.

The following presents the anticipated schedule and sequencing of the excavation and removal project. Note that certain tasks are required prior to the start of the removal effort, but are not detailed in this schedule and sequencing section. These include but may not be limited to the driveway permitting required prior to proceeding, and the logistical support such as site security, mobilization of office trailers, transportation containers, excavating equipment, and training of the contractor and subcontractor personnel.

- The perimeter and site interior guardrail will be removed. Guard rail posts and footings from below ground will be surveyed for radiological impacts. The perimeter fence has been installed and site grid has been established and marked.

- The utilities will be located and as necessary, cut-off and abandoned.

- The existing light poles on the site will be disconnected and removed.

- The asphalt stripping will begin. It is proposed to strip initially only the southwest portion of the site, retaining pavement along the north and east sides of the site. After the removal of radiologically-impacted materials from the southwest portion of the site and removal of pesticide-impacted soils

from the Pesticide Impact Area, and the completion of screening of surrounding soils in these portions of the site, the remaining portions of the site will be addressed for radiological materials according to the same procedures for removal and screening of radiological materials and in accordance with the sequence depicted on Figure 3-1.

- The asphalt and sub-base will be screened for radiological impacts as they are removed. The underlying soil will be surveyed as the asphalt and sub-base are removed.

- Removal of the identified radiologically-impacted soil will be performed first. In the southwest portion of the site, removal of the non-radiological pesticide-impacted soil will be performed second. The removal will proceed until all initially identified radiologically-impacted and pesticide-impacted soils have been removed.

- Preparation of the closure documentation report will begin upon removal of all identified radiologically impacted soil. This report will be submitted within 60 days of USEPA notice that all materials required to be removed pursuant to this Work Plan have been removed from the site.

3.2 Traffic Control

During the removal project, trucks carrying excavated impacted material will be traveling between the site and the rail terminal or Waste Management. Traffic from trucks carrying the radiologically-impacted soil will not be extensive, perhaps 5 to 10 with a maximum of 15 trucks a day, and may be conducted during nighttime hours when local traffic congestion is minimized. Trucks traffic carrying pesticide-impacted soil will be more extensive during the removal phase of these soils, perhaps 20 to 40 trucks a day. Trucks carrying pesticide-impacted soils will travel during the day from the site to the disposal site. Traffic controls will be implemented to minimize the potential for accidents to occur. A summary of the criteria which will be used to select the traffic routes is provided below.

- Routes will be adequate to support the loads. The selected route must be capable of supporting the loaded trucks. Routes with small light bridges and surfaces other than asphalt or concrete in good repair will be avoided wherever possible.

- Ease of travel. The route should minimize the number of stops and turns, and the streets should be sufficiently wide for two trucks to pass where other vehicles are parked on both sides of the street.

- Minimum other traffic. Major traffic routes should be avoided. The more traffic, the greater the potential for an accident to occur. Also, minor traffic routes generally have lower speed limits than major routes. Hours of hauling impacted materials to the rail terminal will be selected to avoid rush-hour traffic.

- Approval of the route. TRS or Kerr-McGee will prepare and submit proposed route maps to the City of Chicago Department of Transportation for approval of both the radiologically-impacted soil and the pesticide-impacted soil.

A detailed description of the Traffic Control Plan is provided in Appendix 2 of this Work Plan.

3.3 Site Security Plan

A detailed description of the Site Security Plan is provided in Appendix 6 of this Work Plan. This section provides a summary of the measures which will be taken to minimize the potential for accidents during the work. The work may create several potentially hazardous conditions. These conditions include but are not limited to the following:

- Open excavations
- Moving construction and excavation equipment
- Truck traffic

Only authorized persons will be permitted on-site. Authorized persons include the Project Manager, consultant personnel, contractors, subcontractors, and their representatives. USEPA personnel are authorized to be on-site subject to compliance with OSHA requirements and other reasonable safety precautions.

Visitors and other non-essential personnel may enter the work area only upon notice and authorization by the STS Project Manager or designee. This restricted access will ensure the STS Project Manager or designee can communicate to visitors appropriate safety information.

The site will be secured with a construction security fence around its entire perimeter. Gates will be provided at access points but will remain closed and locked when not in use and when there are no removal activities on-site.

Signs will be posted at a maximum of 100 foot intervals around the perimeter fence and at each access gate. The signs will read:

"UNDERGOING ENVIRONMENTAL REMOVAL ACTION

FOR FURTHER INFORMATION CONTACT

THOMAS PABIAN AT 312-573-5300

Your call will be returned during normal business hours.
Please leave your name and telephone number after the recorded message."

3.4 Health and Safety Plan

This section briefly describes the key personnel responsible for health and safety on the project, the types of hazards which might be encountered during the work to be done, the proposed training, and the personnel protective equipment (PPE) which may be worn for the potentially hazardous conditions which might be encountered.

3.4.1 Key Personnel

While health and safety will be the concern of every person on the job, two persons will have health and safety as their primary concern. These persons are the Health and Safety Officer and the Field Team Leader. The responsibilities for these positions are detailed in the Health and Safety Plan, Attachment 3 to this Work Plan.

3.4.2 Potential Hazards

Potential hazards which could be encountered during the removal activities include contaminated materials and the hazards associated with construction work. Contaminants of concern include the entire decay series for U-238 and Th-232 as well as exposure to pesticides, including chlordane, aldrin, lindane, dieldrin, heptachlor, and heptachlor epoxide. Clean-up criteria for radiologically-impacted soil are based on total radium, Ra-226 plus Ra-228. Clean-up criteria for pesticide-impacted soil are based on the TACO Tier 1 residential standards for ingestion or inhalation, whichever is lower, in 35 Ill. Admin. Code

Part 742, Appendix B, Table A. Radiologic and air monitoring as described in this Work Plan will be performed during excavation to further define the presence of radiological contaminants.

The mechanisms for exposure to these materials are direct exposure, inhalation, ingestion and eye/skin contact. The primary mechanism of exposure is direct exposure to external gamma radiation. All workers will be instructed in appropriate measures to protect against exposure to the above materials, and PPE will be worn until monitoring shows such is not necessary.

Physical hazards which might be encountered at this site include but are not limited to the following:

- Construction equipment (front-end loaders, back-hoes, trucks, compactors, bulldozers);
- Power tools (saws, drills, jack hammers, compactors);
- Heat and cold stress;
- Overhead power lines;
- Buried utilities;
- Excavations;
- Confined space;
- Noise;
- Demolition of structures; and
- Slip, trip and fall conditions, especially during wet or freezing periods.

3.4.3 Training

Site and project specific radiation and health and safety training will be provided for all on-site personnel prior to work on site. All personnel required to work in the Contamination Reduction Zone or the Exclusion Zone shall complete training conforming to the requirements of 29 CFR 1910.120(e) including

40 hours of initial hazardous waste site worker training. Where appropriate, they shall have 8 hours of annual refresher training, and 8 hours supervisors training. Field personnel shall complete radiation safety training in compliance with 32 IAC 400. This training shall include, at a minimum, 4 hours of training pertaining to radiation safety and awareness. Training will be conducted by a qualified safety specialist and/or a qualified senior health physics technician, at a minimum. The Project Training Program in included in Appendix 7. As noted in the Health and Safety Plan, Federal safety requirements take precedence over state requirements.

All site personnel will be trained and briefed on radiation basics, anticipated hazards, equipment to be worn, safety practices to be followed, contamination prevention practices, emergency procedures, radiation basics and communications. Procedures for leaving a contaminated area shall be planned and implemented prior to going on-site. Work areas and decontamination procedures will be established based on expected site conditions, and updated as necessary during construction.

In addition to this formal health and safety training, "tailgate" safety meetings will be held weekly, or more frequently, dependent on safety issues arising during the project. These meetings may be led by the worker"s foremen and every employee must sign in before beginning work for the week. The subject covered and persons present will be recorded for each meeting and kept as part of the project records. Health and safety incidents and monitoring results will be discussed in the tailgate safety meetings, when appropriate.

Visitors to the site will be briefed on the requirements of the Health and Safety Plan before being allowed within the work area, and will be accompanied by a foreman or supervisor whenever possible.

3.4.4 Personnel Protective Equipment (PPE)

Based on information from previous investigations of site conditions, it is anticipated that most excavation work can be done in Level D PPE. Level D PPE for this project consists of hard hat, steel-toed work shoes or boots, work gloves and safety glasses. Coveralls will be required for all work in exclusion zones. Prior to exiting any exclusion zones, personnel will go through decontamination, disposal of all appropriate PPE, and frisking procedures as described in the Health and Safety Plan.

3.4.5 Monitoring

A primary goal during the removal activities will be to control radioactive and pesticide particulates from the excavation, earth moving, and other activities on-site. A primary requirement of dust control is "no visible dust". Fugitive dust generation is caused by a range of activities including excavation, loading, dumping, transporting and scraping using heavy equipment such as bulldozers, front-end loaders, trucks and graders. Traffic along roadways causes resuspension of particulates.

An Air Monitoring Plan is included as Appendix 8 to this Work Plan. The principal objectives of the air monitoring activities are to:

- Ensure worker and general population safety and provide radiological control information;
- Evaluate work procedures and site control measures. In addition to identifying the need for corrective action, air monitoring also documents the effectiveness of such control actions;
- Measure releases of airborne radioactivity (should any occur) and ensure that people living and working in the surrounding area are not exposed to radiation above acceptable limits.

Air monitoring will be conducted at two levels. Site perimeter monitoring will be conducted at the four sides of the site (north, south, east, and west). This air monitoring is for the purpose of documenting, and if detected, initiating measures to control off-site airborne contamination. Air monitoring will be conducted in accordance with the Air Monitoring Procedure, SOP 212.

Personal air monitoring will be required for workers in an exclusion zone. Procedures for personal air monitoring are presented in the Health and Safety Plan included in Attachment 3.

3.5 Application of ALARA to Excavation

The clean-up criteria established is 5 pCi/g total radium (Ra-226 + Ra-228) above the background. Background for this area has been established on vicinity sites as 2.1 pCi/g, resulting in a clean-up criteria of less than or equal to 7.1 pCi/g total radium. Areas found to contain total radium in excess of the action criterion will be included in the removal activities. Averaging over areas up to 100 square meters is allowed, but only after reasonable efforts have been made to achieve as low as reasonably achievable

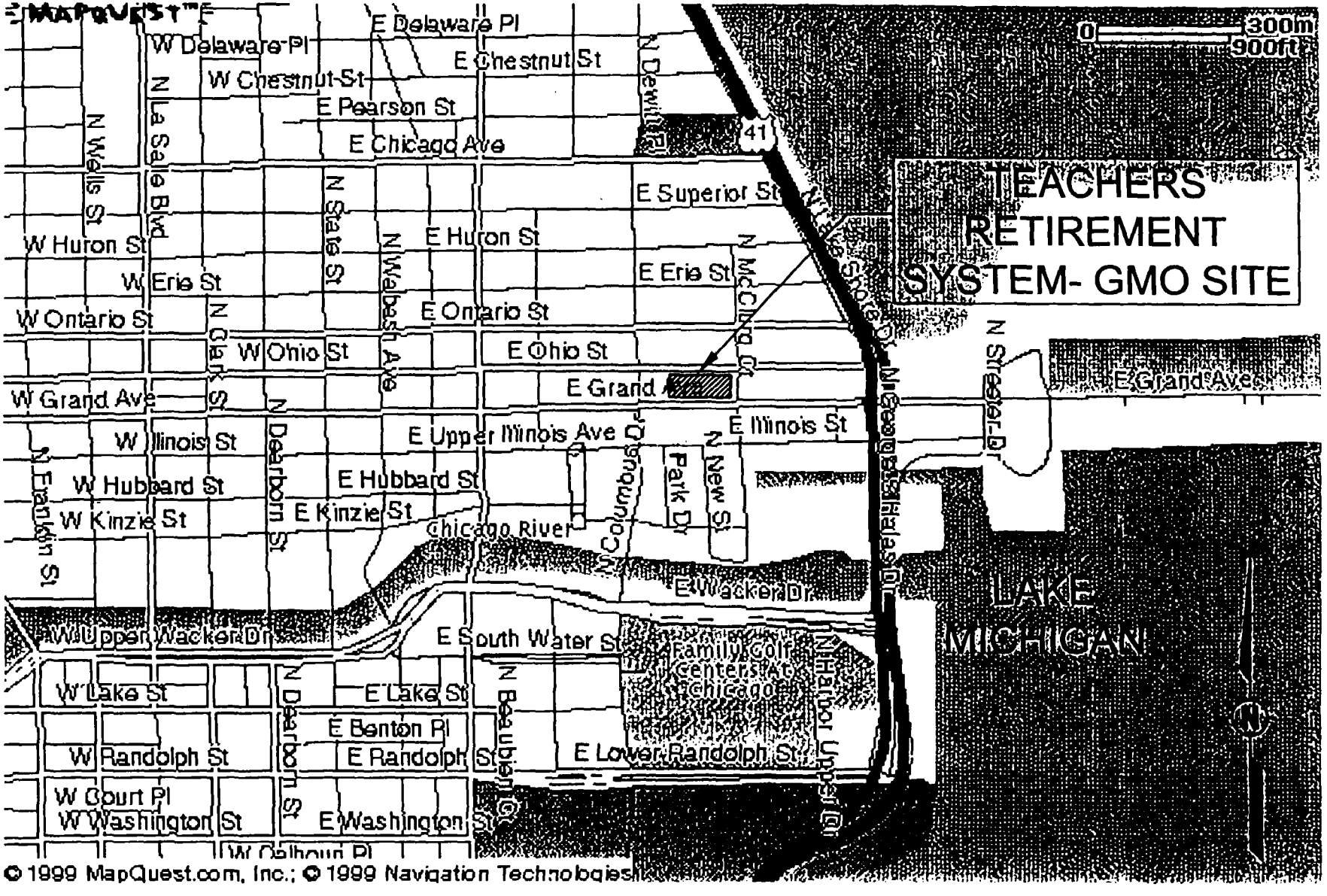
(ALARA) levels. The principle of keeping ALARA radiation doses consistent with economic and social constraints also applies to the removal activities.

ALARA and the numerical criterion will be met through a coordinated program of surveys and verification conducted by TRS. USEPA will provide oversight role in the application of ALARA to the excavation activities.

3.6 Data Management

Data management for the site, as related to excavation activities, consists of health physics data, soil radioactivity data and civil construction and excavation data (i.e., land surveys, excavation volume estimates, etc.). Given the relatively short anticipated duration of the excavation activities for this project, data can be effectively managed utilizing the paper records required by this Work Plan.

An on-site or site vicinity field laboratory will be used to analyze soil samples as excavation and removal proceeds, and for pre-verification sampling that the radiological clean-up criteria have been met. Analytical records will be kept at the site and at the Vernon Hills, Illinois offices of TRS's contractor, STS Consultants, Ltd. Air monitoring analyses will be maintained at both the site and STS's offices, and will be transmitted with the monthly project progress reports to USEPA.



Teachers Retirement System - GMO Site - Chicago, IL
Figure 1.1 - Site Location Map

PROJECT MANAGEMENT ORGANIZATION CHART

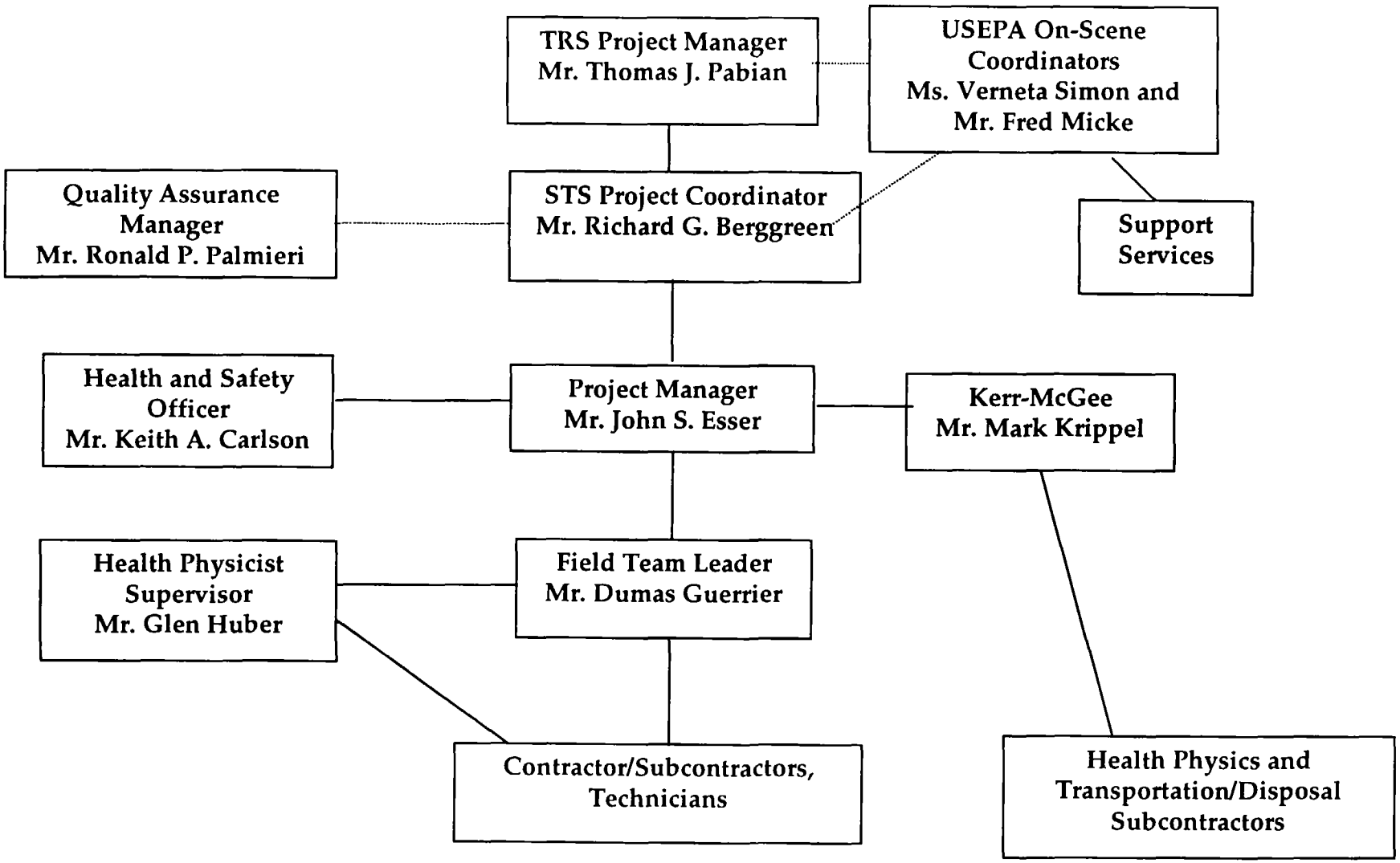
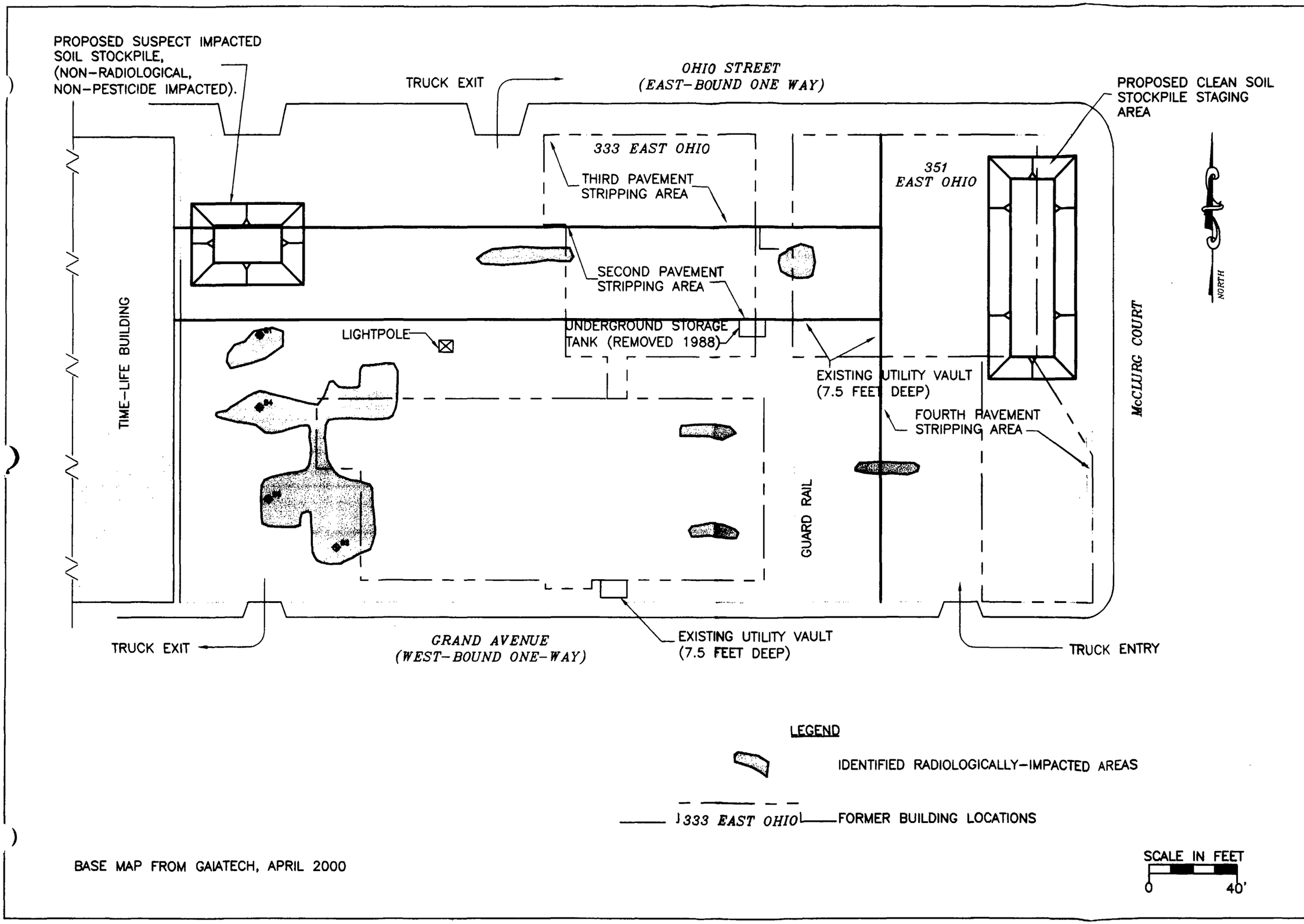


Figure 2-1



BASE MAP FROM GAIATECH, APRIL 2000

DRAWN BY PVP	DATE 11/06/01	
CHECKED BY JRA	DATE 11/06/01	
APPROVED BY RGB	DATE 11/06/01	
CADFILE X:\PROJECTS\25585XG\01-LOC-DIAG.dwg		

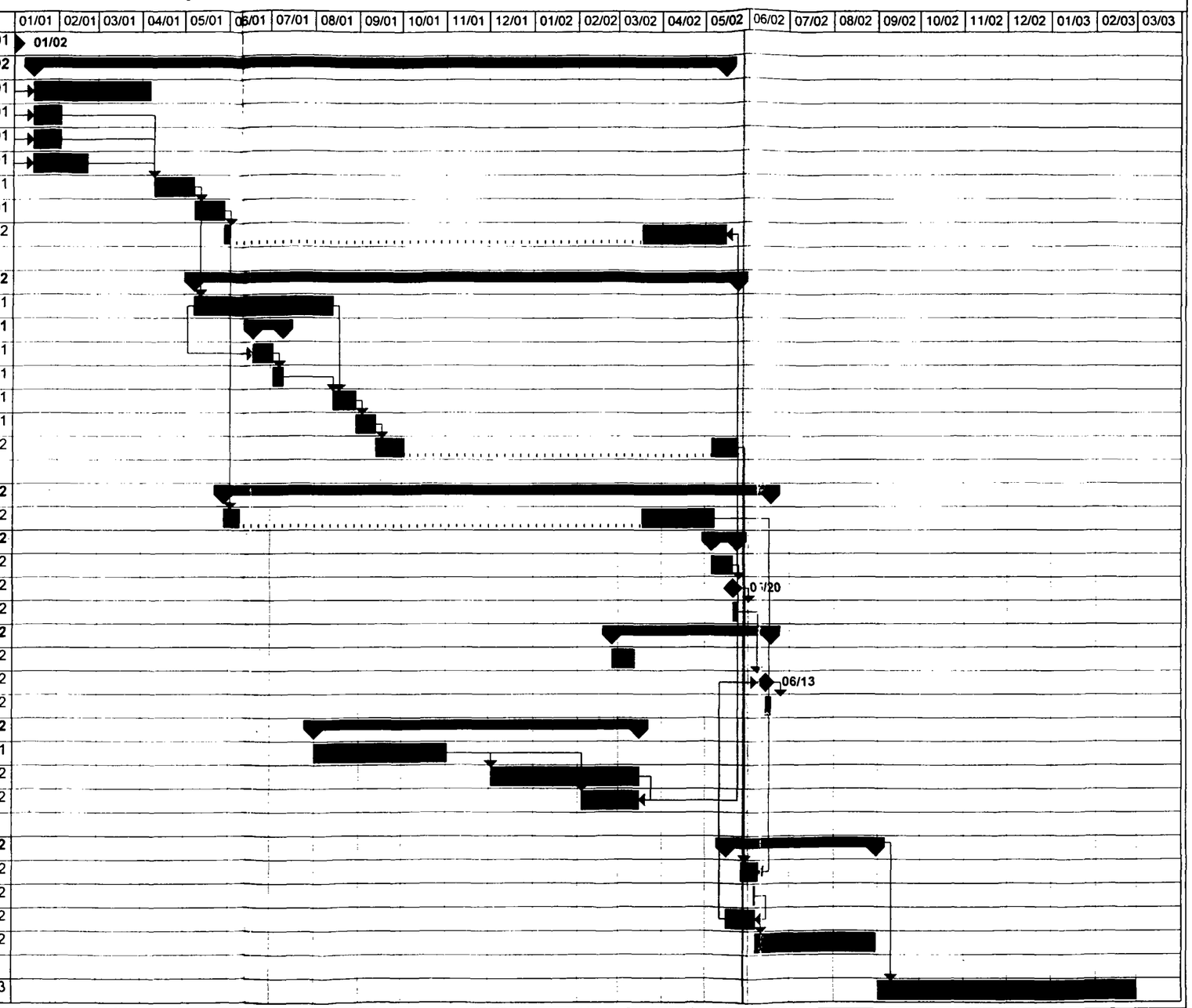
SITE PLAN
PAVEMENT STRIPPING, SOIL STAGING, ANTICIPATED TRAFFIC PATTERNS
341 E. OHIO STREET SITE
CHICAGO, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 25585-XG
STS PROJECT FILE 01-LOC-DIAG.dwg
SCALE 1"=40'±
FIGURE NO. 3-1

GMO Site - Schedule
STS Project No. 25585-XG

ID	Task Name	Duration	Start	Finish
1	Receive Project Authorization	0 days	Tue 01/02/01	Tue 01/02/01
2	**WORK PLAN DEVELOPMENT:**	**348 days**	**Mon 01/15/01**	**Wed 05/15/02**
3	Develop Work Plan	60 days	Mon 01/15/01	Fri 04/06/01
4	I.D. ROW & Onsite Utils.	15 days	Mon 01/15/01	Fri 02/02/01
5	Time-Life Substructure As-Built Condition	15 days	Mon 01/15/01	Fri 02/02/01
6	Draft Plan	28 days	Mon 01/15/01	Wed 02/21/01
7	USEPA Review/Response	20 days	Tue 04/10/01	Mon 05/07/01
8	Revise Plan & Submit Final Draft	15 days	Tue 05/08/01	Mon 05/28/01
9	Agency Approval	47 days	Tue 05/29/01	Wed 05/15/02
10				
11	**REMEDIATION BID PACKAGE:**	**274 days**	**Tue 05/08/01**	**Fri 05/24/02**
12	Develop Documents	70 days	Tue 05/08/01	Mon 08/13/01
13	**Owners Review**	**15 days**	**Tue 06/19/01**	**Mon 07/09/01**
14	Review at 50%	10 days	Tue 06/19/01	Mon 07/02/01
15	Review at 100 %	5 days	Tue 07/03/01	Mon 07/09/01
16	Revise Bid Package	12 days	Tue 08/14/01	Wed 08/29/01
17	Solicit Contractor Bids	10 days	Thu 08/30/01	Wed 09/12/01
18	Review/Negotiation & Award Contract	29 days	Thu 09/13/01	Fri 05/24/02
19				
20	**PERMITS/APPROVALS:**	**275 days**	**Tue 05/29/01**	**Mon 06/17/02**
21	Department of Underground Approval	46 days	Tue 05/29/01	Tue 05/07/02
22	**MWRDGC SDA Approval**	**14 days**	**Mon 05/06/02**	**Thu 05/23/02**
23	Draft SDA Request	11 days	Mon 05/06/02	Mon 05/20/02
24	Submit SDA to MWRDGC	0 days	Mon 05/20/02	Mon 05/20/02
25	MWRDGC Approval	3 days	Tue 05/21/02	Thu 05/23/02
26	**Chicago Department of Sewers Permit**	**81 days**	**Mon 02/25/02**	**Mon 06/17/02**
27	Draft Permit Request	12 days	Mon 02/25/02	Tue 03/12/02
28	Submit Permit Request	0 days	Thu 06/13/02	Thu 06/13/02
29	Dept of Sewers Approval	2 days	Fri 06/14/02	Mon 06/17/02
30	**Pesticide Contamination Resolution**	**163 days**	**Wed 08/01/01**	**Fri 03/15/02**
31	Testing for Pesticides	67 days	Wed 08/01/01	Thu 11/01/01
32	Obtain USEPA Concurrence	75 days	Mon 12/03/01	Fri 03/15/02
33	Revise Work Plan	30 days	Mon 02/04/02	Fri 03/15/02
34				
35	**CONSTRUCTION:**	**77 days**	**Thu 05/16/02**	**Fri 08/30/02**
36	Clear Utilities	10 days	Mon 05/27/02	Fri 06/07/02
37	H&S Training	1 day	Wed 06/05/02	Wed 06/05/02
38	Mobilization/Site Preparation	15 days	Thu 05/16/02	Wed 06/05/02
39	Implement Remediation Plan	62 days	Thu 06/06/02	Fri 08/30/02
40				
41	**PROJECT CLOSE OUT:**	130 days	Mon 09/02/02	Fri 02/28/03



Project: GMO Site
Date: Tue 05/28/02

Task		Milestone		Rolled Up Split		External Tasks		Deadline	
Split		Summary		Rolled Up Milestone		Project Summary			
Progress		Rolled Up Task		Rolled Up Progress		External Milestone			

FIGURE 3-2

TEACHERS' RETIREMENT SYSTEM - GMO SITE

CONSTRUCTION QUALITY ASSURANCE PLAN

ATTACHMENT 1

Title: Construction Quality Assurance Plan

Revision Number: 0

Date:

Replaces: New

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ATTACHMENTS

ATTACHMENT A	SPECIFICATIONS
Section 01340	Submittals
Section 01500	Temporary Facilities and Controls
Section 02010	Demolition and Debris Removal
Section 02840	Site Utilities

1.0 INTRODUCTION AND PROJECT OVERVIEW

This Construction Quality Assurance Plan (CQAP) presents the objectives and functional activities associated with site assessment and cleanup of radiologically-impacted material and other pertinent activities at the GMO Site (Site).

Teachers' Retirement System (TRS) through its qualified contractors will perform the site assessment and removal action at the Site. The Work consists of implementing site security measures, preparing excavation plans and drawings, excavation and sampling of clean overburden, excavation and disposal of radiologically-impacted material above the specified cleanup criterion, air monitoring, dust control, verification, and backfilling released excavations with clean overburden.

This CQAP describes the quality requirements and responsibilities for the project. Section 2 describes the quality organization. Section 3 describes the quality requirements for the site assessment and cleanup of radiologically-impacted material. Section 3 of this CQAP describes Contaminated Material Loadout and Earthwork. Section 4 of this document describes reporting and recordkeeping requirements of the quality system.

2.0 QUALITY ORGANIZATION AND RESPONSIBILITY

This Section of the Work Plan describes the management structure that TRS will use to accomplish the site assessment and remediation activities. The various quality assurance and management responsibilities of key project personnel are defined below.

For these investigation activities, the Project Team includes TRS' project management contractor, STS Consultants, Ltd. (STS), contract laboratories, and investigation, remediation and transportation teams comprised of various subcontractors. Subcontractors used for any part of the work shall be competent in the line of work they are hired to do.

2.1 CONSTRUCTION QUALITY

The Field Team Leader will be responsible for the quality of the construction, and ensuring that the work is conducted in accordance with the Work Plan. He has the primary responsibility to modify site activities to meet remedial action objectives or CQA Plan procedures.

The Field Team Leader will be responsible for reviewing investigation data, and excavation drawings. He also has primary responsibility for documenting modifications to the Work Plan or procedures accordingly.

2.2 CONSTRUCTION CONTRACTORS

TRS intends to do perform the site assessment and remediation work using contractors. The contractors will perform the engineering, excavation, transportation, and health physics activities associated with the proposed work. These contractors will meet the requirements of this CQA Plan.

2.3 QUALITY ASSURANCE SUPERVISOR

The STS Quality Assurance (QA) Supervisor will serve as the QA Supervisor on the project. He is responsible for implementing STS's Corporate Quality Assurance Program. He has direct access to corporate executive staff, as necessary, to resolve any QA dispute.

The QA Supervisor is responsible for verifying compliance with this CQA Plan, reviewing construction quality assurance documentation, and tracking deviations from the CQA Plan.

2.4 LABORATORY SUPERVISOR

Responsibilities of the onsite laboratory supervisor or his designee are as follows:

- receives and inspects the incoming samples
- ensure the appropriate laboratory procedures are followed, and documentation is complete
- signs appropriate documents
- controls and monitors access/storage of samples within the laboratory

3.0 QUALITY REQUIREMENTS FOR SITE ASSESSMENT AND CLEANUP

A detailed description of the work included in the site assessment and cleanup is located in the Removal Action Work Plan. This Section of the CQA Plan provides a description of quality requirements for specific work items.

3.1 SITE ASSESSMENT

Previous contractors, GaiaTech and B. Koh and Associates, conducted Phase I and Phase II site assessments to determine environmental conditions, including the extent of material exceeding 7.1 pCi/g. This information will be reviewed and used to prepare an excavation map.

Any site assessment performed as part of this removal action will also follow LLII SOP 214 – Soil Sampling Procedure, as well as field laboratory procedures LLII SOP 366, Operation of the Accuspec Gamma Counter.

Specific QA requirements include proper calibration of meters and laboratory equipment, data recording, and layout of borehole locations.

3.2 EXCAVATION

Excavation will consist of segregation of clean overburden, and excavation of material exceeding 7.1 pCi/g that will be loaded directly into intermodal containers for shipment to the landfill. If the quantity of radiologically-impacted material is not sufficient to fill a container, the material will be temporarily stored in Supersacks on-site until enough material is collected to fill an intermodal container. This section also includes verification of the excavations.

3.2.1 Overburden Verification

Overburden verification will follow LLII SOP 210 – Gamma Radiological Surveys, and LLII SOP 214, Soil Sampling Procedure. SOP 214, paragraph 12.1 defines the calculations used to confirm that the overburden samples meet the 95% confidence level and QC sample duplicate requirements.

3.2.2 Contaminated Material Excavation

Material exceeding 7.1 pCi/g total radium (Ra-226 + Ra-228) will be excavated in accordance with the procedure discussed in the accompanying Work Plan for the TRS-GMO Site.

The limits of material exceeding 7.1 pCi/g will be loaded directly into lined intermodal containers for offsite disposal. If the quantity of radiologically-impacted material is not sufficient to fill a container, the material will be temporarily stored in Supersacks on-site until enough material is collected to fill an intermodal container. After the excavation has been excavated to apparently limits below the 7.1 pCi/g threshold, the HPs will survey the excavation in accordance with the following section (3.2.3). Additional material exceeding 7.1 pCi/g may be required to be loaded into the containers (or Supersacks, as applicable) to meet the verification release criteria.

Partially loaded containers may be left open throughout the work day, but all containers should have their lids closed at the end of each work day. Areas with exposed material exceeding 7.1 pCi/g shall be considered exclusion zones and be roped off with rad-rope. Detailed descriptions of the health and safety measures that will be taken to protect workers and other visitors to the excavation activities are provided in the attached HASP.

3.2.3 Verification

Verification of the excavations will be performed in accordance with the procedure discussed in the Removal Action Work Plan for the TRS-GMO Site.

Verification will also follow LLII SOP 210 – Gamma Radiological Surveys and LLII SOP 214 – Soil Sampling Procedure, as well as field laboratory procedure LLII SOP 366, Operation of the Accuspec Gamma Counter.

Specific QA requirements include proper calibration of meters and laboratory equipment, data recording, and layout of excavation locations.

3.3 INTERMODAL CONTAINER SHIPPING

Intermodal containers will be inspected prior to lining. They will be inspected for lids and doors that close properly, and that all chains and/or fasteners are intact. Water in the base of the unlined container will be drained out through the tailgate, to the extent that there is no standing water greater than 1/8" deep in the container prior to lining. Containers that cannot be repaired will be rejected.

After the container is loaded, the container lid will be closed and secured. The HP will perform a surface contamination survey of the containers for shipment in accordance with LLII SOP 345 – Surveys for Surface Contamination and Release of Equipment for Gamma Radiological Surveys. The HP technician will also perform a dose rate survey on the exterior of the container in accordance with LLII SOP 320 – Radioactive Material Shipments, to determine DOT placarding requirements and shipping manifest reporting requirements.

The HP technician will prepare the Bill of Lading (BOL). The HP technician will be responsible to record the correct container number onto the BOL. The transport driver will also be responsible for checking that the BOL matches the container number prior to bringing the container off the Site.

STRAIGHT BILL OF LADING-SHORT FORM-ORGINAL-Not Negotiable
RECEIVED, subject to the classification and lawfully file tariffs in effect on the date of the issue of this Bill of Lading

From: **KERR-McGEE CHEMICAL LLC** | *1.1.1.1.1 TRS – GMO Site*

pparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the p under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to t, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms, and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on ereof, if this is a rail or rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, on the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns

CARRIER IAIS / UP	DATE	SHIPMENT NUMBER **0659-01-**
BILL TO: Kerr-McGee Chemical LLC P.O. Box 548 West Chicago, Illinois 60186	CONSIGNED TO. Envirocare of Utah, Inc. Clive Disposal Site Interstate 80, Exit 49 West of Salt Lake City, Utah Clive, UT	FROM NO. STATION: STATE *1.1.1.1.1.1.1 DER-UP-C* **21242**
ROUTE: -MM-BLUE ISLAND, IOWA INTERSTATE-GRAND JUNCTION	DELIVERING CARRIER: UP	FULL NAME OF SHIPPER KERR-McGEE CHEMICAL LLC

CUSTOMER NO.	KM ORDER NO	[redacted]	DATE ORDER RECEIVED
CUSTOMER NO	KM ORDER NO.		DATE SHIPPED
FREIGHT CHARGES ☒ Prepaid ☐ Collect	*IF CHARGES ARE TO BE PREPAID WRITE* OR STAMP HERE "TO BE PREPAID" TO BE PREPAID	KIND OF R.R. EQUIPMENT **CONTAINER**	F.O.B
CAR INITIAL AND NUMBER	CUSTOMER P.O. OR REQ'N NO	SHIPPED FROM CHICAGO	

*If the shipment moves between two ports by water the law requires that the bill of lading shall state whether it is carrier's or shipper's weight.

LINE NO.	DESCRIPTION AND CLASSIFICATION	STCC. NO.	TOTAL QUANTITY	PACKAGING & LABELING CODE
	SOIL AND DEBRIS CONTAINING SMALL AMOUNTS OF THORIUM TAILINGS. DO NOT HUMP	4029106	**44,800 LBS.**	

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

In case of emergencies call CHEMTREC at 1-800-424-9300.

The description and weight indicated on this *bill of lading are correct. Subject to* Verification by the Governing Weighing & Insp. Bureau According to Agreement.

CHEMTREC
CHEMICAL, TRANSPORTATION, EMERGENCY CENTER

RAIL SHIPMENTS PLACARDED NO **TRUCK SHIPMENTS: PLACARDS OFFERED** ☐ YES ☐ NO **PLACARDS ACCEPTED** ☐ YES ☐ NO

LINE NO.	PRODUCT CODE NUMBER	NUMBER OF PACKAGES	FREIGHT CLASS OR RATE	GROSS WEIGHT	TARE WEIGHT	NET WEIGHT

FOR CHEMICAL EMERGENCY-SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT - CALL CHEMTREC - DAY OR NIGHT
800-424-9300
483-7616 in District of Columbia
202-483-7616 from outside U.S.

PRODUCT ANALYSIS IN PERCENT K_2O	KCl	P_2O_5	BPL	TOTAL GROSS WEIGHT	TOTAL TARE WEIGHT	TOTAL NET WEIGHT
				77,500		**44,800**

"Shipper's imprint in lieu of stamp; not a part of bill of lading approved by the Interstate Commerce Commission."

On shipment in Bulk, Weight of Door Boards is to be added to tare weight of car as per Governing Tariff. Doors not to be appropriated. Do not assess Charges on weight of Doors. specifically stated by the shipper to be not exceeding per

NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property The agreed or declared value of the property is hereby

THIS IS TO CERTIFY THAT THE ABOVE NAMED MATERIALS ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.

KERR-McGEE CHEMICAL LLC **PER**

PER

Shipper Permanent post office address of shipper,
Oklahoma City, OK 73125

AGENT

Figure 3-1

FIGURE 3-2
KERR-MCGEE CHEMICAL CORPORATION
WEST CHICAGO FACILITY

SHIPMENT LOAD DIAGRAM - TRUCK

SHIPPER_____ CAB NUMBER _____ TRAILER NUMBER ____
SURVEY BY _____ SHIPMENT N0. _____ DATE _____

TRUCK CHECKED FOR CONTAMINATION:

BEFORE LOADING: ☐ < 02200 dpm/100 cm^2 beta-gamma ☐ < 220 dpm/100 cm^2 alpha

☐ CONTAMINATED TO_____

RADIATION LEVEL, MR/hr _____ CONTAMINATION LOCATION _____

AFTER LOADING: ☐ < 02200 dpm/100 cm^2 beta-gamma ☐ < 220 dpm/100 cm^2 alpha

Cab _____ mR/hr
(Sleeper)

Front of Van

Surface _____ mR/hr

6' _____ mR/hr

Left Side

Surface _____ mR/hr

6' _____ mR/hr

Right Side

Surface _____ mR/hr

6' _____ mR/hr

Top of Truck

Surface _____ mR/hr

6' _____ mR/hr

Under Truck

Surface _____ mR/hr

Rear Surface _____ mR/hr

6' _____ mR/hr

4.0 REPORTING

Data management for the project, as related to site assessment and cleanup activities, consists of gamma logs, soil sample analyses, excavation maps, health physics data, air monitoring data, overburden statistical analyses, verification soil sample analyses, excavation maps, BOLs, manifests, and container release surveys. Original field notes and laboratory data will be filed in the project files at the project site and at STS's Vernon Hills, Illinois office.

4.1 DAILY RECORDKEEPING

The Field Team Leader will prepare a daily report recording the site activities. The daily report will cover safety, quantities shipped, construction activities, and staffing. The daily report will be submitted to the STS Project Manager for distribution to the project files. A copy of the daily report will be provided to the Kerr-McGee field representative.

4.2 NONCONFORMANCES AND CORRECTIVE/PREVENTIVE ACTION

4.2.1 Control of Nonconforming Product

Material or services which do not conform with specified requirements of this CQAP, the accompanying Work Plan, or other project documents, will be clearly identified and recorded. Each nonconformance is documented, identified, and described, with a recommendation for disposition. Reworked, repaired, and replacement items are inspected and tested against original inspection and test requirements. The quality assurance system contains procedures to assure that reworked, repaired, and replaced items do not lose their identity and are not inadvertently used or installed. Rejected or scrapped materials are disposed of effectively and efficiently.

A Nonconformity Report (NCR) has been included as Figure 4-1.

FIGURE 4.1
NONCONFORMITY REPORT

Date:_____ Report No: _____

Vendor/Department: _____ Originator _____

DESCRIPTION OF NONCONFORMANCE

_____

_____

_____

Signature:_____ Date: _____

DISPOSITION

☐ Use as is ☐ Rework ☐ Regrade ☐ Reject ☐ Scrap

Action Taken: _____

_____

_____

EXAMPLE

_____

_____

_____

Action Taken By:_____ Date Action Taken: _____

CLOSE-OUT

Remarks: _____

_____

_____

_____

Responsible Area Manager _____ Date Closed _____

QA Supervisor _____ Date Closed _____

FIGURE 4.1
NONCONFORMITY REPORT (CONTINUED)

The following instructions are printed on the back of the Nonconformity Report form:

1. **Originator** is the person who discovers the nonconformity.
2. **Originator** fills out **Date** and, if possible, obtains **Report No.** from QA Supervisor and fills in on form.
3. **Originator** fills in **Description of Nonconformance**, signs (**Signature**), dates (**Date**), sends form to Responsible Area Manager, and informs the QA Supervisor of the nonconformity.
4. Responsible Area Manager checks form for **Report No**. If no **Report No.**, he/she obtains one from the QA Supervisor and puts on the form.
5. Responsible Area Manager fills in the **Disposition** section of the form by specifying **Action Taken**, signing off on action taken (**Action Taken By**), and dating (**Date Action Taken**) the form. The written description of action taken should include remedial action taken as well as action taken to permanently solve the problem.
6. Responsible Area Manager closes out the nonconformance by making any **Remarks**, signing (**Responsible Area Manager**), dating (**Date Closed**), and forwarding the form to the QA Supervisor.
7. QA Supervisor acknowledges closeout by signature (**QA Supervisor**) and date (**Date Closed**) and files the form.

4.2.2 Corrective and Preventive Action

The QAPP which accompanies this CQAP employs corrective and preventive action to correct and eliminate root causes of problems which are systemic and/or repetitive, or which could occur at a future time. When solutions require changes to the quality system and its documentation, those changes are recorded and captured within the document control system.

4.2.2.1 Corrective Action

Corrective action is necessary to remedy nonconformities that occur in the Quality Assurance System. Nonconformities can be reported by the Customer, by any supplier, or by a contractor. Nonconformities discovered during internal and third party audits are reported as Corrective Action Requests.

Corrective action includes:

- Identification of observed nonconformances in supplied product, services, operations, or output product
- Investigation of the discrepancy
- Determination of the cause
- Initiation of actions to correct the nonconformance to a degree appropriate to the magnitude of problems and commensurate with the risks encountered
- Evaluation of the effectiveness of the corrective action in preventing recurrence
- Changing the system and system documentation when necessary

Responsibility for corrective action is determined organizationally by the area affected. Corrective action involving a project supplier or contractor requires that the supplier or contractor provide the following information:

- Description of factors contributing to the deficiency

- Description of the remedy to correct the nonconformance

Conditions adverse to quality, safety, reliability, or performance are documented and reported to appropriate management for corrective action.

4.2.2.2 Preventive Action

Whereas corrective action is necessary to eliminate a nonconformance or correct a deficiency within the quality assurance system, preventive action is taken to discover and eliminate potential nonconformance. Preventive actions include:

- Periodically reviewing work operations, audit results, quality records, service reports, and customer complaints to detect and eliminate potential causes of nonconformities

- Discovery and evaluation of alternative solutions to prevent nonconformance to a level corresponding to the risks encountered

- Implementing of an appropriate solution alternative

- Evaluating of the effectiveness of the preventive action to prevent recurrence

- Changing the system and system documentation when necessary

- Assuring that Management reviews all preventive actions

- Establishing procedures to assure that the preventive action process occurs continually

ATTACHMENT A

SPECIFICATIONS

Section 01340	Submittals
Section 01500	Temporary Facilities and Controls
Section 02010	Demolition and Debris Removal
Section 02840	Site Utilities

SECTION 01340 SUBMITTALS

SECTION 01340

SUBMITTALS

1.0 GENERAL

1.1 Scope

The Contractor and TRS shall make submittals required by the contract documents and the UAO, and revise and resubmit them as necessary to comply with the specified requirements.

1.2 Related Work

Individual requirements for submittals are described in pertinent sections of these specifications.

2.0 PRODUCTS

Not used.

3.0 EXECUTION

3.1 Submittals

All submittals shall be given to STS on behalf of TRS. Copies of all submittals shall be given to the STS Quality Assurance Supervisor. TRS's representative and the Quality Assurance Supervisor shall be responsible for reviewing submittals in a timely manner. Some submittals must be made to the USEPA who will be responsible for approving or responding to them.

3.2 Identification of Submittals

A. Consecutively number all submittals and uniquely number all resubmittals by including the original submittal number for reference.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

C. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.

D. Maintain an accurate submittal log for the duration of the project, showing current status of all submittals to the USEPA. Make the submittal log available to the USEPA for review upon request.

3.3 Timing of Submittals

A. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

B. Allow at least ten (10) working days for review by the USEPA following their receipt of a submittal requiring a response, unless a longer period is indicated by the Specifications for specific items.

3:4 Review and Revisions

A. Review by the USEPA, TRS, or the STS Quality Assurance Supervisor does not relieve the Contractor from responsibility for errors which may exist in the submitted data.

B. Revisions. Make those revisions and only those revisions directed or approved by the USEPA, TRS, and STS. Changes to correct inaccuracies or errors may be made, but all such changes must be identified. Promptly resubmit in accordance with Article 3.2 of this Section.

3.5 Summary of Potential Submittal Requirements to USEPA

The following tables summarize potential submittals which may be requested by the USEPA for this project. Sections represent Specification section numbers. All submittals will be made by or through TRS.

Submittal	When Due
Air Monitoring Data	With Monthly Report
Construction Schedule Update	With Monthly Report
Notification of Shipments to Out-of-State Disposal Facility	10 days prior to shipping
Monthly Report	By the time of the month as directed by USEPA
Verification Notice and Sampling Data	Upon successful completion of verification testing
Construction Completion Report	Within 60 days of finishing construction

3.6 Summary of Potential Permits Required to be submitted to City or County

The following tables summarize potential submittal requirements pertinent to this project for work conducted off-site. Permits are not required for work done on the site itself and adjacent areas necessary to complete the work. Applications for permits applicable to all work (i.e., road access or transportation of materials) will be submitted prior to the beginning the of the excavation and restoration phase. Applications for other permits (i.e., construction or repair of public utilities) will be submitted prior to work on that utility.

Potential Permit or Procedural Requirements
Control of Erosion and Stormwater Transportation of Materials Off-Site Road Closure or Restricted Access Repairs to Public Utilities

3.7 Summary of Submittal Requirements to Project Quality Assurance Supervisor

Provide copies of all submittals to the Project Quality Assurance Supervisor. The Project Quality Assurance Supervisor shall not be responsible for approval of submittals, but shall be responsible for noting submittals which do not fulfill all requirements of these Specifications and providing such information to TRS.

SECTION 01500 TEMPORARY FACILITIES AND CONTROLS

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

1.0 GENERAL

1.1 Scope

The work of this section of the Specifications includes providing, maintaining, and removing at the completion of the work all temporary facilities and controls needed for the project including, but not necessarily limited to:

A. Temporary utilities.

B. Supporting facilities.

C. Temporary access and protection facilities.

1.2 Related Work

A. Division 1 Sections of these Specifications

B. Section 02010 - Demolition and Debris Removal

C. Section 02840 - Site Utilities

2.0 PRODUCTS

Not Used.

3.0 EXECUTION

3.1 Protection of Work and Property

A. Perform work within limits shown in the Work Plan in a systematic manner that minimizes inconvenience to the public.

B. No residence or business shall be cut off from vehicular traffic unless special arrangements have been made.

C. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along the line of the work, unless other arrangements satisfactory to owners of said facilities and utilities have been made.

D. Where completion of work requires temporary or permanent excavation and/or relocation of an existing utility, coordinate all activities with owner of said utility and, perform all work to their satisfaction.

E. Protect, shore, brace, support and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by the work.

F. In areas where the contractor's operations are adjacent to or near a utility such as gas, telephone, television, electric power, water, sewer or irrigation system and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection thereof have been made.

G. Notify utility offices which may be affected by the work at least two days in advance of any disturbance.

H. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to the work, notify proper authorities immediately. Cooperate with said authority in restoring service as promptly as possible.

I. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures. Maintain original site drainage wherever possible.

3.2 Utilities

A. Water

1. The Contractor shall provide necessary temporary water supply such as portable water tanks as required for dust and moisture control during excavation and backfill operations, for the decontamination facilities, and for other construction requirements.

2. The Contractor may make arrangements with the property owner for temporary water from existing facilities.

3. Provide potable water and dispenser or similar facilities for personnel use at the site.

B. Electricity

1. Provide necessary temporary electric services such as portable generators for construction purposes and related activities.

2. The Contractor may make arrangements with the property owner for temporary electrical service from existing facilities.

C. Heating

1. Provide heating necessary for work operations.

2. Open-flame heating devices or oil burning salamander-type devices shall not be used.

3.3 Supporting Facilities

A. Sanitary Facilities

1. Provide temporary sanitary facilities in the quantity required for use by all construction personnel.

2. Maintain these facilities in a sanitary condition at all times.

B. Trash Disposal and Site Cleanup

1. If necessary, provide a minimum of two (2), three (3) cubic yard capacity dumpsters for the collection of uncontaminated trash. At reasonable intervals, and not less than once a week, remove trash accumulated in the dumpsters and containers, and dispose at a permitted landfill.

2. Cleaning and trash disposal operations shall comply with all health and safety requirements established for the project.

3.4 Temporary Access and Protection Facilities

A. General Requirements

1. Excavation operations shall be conducted in phases to ensure minimum interference with roads, walks, entrances, and adjacent occupied facilities. Temporary walkways, railings, ramps, roads, and other facilities will be provided as needed to maintain safe access through uncontrolled areas of the site.

2. Where temporary partitions are used in public areas, construct partitions of clean plywood at least 1/2-inch thick, with 2 x 4 double studding at 48 inches on centers vertical and with top and bottom plates. Provide 2 x 4 kicker support system held in place with sand bags.

3. Provide covered passageways where necessary, to ensure safe passage of persons in or near areas of work. Provide barricades and safety lights as needed to control vehicular traffic.

4. Provide temporary weather protection as necessary to prevent damage to existing facilities.

B. Security Measures

1. Prior to beginning construction work at the site, erect security measures (fencing, warning tape, barricades, etc.) to prevent inadvertent access to restricted areas as defined in Section 01020. Provide sufficient area within the boundary of the security measures to contain the work area, and allow safe operation of construction equipment.

2. Security measures shall be, as a minimum, yellow or red hazard flagging suspended on metal fence stakes on 20 feet centers or approved equal. Stable portable post bases may be substituted for embedding posts at the Contractor's option.

3. Install warning signs on security measures at 40 foot intervals. Remove the warning signs when security measures are removed.

4. Relocate security measures when indicated by the Work Plan, or as the work progresses, to release completed work areas for unrestricted use after a final inspection has been performed.

C. Weather Protection

The Contractor shall furnish and install temporary enclosures as needed to protect construction from damage due to weather or elements, or to maintain suitable temperature during the installation or finishing of work. At the end of each day, all work susceptible to damage shall be protected.

SECTION 02010 DEMOLITION AND DEBRIS REMOVAL

SECTION 02010

DEMOLITION AND DEBRIS REMOVAL

1.0 GENERAL

1.1 Scope

A. This section describes excavation requirements for existing Site features, including:

1. Salvage Disposition, Storage, and Handling of Property.
2. Demolition of Existing Site Features.
3. Sawcutting.
4. Debris Segregation, Decontamination, Haulage, Storage, and Disposal.
5. Matching and Patch Repairing.

B. Descriptions for radiological surveying are specified in the Work Plan, Appendix 5 (Verification Sampling Plan) and Appendix 6 (Site Security Plan).

1.2 Related Work

A. Division 1 Sections of these Specifications.

B. Section 02840 - Site Utilities

1.3 Salvage Disposition, Storage and Handling of Property

A. Remove all structures, equipment, facilities, materials and other items called for in the Work Plan or that otherwise must be removed to access the work areas and store

as directed. Such items shall be removed completely, including appurtenances, and shall be properly protected.

C. All non-radiologically-impacted_materials, equipment, and other items permanently removed from the work area for the proper completion of the excavation work shall be properly managed and/or disposed as applicable.

1.4 Submittals

A. All submittals shall be made to the STS Project Manager.

B. Submit landfill tickets for all uncontaminated debris disposed offsite, no more than five (5) days after disposal, *except where dumpsters are emptied directly into collection trucks. The use of dumpsters will be recorded in the field logbook.* Each ticket shall contain at least the information below.

1. Date of disposal.
2. *Estimated* volume or weight of load if required by the designated measurement method of the landfill.
3. Description of materials disposed.
4. Name *of wastehauling subcontractor.*

C. Prior to beginning any work, the Contractor shall submit a plan describing the work for this property, based on the requirements of these Specifications and the final agreements with TRS.

1.5 Health and Safety Conditions of the Work

In addition to the hazards common to demolition, radioactive materials are known to be present at this Site, and may be present in or on slabs/paving, structures, facilities and utilities.

A. Detailed health and safety requirements for work on the vicinity properties are included in Section 01020 of these Specifications and the HASP.

B. All demolition work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

C. Based on existing information, excavation work can proceed under Level D personal protection conditions (see HASP). Air and soil monitoring and sampling will be done during the conduct of the work to determine if modifications to Level D work conditions are necessary.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by the STS Project Manager, STS Field Team Leader, or their Agent.

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal, equipment and vehicle decontamination) with minimal delay. Additional requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing hazardous materials or levels of radiation above background are encountered are discussed in Section 01020 of these Specifications.

D. The Quality Assurance Supervisor, Field Team Leader, or Health and Safety Coordinator may bar from the Site any person or persons who shows a disregard for health and safety of themselves or others.

1.6 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to the Project Quality Assurance Supervisor prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

Part 2 - Products

Not used.

Part 3 - Execution

3.1 General

A. The work performed under these Specifications shall be done as indicated in this Work Plan, specified herein, and as required by the permits and the laws, rules and regulations of the City of Chicago, the State of Illinois and the USEPA.

B. The Contractor shall remove existing property features as indicated in the Work Plan and shall perform demolition in a manner to allow segregation and proper disposal of contaminated and uncontaminated material. The Contractor must use methods and operations which will minimize the potential for the spread of contamination.

C. It shall be the Contractor's responsibility:

1. To maintain adequate safety measures and working conditions (see Section 01020 of these Specifications and the HASP).

2. To take all measures necessary during the performance of the work to protect the entire project area and adjacent properties which would be affected by this work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the STS Project Manager, STS Field Team Leader, or their Agent.

3. To maintain completed areas until the entire project area is in satisfactory compliance with the Specifications.

D. Utility lines and structures indicated on the Drawings which are to remain in service shall be protected by the Contractor from any damage as a result of his operations. Requirements for locating, exposing, protecting, and replacing utilities are provided in Sections 02220 and 02840 of these Specifications.

3.2 Structure Demolition

A. General

No structures are present on the site, with the exception of the perimeter guard rail and light poles. The guard rail and light poles will be removed with the pavement removal. Subsurface footings will be surveyed in accordance with Appendix 9 Field Sampling Plan.

B. Asphalt and Concrete Paving and Slabs

1. The methods used to demolish and remove asphalt and concrete materials shall be at the discretion of the Contractor, as long as the requirements of these Specifications are met. All finished cutting of concrete or asphalt paving or slabs shall be done by sawcutting. The requirements for sawcutting are described in Article 3.3 of this section.

2. All demolition of pavement and slabs shall be done in a manner to minimize disturbance of the underlying soil. This could include, but not be limited to,

pre-breaking or sawing the pavement and slabs, and the measures described in Article 3.3 of these Specifications.

3. Prior to demolition of paving or slabs, the work area will be cleared of any remaining debris.

   a. The paving, slab or wall will be cut or broken into manageable pieces.

   b. During cutting or breaking, some metallic materials such as steel rod or wire-mesh reinforcing, embedding fittings or anchor bolts, etc., may be encountered. If necessary, embedded metallic materials shall be separated from the concrete during crushing operations.

   c. All "hot work" required for cutting metallic materials during demolition or crushing will be done as required by Section 01020 of these Specifications and the HASP.

4. Contaminated concrete paving and slabs may be disposed by size reduction (i.e., cutting into sections that meet disposal criteria) for ultimate shipment to Envirocare.

5. Uncontaminated concrete paving and slabs may be disposed in approved local landfills or used as Common Fill if it meets the requirements of Section 02200, 2.1 B.

C. <u>Foundations</u>

1. The methods used to demolish and remove foundations shall be at the discretion of the Contractor, as long as the requirements of these Specifications, the permits, and the laws, rules and regulations of the City, County, State, OSHA or the U.S. EPA, whichever are more stringent, are met.

2. All demolition of foundations shall be done in a manner to minimize disturbance of the surrounding and underlying soil. This could include, but not be limited to, pre-breaking or sawing the foundation elements, and the measures described in Article 3.3 of these Specifications.

3. Concrete, rock or block foundations may be demolished and reduced in size as described in the foregoing subpart.

4. Foundation walls which serve as retaining walls to support earth or adjoining structures shall not be demolished until such earth has been properly braced, or adjoining structures have been underpinned to prevent movement.

Bracing and shoring shall be evaluated and, if necessary, designed by a qualified Professional Engineer.

5. Adjacent foundation walls and "party" walls to a basement, which are to serve as retaining walls against which fill or debris will be placed, shall be checked for structural strength before they are to be so used. Evaluations and, if necessary, designs of shoring and bracing shall be done by a qualified Professional Engineer.

6. Foundations and basement floor slabs will be removed to verify conditions beneath them. The concrete, if not contaminated, will be staged on-site for later removal or will be removed as clean debris. Concrete found to be impacted will be decontaminated in accordance with SOP LLII345. If decontamination cannot be reasonably completed, the concrete will be reduced in size sufficient to be managed as impacted and loaded for off-site shipment and disposal.

D. Retaining Walls

1. The methods used to demolish and remove retaining walls shall be at the discretion of the Contractor, as long as the requirements of these Specifications, the permits, and the laws, rules and regulations of the City, County, State, OSHA or the U.S. EPA, whichever are more stringent, are met.

2. All demolition of retaining walls shall be done in a manner to minimize disturbance of the surrounding and underlying soil. This could include, but not be limited to, pre-breaking or sawing the pavement and slabs, and the measures described in Article 3.3 of these Specifications.

3. Shoring or bracing may be necessary during the demolition of retaining walls. Shoring or bracing shall be designed by a qualified Professional Engineer, competent in soils. Shoring and bracing designs shall be submitted to the Respondents or their Agent and the Field Team Leader prior to beginning excavation where their use may be necessary.

4. Concrete, rock or block foundations may be demolished and reduced in size as described in the foregoing subpart.

3.3 Sawcutting

A. The Contractor shall be responsible for all sawcutting necessary for the excavation of contamination whether described in the Work Plan or not. The Contractor shall sawcut concrete, masonry, asphalt paving, and other work as needed, observing the following requirements:

1. The Contractor shall provide liquid or other dust control for all sawcutting of contaminated materials or materials overlying contaminated materials.

2. Finished vertical concrete or masonry cuts shall be made using a track-mounted concrete saw. The finished cut shall be a minimum of three inches deep, in a straight and true line.

3. Finished horizontal concrete or masonry cuts shall be made using a cradle-mounted concrete saw. Make the finished cut a minimum of three inches deep, in a straight and true line.

4. Where portions of masonry will be removed and replaced, masonry excavation and restoration shall be along mortar joints so the finished wall will have the same masonry pattern as the existing.

5. Finished asphalt paving cuts shall be made using an asphalt blade in a cradle-mounted saw. The finished cut shall be a minimum of two inches deep, in a straight and true line.

6. If a clean break cannot be made where new concrete will be replaced against old concrete, provide sawcutting necessary to produce clean edges on the existing concrete.

7. Hand-held demo saws shall not be used to produce finished cuts without prior approval of TRS.

3.4 Matching and Patch-Repairing

A. The Contractor shall observe the following guidelines for matching and patch-repairing.

1. When existing construction is cut or otherwise disturbed to permit installation of new work, match and patch-repair existing construction so disturbed.

2. Remove all projections, and point and patch new masonry to match style, color and workmanship of existing masonry.

3. Paint surfaces to match the adjacent areas. Repaint all walls to the nearest edge or corner.

4. In newly graded areas, take every precaution and temporary measures necessary to prevent damage from erosion.

5. Where any settlement or washing of earthwork may occur prior to acceptance of the work, repair and re-establish grades to the required elevations and slopes. This applies to damage to the newly graded areas within the construction limits and damage to adjacent properties by eroded material.

B. The Contractor is responsible for using methods and materials which are similar in appearance and equal in quality to those areas or surfaces being repaired, and shall remove areas, surfaces or items which cannot be satisfactorily matched and patch-repaired and replace them with new.

3.5 Decontamination of Items

A. Some contaminated items such as slabs, pavement, and piping, can be decontaminated and disposed in industrial or other landfills. Decontamination of items will include removing the contaminated dust, dirt or encrustations from the surfaces of the items. Decontamination may be accomplished by high-pressure spraying, or manually removing contaminated materials with brushes, soap and water, rags, and miscellaneous hand tools until the items are verified as radiologically suitable for the proposed disposal.

B. Decontamination of contaminated equipment, tools, materials and supplies is described in detail in Section 01020 of these Specifications.

3.6 Contaminated Material Loadout and Transport

A. General Requirements

1. Before beginning contaminated material loadout operations, the Contractor shall construct temporary site drainage facilities and initiate dust control measures. The Contractor also shall construct all decontamination and loadout facilities and establish survey controls.

2. The Contractor shall use equipment and methods that minimize the potential for spillage of materials during loading operations.

3. At a minimum, the loadout shall be cleaned (liquid and nonliquid wastes removed) at the end of every other day. Spilled materials shall be promptly removed from the loading facility if the quantity is such that the material could be picked up and transported out of the loadout facility.

4. All decontamination of equipment shall be done as required herein and by Section 01020 of the Specifications.

5. In no case shall equipment with radioactivity above the release levels be allowed to leave the Site.

B. Loadout

1. All loadout of material will be done as required by these Specifications and the Work Plan. Loading of trucks and other containers with contaminated soil or debris shall be done only in the loadout or equipment decontamination areas.

2. Contaminated soils and debris will be loaded directly into containers as they are excavated, and the container staged in a clean area for pickup and transport to the rail terminal. Materials will be placed so they do not extend above the sides of the container. Materials protruding above the sides of the container will be pushed down or removed for placement into another container. If isolated quantities of impacted soil are encountered in volumes less than necessary to fill a container, the material will be placed in Supersacks and stored temporarily until there is sufficient material accumulated to fill a container.

3. Rolloff containers will be secured with lids.

4. Drivers shall remain inside the truck with the windows closed or shall exit the truck prior to loading.

C. Decontamination

1. Detailed requirements for the decontamination of trucks and containers are provided in Section 01020 of these Specifications.

2. Following loading in the loadout area, and decontamination if such is necessary, all trucks and containers will be frisked.

3. If frisking shows such is necessary, trucks and containers will be decontaminated by wiping or spraying.

4. Trucks and containers need a final survey prior to unrestricted release from the loadout.

D. Transport

1. Trucks picking up and dropping off containers at the staging areas outside of the loadout need not be decontaminated unless a container spill has occurred.

2. Trucks shall only use the designated route(s) to transport materials from the Site to the rail terminal, and shall obey all signs, speed limits and other traffic laws. Any driver not obeying traffic laws, or the requirements of these Specifications, shall be removed from the work.

3. All trucks shall properly display decal with all information required for transport of contaminated materials.

4. Each truck shall carry the standard industry bill of lading for each shipment to the rail terminal.

5. All truck drivers shall have the training required by 29 CFR 1910.120 and shall be trained in the procedures to be used in the event of an emergency, as described in the Emergency Contingency Plan.

3.7 Storage

A. All storage or stockpiling of materials shall be done as required by Section 02200 of these Specifications and described in the Work Plan.

B. On the GMO Site

1. Non-radioactive materials, including fill, may be temporarily stockpiled (staged) on the Site in the locations noted in the Work Plan, or as approved or directed by STS or its Agent.

   a. As necessary, staged non-radioactive materials shall be covered or otherwise managed to control dust.

2. Radioactive materials may be staged on the Site only with written approval from the STS Project Manager or its Agent.

   a. Radioactive materials shall only be stored on contaminated or specially prepared areas to minimize the potential for contamination of "clean" areas.

   b. All staged radioactive materials shall be removed from the Site by the end of the day, weather permitting. If materials must be left overnight, security will be provided. If isolated quantities of impacted soil are encountered in volumes less than necessary to fill a container, the material will be placed in Supersacks and stored temporarily until there is sufficient material accumulated to fill a container.

   c. Except when work is actively in progress, the staged contaminated materials that are not containerized shall be stored temporarily in Supersacks on-site, or if that is not feasible or practical in the short term, the material will be completely covered with impermeable plastic sheeting or other approved covers.

C. **On the Rail Terminal Site**

1. Loaded and tarped containers will be stored at the rail terminal temporarily until the appropriate train is loaded and dispatched to the permanent disposal facility.

3.8 Disposal

A. At a minimum, all materials shall be disposed as required by the permits, these Specifications, and the laws, rules and regulations of the State of Illinois or the USEPA, whichever are more stringent. All materials to be disposed shall be surveyed as required by Section 01020 of these Specifications to determine they are suitable for the intended disposal method and location.

B. If clean materials are disposed by landfilling or recycling, the Contractor shall provide the STS Project Manager and the Field Team Leader with the name of the landfill or recycler.

1. The landfill or recycler must be qualified to receive the waste. The landfill or recycler must provide the Contractor with qualification information.

2. The STS Project Manager or its Agent has the right to reject any landfill which does not meet qualification standards.

3.9 Cleanup

Upon completion of work in this section, all rubbish and debris shall be removed from the job site. Soils or fill materials that were excavated from the site and were determined not to exceed the radiological cleanup standard of 7.1 pCi/g total radium (Ra-226 + Ra-228) may be used or redeposited on the site as fill material. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition.

SECTION 02840 SITE UTILITIES

SECTION 02840

SITE UTILITIES

1.0 GENERAL

1.1 Scope

A. This section describes the general requirements for locating, protecting, removing and installing site utilities.

B. The known locations of utilities will be shown in the Work Plan.

1. Excavation to or below the locations of known utilities is expected as part of the work for the Site.

2. Utility lines and structures indicated in the Work Plan which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work.

1.2 Related Work

A. Division 1 Sections of these Specifications

B. Section 02010 - Demolition and Debris Removal

C. Section 02200 - Contaminated Material Loadout and Earthwork

D. Section 02220 - Undermining Existing Features

1.3 Health and Safety

A. Detailed discussions of the potential hazards and the requirements for minimizing the potential for harm to project and offsite personnel, and to the environment, are provided in Section 01020 of these Specifications and the HASP.

B. All work shall be done under the supervision of personnel experienced and qualified for the work.

C. All work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

D. Sampling and analyses of soils from the Site indicate levels of radioactivity in the soils above background levels. Based on the sampling and surveys, the work can proceed under Level D personal protection conditions (see HASP). Air and soil monitoring and sampling will be done during the work to determine if modifications to Level D work conditions are necessary (see Section 02010). Complete descriptions of health and safety requirements for this Site are provided in Section 01020 of these Specifications and the HASP.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by STS Consultants, Ltd. (STS), on behalf of TRS or its Agent.

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal equipment and vehicle decontamination) with minimal delay. The requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing hazardous materials or levels of radiation above background are encountered are discussed in Section 02010 of these Specifications.

E. The Field Team Leader or Health and Safety Coordinator may bar any person from the Site who, in their opinion, shows a disregard for health and safety requirements.

1.4 Environmental Safeguards and Regulations

The Contractor shall comply with all federal, state, and local regulations, and the requirements of these Specifications at all times to prevent pollution of air, water and soil. Detailed requirements for the protection of the environment are provided in Section 01020 and the HASP.

1.5 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to STS or their Agent and to the Project Manager prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits or, if the work is exempted under CERCLA from any permits, in accordance with the substantive requirements which would apply if the work were not exempted from such permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

1.6 Quality Assurance

A. STS will provide soil testing services. STS will take soil samples and perform moisture-density, gradation, and other tests to ascertain the completed work

is in compliance with these Specifications. Samples of the soil may be taken at the place of excavation, stockpiles, or from the fill itself. The testing consultant shall conduct density and other tests on the fill as required by these Specifications. The Contractor shall render assistance as necessary to enable sampling and testing.

B. The Field Team Leader shall be a person qualified and experienced in the work described in these Specifications.

C. All work shall be done according to the requirements of these Specifications.

1.7 Submittals.

All submittals shall be made to the STS or its Agent.

2.0 PRODUCTS

2.1 Backfill Materials

A. General. Fill materials shall be obtained from suitable stockpiles or borrow as defined in these Specifications. Materials containing organic (except topsoil), perishable, spongy, frozen, expansive or other deleterious materials shall not be acceptable.

B. Embedment. Embedment material shall be fine aggregate or sand as defined by Part 2 of Section 02200 of these Specifications.

2.2 Utilities

Materials used to reconstruct utilities shall be as required by the utility company, the governing municipal agency, or the building code.

3.0 EXECUTION

3.1 Location

A. The known locations of utilities shall be included in the Work Plan for the Site. The Contractor shall be responsible for field verifying utility locations and for obtaining any necessary additional information to properly implement and execute the Work Plan.

1. Known and suspected utilities are shown in the Work Plan. The locations as shown may prove to be inaccurate and other obstructions not shown may be encountered. Any reliance on this information will be at the Contractor's risk. The Contractor shall arrange to have all utilities located by the utility companies or a utility location service prior to beginning work (e.g., DIGGER).

2. Excavations in the areas of suspected underground utilities shall be done with care, using equipment such as small, rubber-tired backhoe/loaders. When within one foot of the expected vertical and horizontal location of the utility, excavation will be done manually until the exact location of the utility is determined.

B. Utility lines and structures which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

1. Where utility lines or structures not shown in the Work Plan are encountered, the Contractor shall report them to STS or its Agent before proceeding with the work.

2. Unless their excavation is necessary to allow work to proceed or as a result of contamination, the Contractor shall bear the cost of repair or replacement of any marked utility lines or structures which are broken or damaged by his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work.

3.2 Existing Utilities Designated for Excavation

A. Overhead Utilities shall be removed and replaced by the utility if such is necessary for proper completion of the work. If the utility will not or cannot remove them, procedures for excavation will be discussed with and approved by the utility. At a minimum, removal of overhead utilities shall include the following.

1. Obtain the necessary disconnects and verify the utilities are de-energized and grounded prior to the work.

2. Remove cables and guy-wires from the utility poles.

3. Determine if the above- and below-grade sections of the poles are contaminated with radiological materials.

   a. If the above-grade sections are not contaminated and the lower section is, or if the potential for contamination of the below-grade section is unknown, fell above-grade sections of utility poles by sawing or other suitable methods to separate the uncontaminated above-grade sections from the potentially contaminated below-ground section.

   b. If both sections are contaminated, the pole may be removed by felling the above-grade part and excavating the below-grade part, or by pulling the pole from the ground with a crane or other equipment.

4. Uncontaminated components of overhead utilities, such as cables, guy-wires, etc., shall be disposed as required by Section 02010 of these Specifications.

5. Contaminated components of overhead utilities shall be removed and processed for loadout and disposal as other contaminated debris (see Section 02010 of these Specifications).

6. Excavated materials shall be handled as required by Subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

B. Underground Utilities to be removed may be removed by the utility. At a minimum, the following procedures shall be used.

   1.. Obtain the necessary disconnects or shutoffs prior to the work and verify the utility is de-energized, drained, or purged as necessary (lock-out and tag-out procedures properly implemented).

2. Excavate and manage materials to access contaminated utilities or bedding materials as required in Subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications. Monitoring of excavations will be required both on-site and in adjacent rights-of-way.

3. Remove, decontaminate and dispose of contaminated utility materials as required in subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

4. Replace, repair, or abandon the removed utility as directed by these Specifications and the Work Plan, or the utility company or municipal agency having jurisdiction.

   a. Replacement or repairs of the utilities shall be in accordance with the requirements of these Specifications or the utility or agency.

   b. Abandoned utilities shall be capped as required by Article 3.3 of this section.

3.3 Underground Utilities Encountered During Excavation

A. Damage to utilities shall be repaired under the supervision of the respective utility service or municipal agency having jurisdiction.

B. Abandoned utilities shall be cleaned of all encrusted contamination. Open ends or broken pipes shall be properly capped.

   1. At a minimum, capping may be done by crimping, pouring concrete around, or plugging the open end in such a way as to prevent a "least path of resistance" for any future gas leaks.

   2. Capping will be done as required by the utility or municipal agency if their requirements exceed those above.

C. Active utilities shall be supported in-place, if suitable, or removed and replaced as necessary to excavate to the depths shown in the Work Plan.

   1. Support or removal and replacement shall comply with the more stringent requirements of the affected utility or municipal agency or these Specifications (see this section and Section 02220 of these Specifications).

2. Utility lines, whether removed or left in-place, shall be cleaned of encrusted contamination as required and described by Section 02010 of these Specifications.

3. Removed utilities shall be managed and disposed as required in Section 02010 for other demolition debris.

3.4 Underground Utility Installations

A. The Contractor shall coordinate interruptions of utility services through STS or its Agent.

B. If utilities are installed after backfilling is complete, all excavations shall be by open cut.

1. The banks of the trenches should be as vertical as possible. Shoring and bracing, as necessary shall be designed by a qualified Professional Engineer competent in soils engineering. The design of shoring and bracing shall be provided to STS or its Agent.

2. If rock is encountered, the base of the trench will be overexcavated at least six inches to allow for placement of bedding material.

C. If utilities are installed before backfilling is completed to final line, elevation and grade, the fill shall be to at least 12 inches above the top of the utility before excavation and placement of the utility is begun.

D. Trench Preparation. The bottom of the trench shall be accurately excavated to line, and graded and shaped to fit the lower one-quarter of the pipe to provide uniform bearing and support for each section; wedging and blocking will not be permitted. If the pipe has bell ends, the trench shall be overexcavated at the joints. If the common fill is granular, the base of the trench shall be scarified to a depth of six inches and recompacted to at least 95% of maximum density at t2% of optimum moisture (standard proctor, ASTM D698). If the common backfill is not granular in nature, the base of the trench shall be overexcavated six inches and backfilled with granular

(embedment) material compacted to at least 95% of maximum density at t2% of optimum moisture.

E. Utility Embedment. All utility lines except electric lines and irrigation lines two inches or less in diameter shall be embedded in fine aggregate (see Subpart 2.1.13 of this section).

1. Embedment material shall extend a distance equivalent to the utility diameter above, below and to the sides of the utility for utilities greater than six inches in diameter. A six-inch embedment shall be provided for utilities less than or equal to six inches in diameter.

2. Care shall be taken not to disturb either the horizontal or vertical alignment of the utility; embed both sides of the utility simultaneously. If necessary, compact embedment material by hand to avoid displacement and damage to the utility.

F. All utility installations shall be inspected by STS, and by the utility or municipal agency if necessary, at the following times.

1. Before placing embedment material over the utility.

2. Before placing common fill over the embedment material.

G. Compaction of common material over the utility shall be by manually-operated power equipment or by hand until at least 12 inches of fill has been placed over the utility. Damage to the utility by compaction or other causes after proper installation shall be the responsibility of the Contractor.

H. Tests. Testing shall be done on all repaired or replaced systems. Testing may be done by the utility or municipal agency or Contractor. All testing will be done as required by the utility, municipal agency or applicable building code. All testing will be done in the presence of STS, and utility, municipal agency or building inspectors, as necessary.

341 EAST OHIO STREET SITE

QUALITY ASSURANCE PROJECT PLAN

ATTACHMENT 2

Title: Quality Assurance Project Plan

Revision Number: 3

Date: June 13, 2002 Replaces: Revision Number 2

QUALITY ASSURANCE PROJECT PLAN

341 EAST OHIO STREET SITE

REVISION 3

JUNE 13, 2002

PREPARED BY

STS CONSULTANTS, INC.

FOR

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

STS CONSULTANTS, LTD.

Quality Assurance Project Plan
341 East Ohio Street
Chicago, Illinois

Revision 3

STS Project No. 1-25585-XG
June 13, 2002

QUALITY ASSURANCE PROJECT PLAN

341 EAST OHIO STREET SITE

NOVEMBER 27, 2001

PREPARED BY: John S. Esser DATE: 6/19/02
~~JULIE APOLINARIO~~ John S. Esser
PROJECT MANAGER

APPROVED BY: Richard G. Berggreen DATE: 6/19/02
RICHARD G. BERGGREEN, C.P.G.
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APPROVED BY: Frederick A. Micke DATE: 5/30/02
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APPROVED BY: Richard L Byvik DATE: 6/3/02
~~LUBA FINKELBERG~~
U.S. EPA QAPP REVIEWER
RICHARD L BYVIK
(Conditional Approval)

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GRACE ANALYTICAL LAB, INC.

APPROVED BY: _____ DATE: _____
RSSI

APPROVED BY: W. Zhou Strait DATE: 7-31-02
ARGONNE NATIONAL LABORATORY

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APPROVAL BY: Richard L Byvik DATE: 10/04/02
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QUALITY ASSURANCE PROJECT PLAN

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QUALITY ASSURANCE PROJECT PLAN

341 EAST OHIO STREET SITE

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QUALITY ASSURANCE PROJECT PLAN

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LIST OF ACRONYMS

CFR	Code of Federal Regulations
DQO	Data Quality Objective
EPA	Environmental Protection Agency
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety and Health Administration
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness
PE	Performance Evaluation
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
SOP	Standard Operating Procedure
UAO	Unilateral Administrative Order

PROJECT/TASK ORGANIZATION

ELEMENT A4

The management structure under which the project will be accomplished is illustrated in Figure 2-1 of the Amended Removal Action Work Plan, and also included as Attachment 1 of this Quality Assurance Project Plan (QAPP). The Project Team consists of U.S. Environmental Protection Agency (USEPA) and it's support organizations; Teachers' Retirement System of the State of Illinois (TRS) and its consultants; the construction team comprised of STS Consultants, Ltd. (STS), their contractors and subcontractors; and Kerr-McGee Chemical, LLC and their contractors involved in the transportation and disposal tasks.

This QAPP presents the organization, objectives, functional activities and specific quality assurance (QA) activities associated with the excavation and verification sampling at the GMO Site. All QA procedures will be in accordance with applicable professional technical standards, USEPA requirements, government regulation and guidelines, and specific project goals and requirements. This QAPP is prepared by STS Consultants, Ltd. (STS) in accordance with USEPA QAPP guidance documents, in particular, the Region 5 Instruction on the Preparation of a Superfund Division Quality Assurance Project Plan, Revision 0 and on the EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5).

The duties and responsibilities of these positions and organizations are summarized below.

A. Management Responsibilities

STS will supply the Project Coordinator who will provide overall direction to project activities and has overall responsibility for ensuring that the project meets USEPA objectives and quality standards. These responsibilities include communications between the project team and USEPA, and among the various members of the project team, including Kerr-McGee, the Health Physics subcontractor, the excavation contractors, and other subcontractors on the project. The Project Coordinator is the administrative point of contact between TRS and the USEPA. The position descriptions are included in Appendix A of the QAPP.

The TRS Project Manager, who will be responsible for communication between TRS and the project team, will represent TRS. The TRS Project Manager will review project documents, plans, and progress reports to confirm the plans and implementation are consistent with TRS objectives.

The STS Project Manager will be responsible for the day-to-day implementation of the Work Plan and this QAPP Plan. The Project Manager's primary function is to ensure that technical, financial, and scheduling

objectives are achieved successfully. This will include coordination of schedules with the contractors and subcontractors, planning and scheduling activities with the USEPA to provide for verification of remediated locations, and documentation of activities as provided for in this Remediation Work Plan. The STS Project Manager may not be on-site daily, but will make inspection visits to the Site.

USEPA will be represented by its On-Scene Coordinators (OSC), whom will be Mr. Fred Micke and Ms. Verneta Simon. The OSC is responsible for directing and/or overseeing and coordinating all project activities. He or she is responsible for submitting QAPP and QAPP revisions and amendments to appropriate personnel for review and approval. Mr. Larry Jensen, Regional Radiation Expert and other support staff will assist the OSCs

Kerr-McGee will be responsible for transportation and disposal of the radiologically impacted materials excavated and removed from the site. That responsibility includes health physics personnel to survey the transport containers, subcontractor transportation and logistics personnel, and documentation for shipping and disposal. The disposal is proposed to be under an existing contract with Envirocare of Utah, Inc. In the event Kerr-McGee is unable to fulfill this role, a logistics subcontractor will be available to complete this work.

B. QA Responsibilities

The Project Quality Assurance Supervisor will provide guidance on QA issues. The Project QA Supervisor is responsible for developing programs and tools to implement and monitor the QAPP plan. Specific functions and duties of the Project QA Supervisor include: provide QA audits on various phases of the field operations; review and approve of QA plans and procedures; provide QA technical assistance to project staff; and report on the adequacy, status, and effectiveness of the QA program on a regular basis to the Project Manager. The USEPA Region 5 Superfund QA Reviewer has the responsibility to review and approve QAPPs.

The Project QA Supervisor will provide the Project Coordinator copies of reports pertaining to quality assurance/quality control (QA/QC). The Project QA Supervisor functions independently from the personnel directly responsible for accomplishing the excavation and removal. He/she reports to the Project Coordinator and the TRS Project Manager and has access to higher levels of management with whom he/she can consult to resolve quality related project issues. The Project QA Supervisor will be responsible for internal and external performance and system audits. The Project Supervisor will be responsible for data assessment and validation.

C. Field Responsibilities

The Field Team Leader is responsible for coordinating the field activities, in particular coordinating the excavation and health physics technician subcontractors. The Field Team Leader will be responsible for day-to-day communications with the USEPA's OSC whenever the OSCs are on site. The Field Team Leader will be responsible for identifying and documenting non-conformance.

D. Laboratory Responsibilities

Argonne National Laboratory will provide laboratory subcontract services to USEPA for radiological analysis of samples from this project. A field laboratory will be used to analyze samples onsite. The Health Physics subcontractor, Stan A. Huber Consultants, Inc., will manage this laboratory. Off-site laboratory services will be provided by Severn Trent Laboratories (STL) of St. Louis; Missouri, RSSI of Morton Grove, Illinois; and Grace Laboratories of Chicago, Illinois. STL will perform waste characterization analyses, RSSI will serve in a back up capacity to STL, and Grace Labs will perform the potential groundwater analysis.

STL will perform the following analyses:

- Gamma spectroscopy
- TCLP Extraction
- TCLP Extraction – ZHE
- Volatiles
- Semi-Volatiles
- Pesticides (Organochlorine)
- Herbicides (Organochlorine)
- RCRA Metals
- Corrosivity (pH)
- Paint Filter
- Reactive Sulfide
- Reactive Cyanide
- Ignitability (Flashpoint)

Grace Labs will perform the following groundwater analyses if determined necessary:

Waste or Chemical	Concentration (mg/L)
Cadmium	0.11
Chromium (total)	2.77
Copper	2.07
Cyanide (total)	1.20
Fats, Oils and Greases (FOG) (total)	250.0
Iron	250.0
Lead	0.5
Mercury	0.0005
Nickel	3.98
Zinc	2.61
Dichloromethane	0.294
Chloroform	0.309
1,1,1-Trichloroethane	0.193
Trichloroethylene	0.242
Benzene	0.278
Tetrachloroethene	0.225
Toluene	0.247
Ethylbenzene	0.329
Volatile Organic Compounds (total)*	0.567
Total Toxic Organics**	2.13

pH Range - Not lower than 5.0 or greater than 10.0

Temperatures of liquids or vapors at point of entrance to the sewerage system shall not exceed 150°F.

* Total Volatile Organic Compounds shall be the arithmetic sum of the concentrations of:

Dichloromethane
Chloroform
1,1,1-trichloroethane
Trichloroethylene
Benzene

Tetrachloroethene
Toluene
Ethylbenzene
Acrolein
Acrylonitrile
1,3-butadiene
carbon tetrachloride
Chlorobenzene
Dichloroethane
Dichlorobenzene
1-ethyl 2-methylbenzene
Naphthalene
Styrene
1,3,5-trimethylbenzene
vinyl chloride
Xylenes
1,4-dioxane
ethylene dibromide
methyl ethyl ketone

** Total Toxic Organics shall be the arithmetic sum of the concentrations of those pollutants found under Title 40 Part 413.02(i) of the Code of Federal Regulations.

E. Special Training Requirements/Certification

All of the designated technical team members possess the degree of specialization and technical competence to effectively and efficiently perform the required work. All team members visiting the site will be trained and certified in accordance with 29 CFR 1910.120, as described in the Health and Safety Plan (Attachment 3 of the Remediation Work Plan).

F. Project Management Organization Chart

The Project Management Organization Chart shows the relationships and the lines of communication among all project participants, including the USEPA. The organization chart identifies subcontractor relationships relevant to environmental data operations.

PROBLEM DEFINITION/BACKGROUND INFORMATION

ELEMENT A5

The subject site for this Work Plan and QAPP is a vacant parcel of approximately 2.16 acres located at 341 E. Ohio Street, Chicago, Illinois and is depicted on Figure 1-1 of the Amended Removal Action Work Plan. The site is currently a vacant, at-grade paved parking lot; however, the site is not presently being used for parking. TRS previously made a mortgage loan secured by the site and after such mortgage went into default, TRS subsequently acquired the site by deeds in lieu of foreclosure.

The site is across the street (north of East Grand Avenue) from the site at 316 East Illinois Street in Chicago, Illinois which is owned by River East, LLC, and on which radiological impacted soils were previously detected by the USEPA. USEPA determined that the radiologically impacted soil at the 316 East Illinois Street site was associated with the former operations of Lindsay Light Company at 161 East Grand Avenue. On June 6, 1996, USEPA issued a Unilateral Administrative Order ("UAO") pursuant to Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") to the Chicago Dock and Canal Trust (now known as River East LLC) and to Kerr-McGee Chemical Company (the corporate successor of Lindsay Light Company and now known as Kerr-McGee Chemical, LLC) requiring River East and Kerr-McGee to perform a removal action with respect to the radiologically impacted soil on the 316 East Illinois Street site (which USEPA designated "Lindsay Light II") and on any areas off the Lindsay Light II site on which such radiologically impacted soils were found. Subsequently, radiological impacts were discovered at the site which was owned by Grand Pier Center, LLC immediately to the west of (and across Columbus Drive) Lindsay Light II and which was designated by USEPA as "Lindsay Light II/RV3 North Columbus Drive". USEPA determined that the radiological impacts at Lindsay Light II/RV3 North Columbus Drive were associated with the former operations of Lindsay Light Company. On March 29, 2000, USEPA amended the UAO to require Kerr-McGee, River East and Grand Pier to perform removal action at Lindsay LightII/RV3 North Columbus Drive.

TRS has previously entered into a contract to sell the subject site to a third party purchaser that engaged environmental consultants to perform environmental investigations of the site. B. Koh & Associates, Inc. ("Koh") performed a radiological investigation of the site including surface gamma radiation readings, down-hole radiation readings and soil sampling and analysis. Koh's report dated May 2000 documented its findings of elevated gamma radiation and radiological concentrations at the site. TRS reported the findings in the Koh report to USEPA. On March 1, 2001, USEPA issued an Action Memorandum Amendment setting forth determinations by USEPA that, among other things, (1) the radiological impacts at the site are associated with the former operations of Lindsay Light Company and (2) the UAO requires Kerr-McGee to proceed with a removal action with respect to the radiological impacts at the site.

TRS has made demand on Kerr-McGee to perform all removal actions required at the site but Kerr-McGee has not agreed to perform all such removal actions. In order to provide for the performance of the removal actions, TRS and Kerr-McGee have agreed that (1) TRS will perform excavation, screening and sampling at the site as described in this Removal Action Work Plan, (2) Kerr-McGee will transport and dispose of the radiologically impacted soils removed from the site, and (3) TRS and Kerr-McGee reserve their rights to, among other things, recover their costs with respect to their respective work activities which they will perform with respect to the site.

The following reports of previous environmental investigations were provided by TRS for the preparation of this Removal Action Work Plan.

- Letter dated August 22, 1990 from OHM Corporation to GMO Limited Partnership
- Environmental Site Assessment dated August 28, 1990 prepared by Professional Service Industries, Inc.
- Visual Site Inspection dated December 30, 1993 prepared by USEPA, Region 5, with attached Preliminary Assessment/Visual Site Inspection Report dated December 16, 1993 prepared by PRC Environmental Management, Inc.
- Preliminary Environmental Review dated March 8, 2000, prepared by GaiaTech, Inc.
- A Phase II Soil and Groundwater Investigation Report Time-Life Property, Grand Avenue and McClurg Court, Chicago, Illinois, dated May 11, 2000, prepared by GaiaTech, Inc.
- Summary of Radiological Survey Time-Life Property, Chicago, Illinois, dated May 2000, prepared by B. Koh & Associates, Inc.
- Scanner Van Survey of the Chicago, Illinois Streeterville area dated July 12, 2000 prepared by USEPA Radiation and Indoor Environments National Laboratory.

The intent of the removal actions is to perform the site survey, identify impacted soil and materials, and remove all impacted soil and materials to the proposed cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228). The following activities must be accomplished to complete the project:

- All identified radiologically impacted material above the proposed cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) has been removed from the site
- TRS has received USEPA verification sign-off that all radiologically impacted materials above the cleanup threshold have been removed from the site
- Equipment and personnel have been demobilized from the site
- TRS has submitted the required documentation to USEPA for closure of the site

- USEPA has responded acknowledging the sufficiency of the removal and documentation, in accordance with the UAO and Amendments

PROJECT/TASK DESCRIPTION AND SCHEDULE

ELEMENT A6

A Project Tasks

There are three phases of removal work: the Investigation and Delineation Phase; the Initial Contaminant Removal Phase; and the Site-wide Excavation, Monitoring, and Removal Phase. The Investigation and Delineation Phase was begun with the survey and sampling work previously completed by Koh as reported in their May 2000 report. This phase will continue with the site surveys to be conducted as the asphalt pavement is removed. The Initial Contaminant Removal Phase will consist of the removal of the radiologically impacted zones identified in Phase 1. Finally, the Site-wide Excavation, Monitoring and Removal Phase will involve the surveying of all fill soils on-site, and the segregation and removal for disposal of all radiologically impacted soils encountered. A more complete description of these activities is presented in Section 3.0 - Methodology of the Remediation Work Plan.

Task 1 - Investigation/Delineation Phase, Project Quality Objective.

On May 31, 2000, TRS informed USEPA that elevated levels of radioactive materials had been detected at the GMO property. This notification was based on the Koh report dated May 2000, which documented the presence of seven locations on site that exhibited gamma radiation levels above background levels, and the results of radiologic analysis showing radioactivity levels requiring removal. This information was supported by the USEPA Scanner Van radiation survey of the GMO property and a gamma survey meter walkover by USEPA staff. Following this disclosure, TRS, Kerr-McGee LLC, and USEPA met several times to discuss the extent of the contamination on the GMO property and make preparations for its cleanup. Also, a letter was sent to TRS and Kerr-McGee on July 13, 2000. This letter addressed the need to prepare a Remediation Work Plan for a site cleanup in accordance with the June 6, 1996 UAO.

The project quality objectives for the proposed work plan are threefold. The removal is intended to result in all soil above the clean-up criteria of 7.1 pCi/g total radium being removed from the site. Field and laboratory data quality and minimum detection limits must be sufficient to confirm that all soils exceeding this threshold have been removed. Achieving this objective will result in unrestricted use of the property with regard to radiologic impacts.

The second objective is to confirm that all radiologically impacted soils are disposed at facilities licensed to accept these materials. The Work Plan covers the removal of the radiologically impacted soils for disposal at Envirocare of Utah, Clive, Utah. Other materials, which may be removed from the site, include the asphalt pavement, large demolition rubble such as foundation walls or floor slabs, and possible chemically contaminated materials unsuitable for use as backfill. The screening criteria (7.1 pCi/g) and data quality objectives (disposal at a facility permitted for the material) for the non-radiological material excavated from the site, i.e., pavement and chemically impacted material, will be the same as for the uncontaminated soil which remains on site. The larger blocks of demolition debris will be cleared by frisking and wipes in accordance with requirements per 32 IAC Part 340 Appendix A for off-site release of equipment.

The third objective is to confirm that all personnel working on the site are working under conditions that reduce or eliminate potential exposure to contamination. The air monitoring, film badge monitoring, and PPE requirements specified in the Health and Safety Plan, Attachment 3 to the Work Plan provide for those objectives to be met.

As the project progresses and areas are remediated, the documentation of clean closure will be generated by USEPA. The remedial objective of removing all radiologically impacted soil will be met when the project site has been documented as having met the clean-up criteria over the entire parcel and USEPA acknowledges the removal action is complete.

Task 2 - Target Compounds

The Lindsay Light Company produced incandescent gas mantles near the GMO site. Some manufacturing and/or processing of thorium-bearing monazite sand reportedly took place at the 316 East Illinois Street site. A principal ingredient in gas mantle manufacture is thorium as a nitrate. Small amounts of cerium, beryllium, and magnesium nitrates are also used. Thorium was extracted from the monazite sand using an acid leach. The gas mantles were then dipped into a solution containing the thorium nitrate to provide the mantle's incandescence strength.

Thorium occurs in nature principally as the parent radionuclide Thorium-232 in association with its daughter products in a decay sequence known as the Thorium Decay Series. It is believed that the principal source of contamination at this site is Thorium 232 and thorium decay series nuclides. Cleanup levels will be based on total radium, Ra-226 and Ra-228. The clean-up level specified by USEPA is 5 pCi/g total radium above the background level. Background levels have been determined on vicinity properties to be 2.1 pCi/g total radium. This results in a clean-up criteria of 7.1 pCi/g total radium.

Radiologic analysis of soils from the subject site were performed in May 2000. The results of those analyses indicated the presence of thorium and thorium decay chain compounds only. This would include Ra-228, but not Ra-226. Results as high as 2880 pCi/g of thorium 288 were measured. Analysis for the surrogate Ac-228 on the same sample measured 2110 pCi/g.

Task 3 - Sampling Rationale

The radioactive materials are present in the soil and urban fill. No evidence of groundwater contamination has been identified. Any water removal from the site will be allowed to settle any suspended sediment before discharge. Fugitive dust will be monitored. The principal matrix of concern is soil contamination. The following will be completed prior to any site work:

- The site grid at 5 meter spacing will be established.
- The site boundaries will be located and marked.
- The location of all surface features such as the guardrail, storm drain catch basins, utility vaults, light standards, etc. will be mapped.
- A photographic record of the site will be made and retained in the project files.

The beginning of the removal work task will be to begin removal of the asphalt pavement cover in stages. Once the asphalt paving is removed from each area of the site, 100% of the soil surface in each such area will be surveyed for elevated gamma readings. The survey will cover the exposed soil on survey lines spaced 5 meters. Gamma count values shall be taken at intervals spaced 5 meters (5 x 5 meter grid). The site grid will be marked by stakes and flagging at the edges of the property and by paint on the ground surface on the interior of the site. The areas between the grid points will be scanned following the Gamma Radiation Survey Procedure SOP 210 so as to cover the intra-grid areas. Each exclusion zone will be verified as meeting the clean-up criteria in accordance with the Verification Sampling Procedure, SOP-223.

The sample network design and rationale for sample locations are described in detail in the Field Sampling Plan (FSP) (Appendix 9 of the Remediation Work Plan).

Task 4 - Analytical Rationale

Sample matrices, analytical parameters, and frequencies of sample collection are shown in Table 1-1. The waste characterization analyses are for the purpose of documenting whether the material proposed for

disposal at Envirocare of Utah is a RCRA hazardous waste. That demonstration will involve testing for parameters to evaluate the material for characteristic hazardous waste. SOPs for the waste characterization and groundwater analyses to be performed can be found in Appendix B.

Should it be necessary to discharge water into the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) combined storm and sanitary sewer system, analysis will meet the MWRDGC Appendix A discharge parameters list.

Other analyses are for the radiological constituents of concern. Constituents of concern for the removal documentation analysis have been selected based on constituents that represent the known contaminants. The constituents of concern are the entire thorium and uranium decay series; however, measurements will only be made for Ra-226 and Ra-228.

Soil samples will be analyzed for Ra-226 and Ra-228. Sample splits will be performed in the laboratory. Verification analyses will be performed on sub-sets of six samples. It is not proposed to analyze split samples due to the potential for heterogeneous materials

TABLE 1: SUMMARY TABLE OF SAMPLING AND ANALYSIS PROGRAM

Matrix	Lab/# of Samples			
	Severn Trent	RSSI	Field Lab S.A. Huber	Argonne National Lab
Soil Waste Characterization[1] Field Blank Trip Blank Lab Dup	 10 1 1 2			
Soil (Removal Action)[2] Estimate 5/day x 16 weeks x 5 day/week		Back-up capacity	Minimum 1 per exclusion zone, plus excavation monitoring- estimate 400	As requested
Groundwater (MWRDGC Discharge Permit Application) [3] Lab Dup Trip Blank	 1 1 1			
Soil (Closure Verification) [2] approx. 8,900 m^2. 6 samples per 100 m^2		Back-up capacity	6 per 100 m^2; est. 534	6 per 100 m^2; est. 534
Air (perimeter monitoring, personal air monitoring)[4] Daily Perimeter (4/day, 16 weeks x 5 days) Daily PAM (estimate 2/day x 16 weeks x 5 day)		Back-up capacity	Perimeter, 4 daily = 320 PAM, est. 2 daily = 160	
Soil (Lab cross validation) same set of 10 samples rotated to each laboratory		1 set, 10 samples	1 set, 10 samples	1 set, 10 samples

[1] Waste Characterization: TCLP volatiles, TCLP semi-volatiles, TCLP metals, herbicides, pesticides, gamma spec.
[2] Removal Action, Closure Verification: Radium-226, measured directly or using lead 214 as a surrogate. Radium-228, using actinum 228 as a surrogate. Nutranl system analysis by S.A. Huber or RSSI. High Resolution germanium detector by Argonne.
[3] MWRDGC Discharge Permit application: Appendix A pretreatment standards including gross alpha and gross beta.
[4] Site perimeter Air Monitoring, Personal Air Monitoring: alpha radiation emitters.

producing disparate results. Rather, the same samples will be run in each laboratory to provide for comparison of results on the same soil material.

The on-site laboratory Standard Operating Procedures (SOPs) for radiological analysis of samples will be used for this project. These project-required SOPs are included in Appendix B. TRS will provide the samples on a routine basis at the request of the USEPA. Air samples will be analyzed for gross alpha. Air samples will not be split. The procedures for radiological surveys are described in the FSP.

Air monitoring activities will also be a part of this QAPP. Airborne radioactivity data will be collected to evaluate the effectiveness of work procedures and site control measures. In addition to identifying the need for procedure modification, air monitoring also documents the effectiveness of such modifications. The collected airborne radioactivity data will measure releases of airborne radioactivity to the environment and ensure that people living and working in the area are not exposed to radiation above regulatory limits. The air monitoring program is described in more detail in the FSP.

Task 5 - Data Validation

Data will be validated at each step of collection, reduction, and reporting. This will include validation of the following:

- Laboratory validation of data will follow standard operating procedures. Laboratory validation of data will consist of monitoring the variations in the accuracy and precision of routine analytical procedures through the use of recovery values and blanks.
- Field data validation will follow standardized data collection procedures, including calibration procedures will be used. Each person assigned to each data collection task is responsible for understanding and employing the standard procedures to be used. Field data collected will be recorded on appropriate data collection forms or a field notebook.
- Laboratory data received from the analytical and soil laboratories will be reviewed by the project manager for obvious discrepancies. The data validation process will include an assessment of holding-time compliance, laboratory instrument tuning and performance, calibration procedures, results of calibration, and results of equipment, travel, and method blanks.
- Calculations include data manipulations made that can be checked and that are made in conjunction with the analysis or interpretation of data, engineering design, cost estimate, or any other related activity. Calculations will be reviewed according to the applicable procedures in this document.
- Upon receipt of data reports from the laboratories, data will be reviewed for obvious discrepancies. After screening, the data will be entered into the appropriate database. After data

entry, the entries will be printed and checked against the original data. Errors will be corrected and the corrections verified by checking against the original data.

Further details on data validations tasks and procedures are included in Element D1 of this QAPP.

Task 6 - Quality Assurance Assessments

Quality Assurance Assessments will be conducted of the field survey data through sampling and laboratory analysis of soils. Sampling will include both soil with high field readings indicating radiologic impacts well above the clean-up criteria, and soil with low field readings indicating material below the clean-up criteria. Samples will be taken of the highest material encountered in each inclusion zone on a daily basis. Samples will also be taken on a daily basis of soil indicating level below the clean-up criteria. These analyses will be run at the field laboratory.

Quality assurance assessment of the field laboratory will be done periodically through the analysis at a second laboratory of the soil samples analyzed at the field laboratory. Those analyses will be run at either the USEPA subcontract laboratory, Argonne National Laboratory, or at one of the subcontract laboratories for STS, which include Severn Trent of St. Louis, Missouri, or RSSI of Morton Grove, Illinois.

Internal and external performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the FSP and the QAPP. Internal audits of field activities (sampling and measurements) will be conducted by the TRS Project Quality Assurance Supervisor. The audits will include, but not be limited to, examination of field sampling records, field instrument operating records, sample collection, handling and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody, etc. External audits may be conducted by personnel from the USEPA Region 5 Air and Radiation Division with assistance from USEPA's National Air and Radiation Environmental Laboratory and/or USEPA's Environmental Monitoring Systems Laboratory.

The internal performance and system audits of the laboratories will be conducted by a qualified STS auditor. The system audits, which will be done annually, will include examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedure, sample preparation and analysis, instrument operating records, etc. External performance and system audits of the laboratories may also be conducted by USEPA Region 5 Air and Radiation Division personnel.

Further details on the planned QA assessments are contained in Element C1 of this QAPP.

Task 7 - Data Usability Assessment

Data, which has been validated in accordance with the procedures in Task 5 above, will be reviewed and reconciled with the Project Data Quality Objectives. Specifically, this review will assess the ability to document that the clean-up criteria are being met for material remaining on site, the measurements and documentation are adequate for the material being shipped off site, and health and safety measurements are within data quality limits for all personnel potentially exposed to radiologically impacted materials. Further details on the data usability assessment are contained in Element D3 for this QAPP.

Field data will be assessed by the STS Project Manager or her designee. She will review the field results for compliance with the established QC criteria that are specified in the QAPP and FSP. Laboratory results will be assessed for compliance with required accuracy and completeness as follows:

- Accuracy of laboratory results will be assessed for compliance with the established QC criteria that are described in Element C1 of this QAPP.
- Data completeness of laboratory analysis results will be assessed for compliance with the amount of data required for decision making. The completeness is calculated using the following equation:
- Completeness (%) = $\frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100$
- Data will be validated at each step of collection, reduction, and reporting.

The proposed QA system employs corrective and preventive action to correct and eliminate root causes of problems which are systemic and/or repetitive, or which could occur at a future time. Corrective action is necessary to remedy nonconformities that occur in the QA System. Corrective action includes:

- Identification of observed nonconformances in supplied product, services, operations, or output product
- Investigation of the discrepancy
- Determination of the cause
- Initiation of actions to correct the nonconformance to a degree appropriate to the magnitude of problems and commensurate with the risks encountered
- Evaluation of the effectiveness of the corrective action in preventing recurrence
- Changing the system and system documentation when necessary

Task 8 - Project Documentation

Field notebooks, field reports, sample data logs, soils radioactivity data, sample data analyses, progress reports, audits reports, quality control reports, equipment maintenance reports, health physics data, civil construction and excavation data, material transport records, chain of custody records, verification sampling, and closure documents will be generated for the removal actions at the GMO site. Given the relatively short anticipated duration of the excavation activities for this project, data can be effectively managed utilizing the paper records required in the Removal Action Work Plan.

An on-site field laboratory will be used to analyze soil samples as excavation and removal proceeds, and for pre-verification sampling that the clean-up criteria have been met. Analytical records will be kept at the site and at the Vernon Hills, Illinois offices of TRS's contractor, STS Consultants, Ltd. Air monitoring analyses will be maintained at both the site and STS's offices, and will be transmitted with the weekly progress reports to USEPA.

B. Project Schedule

The Project Schedule (Figure 3-2 of the Amended Removal Action Work Plan) shows the projected start and completion dates for project activities. The project's completion within the constraints of this schedule is dependent upon the weather factors cited below, the timely approval of the Removal Action Work Plan by USEPA, and the timely receipt of any required permits.

Constraints on unloading frozen soils at Envirocare indicate that it will generally not be feasible to excavate in cold weather. The freezing of soils in the shipping containers and the general prospects for inclement weather would seriously affect soil-handling operations at the Site. As a result, the schedule proper completion of excavation and transport to Envirocare by late fall 2001.

QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA
ELEMENT A7

The overall QA objective is to meet and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results that accurately depict the quantities being measured. Specific procedures for sampling, chain-of-custody, laboratory instruments calibration, laboratory analysis, reporting of data, internal quality control, audits, preventive maintenance of field equipment, corrective action, types of quality control checks required (reference samples, controls, blanks, interlaboratory comparison), the frequency of each check, and the quality control acceptance criteria for these checks are described in other sections of this QAPP. Radionuclide analyses of soils by gamma

spectroscopy is not amenable to sample surrogate spikes. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness, and comparability.

A. Data Quality Objectives (DQOs) Process

Step 1: Stating the problem

There are three phases of work that comprise this Work Plan. These consist of the Investigation and Delineation Phase, the Initial Contaminant Removal Phase, and the Site-wide Excavation, Monitoring and Removal Phase. The Investigation and Delineation Phase was begun with the survey and sampling work previously completed by Koh and Associates, as reported in their May 2000 report. This survey and sampling included walkover gamma scans on all accessible portions of the parking lot and soil samples obtained from 33 borehole locations. Thorium concentrations at 7 locations were found to exceed the NRC release limit (see Figure 3-1 of the Amended Removal Action Work Plan).

This phase will continue with the site surveys to be conducted as the asphalt pavement is removed. The Initial Contaminant Removal Phase will consist of the removal of the radiologically impacted zones identified in Phase 1. Finally, the Site-wide Excavation, Monitoring and Removal Phase will involve the surveying of all fill soils on site, and the segregation and removal for disposal of all radiologically impacted soils encountered.

Given the site's manufacturing history, some of the radiologically-impacted soils might also be contaminated with hazardous wastes. Radiologically-impacted soils will be sampled and waste characterization analyses performed to determine the appropriate disposal method.

Step 2. Identifying the Decision

The Decision Statement is: "Determine whether soils, in addition to those areas already identified as radiologically-impacted, need to be removed to clear the site of all radiologically impacted soils. Determine whether the known radiologically impacted soils in the previously identified contaminated zones also contain hazardous wastes."

Step 3: Identifying Inputs to the Decision

Inputs to the decision will include previous sampling efforts and previously established regulatory thresholds for adjacent properties. The Koh and Associates May 2000 Report presents survey and sampling results from the site. The survey and sampling included walkover gamma scans on all accessible portions of the parking lot and soil samples obtained from 33 borehole locations. Thorium concentrations at 7 locations were found to exceed the NRC release limit. Once the radiologically impacted soils have been removed from these known locations, all remaining fill soils on the site will be sampled in 18-inch lifts.

USEPA has previously established the baseline cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) for other sites covered by the UAO. This is the proposed threshold level for this Site also.

Step 4: Defining the Boundaries of the Study

The boundaries for the Study are property line, up to but not including the sidewalks. The scale of decision making is the entire site, including the surface soils and subsurface fill down to native soils and/or sand. The temporal boundaries of the Study are sampling during temperate weather. Excessive rain and subfreezing temperatures will halt the sampling and cleanup activities. No additional constraints to data collection exist.

Step 5: Developing a Decision Rule

The decision rule is "if elevated gamma readings are detected (above 7.1pCi/g) total radium (Ra-226 + Ra-228) during the survey of 100% of the soil surface, that soil will be removed in 18-inch lifts until such time as no elevated readings are detected, and the underlying soil is verified as clear of radiological impacts by USEPA."

The decision rule for the waste characterization is "for those soils with radiological impact in excess of the threshold level, if any hazardous chemicals are detected in concentrations above the regulated allowable limit, they will be separated and disposed of separately from the soils with only radiological impacts."

Step 6: Specifying Limits on Decision Error

Given the level of readings encountered in the Koh study, the removal action will commence with the areas of known radiological impact. After removal of these known soils, all remaining soil will be sampled. Since all soil on the site will be sampled, and verification sampling will be performed on the entire site, the probability of a decision error occurring which results in radiologically-impacted soils being left on the site is less than one percent. Decision errors for the laboratory analyses are part of the laboratory's SOPs and Method Procedures.

Step 7: Optimizing the Design

The first phase of sampling on the site was completed in the Koh study, which resulted in mapped locations of known radiological impact. In addition to these known areas of impact, upon removal of the existing asphalt the entire site will be measured for radiological impact exceeding the threshold amount, using a 5 x 5 grid and complete sampling of the intergrid areas. Sampling of all soil and the verification sampling of the remaining underlying soil is viable, when considering the known levels of contaminants and the temporal constraints. Verification sampling will be performed for the entire site once all the fill soils have been sampled for radiological impact and separated for disposal of the radiologically impacted soils.

B. Measurement Performance Criteria

The fundamental QA objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. Accuracy is a measure of the nearness of a measurement to the true value of the quantity being measured.

Precision is a measure of the closeness to each other of repeated measurements of the same quantity. Duplicate (laboratory split) samples are considered to represent the same population if analyzed values are within two standard deviations of the population mean. That is:

$$A \pm a\sigma - B \pm b\sigma = 0$$

for some value of "a" and "b" when "a" and "b" range from 0 to 2.

The sensitivities required for radionuclide analyses will be the U.S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 4.14.

Precision is defined as an estimate of variability in a measured property, that is, an estimate of agreement among individual measurements of the same property under similar conditions (paraphrased from the subcontract laboratory QAMP, Section 8.3.1, page 45 or 92). Precision of a measurement is affected by random errors, or random variability in the measured property.

Inasmuch as radioactivity is a measurement of the decay of a population of radionuclides and the specificity of decay of an atom is random, it is only in a sufficiently large population that the precision is achieved. Higher levels of activity will result in increased precision, given a constant counting time. Increased precision will result from increased count times for low activity material.

The data quality objectives for the laboratory analyses through the subcontract laboratory are provided in tables 8.4-5, 8.4-6 and 8.4-7 in Section 8 of the laboratory QAMP, attached as Appendix D.

Table 2 presents the data quality objectives for the field measured data. Note that these apply to the contaminant and removal documentation measurements, principally radionuclides, and not to operational measurements such as dewatering wells, excavation side slopes or dust control.

Table 2. QA Objectives for Field Measurements

Matrix	Measured Parameter	Test Method	Precision [1] Low	Precision [1] High	Accuracy [2]	Completeness
Soil	Gamma counts per minute	SOP 210	+- 30%	+- 10%	10% for analog and digital ratemeter, 2% for digital scaler	+95%
	Gamma survey mode (2 second rolling)	SOP 210	+- 50%	+- 20%	10% for analog and digital ratemeter, 2% for digital scaler	+ 95%
Soil	Th - 232	NUTRANL	+- 100%	+- 25%	~+ 20% [3]	95%
	Ra - 226	NUTRANL	+- 100%	+- 30%	~+ 20% [3]	95%

1 High activity is defined as 2x the cleanup criteria of 7.1 pCi/g.
2 Per Manufacturer specifications (Ludlum 2221 Scaler Ratemeter, October, 1998)
3 Over-estimate based on comparison with USEPA laboratory results, Argonne National Lab.

Accuracy is defined as the extent of agreement between sample results and the true value of the parameter being tested, in this case, the level of radiological contamination. Laboratory control samples will be used to evaluate sample accuracy, using spiked samples. The accuracy of the spiked sample is measured by the percent recovery of the analyte. The spike recovery is calculated as follows:

$$\% \text{ Recovery Accuracy} = \frac{\text{Spiked Sample Conc.} - \text{Unspiked Sample Conc.} \times 100}{\text{Spiked Concentration Added}}$$

The SOPs for the field radionuclide screening are outlined in Document 210 of Appendix B. Accuracy and precision requirements for field screening analyses are included in Table 3. Sensitivity requirements of equipment are specified in the SOP describing the equipment. The laboratory's sensitivity for Ra-226 and Ra-228 is summarized on Table 5. Tables 6 and 7 show the minimum detectable limits for Total Solid Particulates (TSP) by Th-Alpha (gross alpha) and the minimum detectable activity for TSP by gamma spectroscopy and the minimum detectable levels for gross alpha and gamma spectroscopy, respectively.

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under normal conditions. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness (\%)} = \frac{\text{number of valid data}}{\text{number of samples collected for each parameter analyzed}} \times 100$$

Data generated by the laboratory has a completeness target of 90 percent.

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the proper design of the sampling program and proper laboratory protocol. The sampling network was designed to provide data representative of site conditions. The rationale of the sampling network is discussed in detail in the FSP. Representativeness will be satisfied by assuring that the FSP is followed, proper sampling technique are used, proper analytical procedure are followed and holding times of the samples are not exceeded in the laboratory. Representativeness will be assessed by the analysis of duplicate (laboratory split) samples.

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in the QAPP, are expected to provide comparable data. These new analytical data, however, may not be directly comparable to existing data because of differences in procedures and QA objectives.

Table 3
Summary of Sample Collection and Analysis [a]

Purpose	Sample Method	Ra-226 and Ra-228 Analysis	Alpha	Duplicate (Field Split) Samples
Air Monitoring	High-Volume Air Monitoring Station	(b) (c)	(b)	0
Verification Sampling	Soil Sampling	(d)	-	6 sub-samples per set

(a) Does not include field QC samples.
(b) A minimum of one sample collected from four separate air monitoring locations per 8 hour period (one day ot operation) for the site. Filters will be changed daily. TSP analysis procedures are described in Section 5.3 of the Air Monitoring SOP-212.
(c) Air samples will be tested for gross alpha.
(d) Verification sampling frequency defined in Verification Sampling Plan (Appendix 5 of the Remediation Work Plan).

Table 4

Radiological Laboratory QA Objectives

Purpose	Method	Accuracy	Precision	Completeness
Ra-226 and Ra-228	NaI Gamma Spectroscopy	±I- 2σ	±I- 2σ	90
Ra-226 and Ra-228	HpGe Gamma Spectroscopy	±I- 2σ	±I- 2σ	90

Table 5
Minimum Detectable Activity for the On-Site Laboratory Soil Counter by Gamma Spectroscopy

Counting Time	Ra-226, pCi/g	Ra-228, pCi/g
2-Minutes	1.40 ± 0.60	1.30 ± 0.56
5-Minutes	0.93 ± 0.40	0.83 ± 0.36
10-Minutes	0.67 ± 0.29	0.62 ± 0.27
20-Minutes	0.61 ± 0.26	0.55 ± 0.24

The onsite laboratory conditions are:

- 20 gram soil placed in a 20-ml polyethylene liquid scintillation counting vial
- Sample counted in a Packard Minaxi system (NaI (Tl) well-type gamma detector)
- Date processed using NUTRANL software. The standard deviation includes the compounded errors of the analysis
- Minimum Detectable Activity per USNRC Regulatory Guide 4.14 (at 4.65 times the standard deviation of the analysis for the instrument background).

Table 6
Minimum Detectable Limits for Th-Alpha (Gross-Alpha)
By TSP (Total Solid Particulates)

Air Sample Type	Run Time (mins)	Flow Rate (L/min)	Volume (cc)	Alpha BKGD (counts/min)	Alpha MDA [a] (dpm)	Alpha MDA (µCi/cc)	Th-232 MDA [b] (µCi/cc)
Craseby GMW-2000	10080	1416	1.4E+10	0.3	0.5	4.7E-17	9.4E-18
SAIC AVS-80A	1440	169.9	2.4E+08	0.3	0.5	2.7E-15	5.4E-16
SAIC AVS-60A*	480	198.2	9.5E+07	0.3	0.5	7.0E-15	1.4E-15
Eberline RAS-1	480	45	2.2E+07	0.3	0.5	3.1E-14	6.2E-15

Air Sample Type	Run Time (mins)	Flow Rate (L/min)	Volume (cc)	Alpha BKGD (counts/min)	Alpha MDA (dpm)	Alpha MDA (µCi/cc)	Th-232 MDA[b] (µCi/cc)
MSA Flow-Lite	2400	2	4.8E+06	0.4	0.6	1.6E-13	3.2E-14

(a) MDA calculated per USNRC Regulatory Guideline 4.14 assuming samples counted on a gas flow proportional counter with an efficiency of 34.1 % and a count time of 30 minutes.

(b) The Th-232 decay series contains seven alpha-emitting nuclides: Th-232, Th-228, Ra-224, Rn-220, Po-216, Bi-212, and Po-212. Of these, the first three nuclides can be assumed to be in complete equilibrium. The noble gas Rn-220 (thoron) may be ejected from the original matrix by recoil from the alpha particle decay of Ra-224. The fraction of Rn-220 that is removed via emanation is dependent on several variables, and is assumed to range from 10 to 40%. The emanating fraction is assumed to be transported away from the original matrix. If 40% of the Rn-220 escapes, the activity of the Rn-220 and its three alpha-emitting progeny nuclides will be at 60% of the Th-232 activity. These four alpha-emitting nuclides produce a total of 3.35 alpha emissions per Rn-220 decay. Since the Rn-220 activity is 60% of the Th-232 activity, these four nuclides only emit the equivalent of two alpha particles per Th-232 decay. These two alphas when combined with the three alpha particles from the nuclides in full equilibrium with the parent, result in the total emission of the five alpha particles. Thus, the Th-232 contribution will be one-fifth or 20% of the total alpha activity.

Table 7
Minimum Detectable Activities for Gamma Spectroscopy

Nuclide	MDA, uCi	TSP Volume, ml	MDA, uCilml
Pb-210	4.0E-05	9.5E+07	4.2E-13
Pb-212	2.0E-06	9.5E+07	2.1 E-14
Pb-214	3.7E-06	9.5E+07	3.9E-14
Bi-212	3.0E-05	9.5E+07	3.2E-13
Bi-214	4.4E-06	9.5E+07	4.6E-14
Ac-228	1.1 E-05	9.5E+07	1.2E-13
Th-234	1.1 E-05	9.5E+07	1.2E-13
Pa-234m	8.6E-04	9.5E+07	9.1 E-12

SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

ELEMENT A8

Radiation field surveys will be conducted by health physics technicians experienced and trained in the use of the instruments. Radiation survey work will be conducted under the supervision of a certified health physicist, and reviewed by the Project Coordinator and STS Project Manager.

The field laboratory will be operated by a health physics technician trained in the operation of the NUTRANL software and detector equipment. The alpha counter will also be operated by an experienced health physics technician. All NUTRANL and alpha counter data will be reviewed by the health physics supervisor.

Site and project specific radiation and health and safety training will be provided for all on-site personnel prior to work on-site. All personnel required to work in the Contamination Reduction Zone or the Exclusion Zone shall complete training conforming to the requirements of 29 CFR 1910.120(e). Field personnel shall complete radiation safety training in compliance with 32 IAC 400. Training will be conducted by a qualified safety specialist and/or a qualified senior health physics technician, at a minimum. The Project Training Plan is included in Attachment 7 to the Work Plan.

DOCUMENTATION AND RECORDS

ELEMENT A9

A. Documents and Records Generated

The following types of data will be generated during the project:

- Surface gamma survey records

- Soil sampling records
- Soil sample field laboratory data
- Fixed laboratory soil analyses data (USEPA contract and STS subcontract laboratories)
- Air quality sampling records
- Air quality analytical data

Surface Gamma Survey Records - These records will be kept on the attached forms (Figure A-9.1). A copy will be maintained in the field office and the original filed in the STS Vernon Hills, Illinois office. Survey equipment calibration records (daily equipment check records) will be maintained in the field office files.

Soil Sampling Records - These records will be documented in three places. A bound field log book will be maintained by each person conducting field sampling. The pages will be sequentially numbered. Records will include the sampler's name, date, sample number, sample location including site grid and depth, gamma readings, climate and any unusual conditions. The soil sampling records will include a chain of custody (Figure A-9.2). Each sample container will be uniquely identified on the chain of custody. The soil sampling records include the individual sample containers. Each container will have the unique sample number, date, sampler's name or initials, sample time, and project name (GMO) on the sample label.

Soil Sample Field Laboratory Data - These data will be provided in two forms. The initial NUTRANL data set will consist of one set per sample and will include the radionuclide concentrations and error limits for uranium 238, thorium 232, radium 226, and potassium 40; the sample number; date and time sampled; laboratory number (sequential); identify the analyst; and analytic method (NUTRANL).

The second field laboratory data form will be a consolidated spreadsheet with all analysis in sequence by laboratory number. This table will include the sample number, data and time sampled, radionuclide concentrations and error limits for the four NUTRANL analytes, and a line totaling the thorium and radium concentrations. The field laboratory will also maintain a copy of the chain of custody for those samples received and analyzed.

Fixed Laboratory Soil Analyses Data - Records for the fixed laboratories, either the USEPA contract laboratory at Argonne or the STS subcontract laboratories, Severn Trent and/or RSSI, will include chain of custody copies, sample receipt and tracking forms, preparation and analysis logbooks, raw data forms, tabulated data summaries, calibration records, and standards, QC sample results, and any corrective action reports.

Air Quality Sampling Records - These records will include duration of sampling including precise start and stop times, date, location on the site parameter, flow rate, sampling equipment, sampler's initials, climate, and any unusual conditions of the sampled interval or vicinity. For PAM samples, the personnel will be identified and the location(s) worked, in addition to start/stop times, data, flow rate, equipment, climate and any unusual conditions.

Air Quality Sample Results - Data will include a unique sequential laboratory number, the chain of custody, sample identifier (either location or personnel), time and date, one day alpha count and a 4-day alpha count.

B. Data Reporting Package Format and Documentation Control

Data will be recorded in field logbooks according to the procedures in the Field Logbook SOP, 215. As noted in SOP-215, logs for each day will contain, at a minimum,

- Personnel on site (including contractors, visitors and regulators, as applicable)
- Weather
- Equipment used and calibration
- Sketch of applicable work area
- Work summary.

The Project QA Supervisor will perform audits of the field notebooks periodically during the project. The Project Manager or her designee will also review the logbooks prior to submitting monthly reports to EPA. These management audits and QA reports will be submitted to EPA at the end of the Project, as outlined in C1. The Project Manager is responsible for assuring adherence to data quality objectives concerning data reporting and data management.

All waste characterization laboratory analysis performed by STL will follow STL's Data Review and Verification SOP (STL-QA-0011). In addition, data reporting requirements for specific analyses are found in the following SOPs:

- Extraction and Cleanup of Organic Compounds from Waters and Soils, CORP-OP-0001STL
- Toxicity Characteristic Leaching Procedure and Synthetic Precipitation Leaching Procedure, CORP-OP-0002STL
- Gas Chromatographic Analysis Based on Method 8000B, 8021B, 8081A, 8082 and 8151A, SW-846, CORP-GC-0001STL

- GC/MS Analysis Based on Methods 8270C and 625, CORP-MS-0001STL
- Determination of Volatile Organics by GC/MS Based on Method 8260B, 624 and 524.2, CORP-MS-0002STL
- Acid Digestion of Soils, SW846 Method 3050B, CORP-IP-0002STL
- Reactive Cyanide, STL-IP-0001
- Reactive Sulfide, STL-IP-0002
- IDL/MDL Determination, STL-QA-0016
- Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by FLAA or ICP Spectroscopy (Method 3010A), STL-IP-0013
- Inductively Coupled Plasma-Atomic Emission Spectroscopy, Spectrometric Method for Trace Element Analyses, SW-846 Method 6010B and EPA Method 200.7, CORP-MT-0001STL
- Preparation and Analysis of Mercury in Aqueous Samples by Cold Vapor Atomic Absorption, SW846 7470A and MCAWW245.1, CORP-MR-0005STL
- Preparation and Analysis of Mercury in Solid Samples by Cold Vapor Atomic Absorption Spectroscopy, SW846 7471A and MCAWW 245.5, CORP-MT-0007STL
- Cyanide Analysis by the Technicon Traacs 800 Autoanalyzer, STL-WC-0002
- Analysis of pH in Water, STL-WC-0011
- Analysis of Sulfide in Water, STL-WC-0012
- Analysis of pH in Soil, STL-WC-0021
- Flash Point by Pensky-Martens Closed Cup Tester, STL-WC-0026
- Paint Filter Liquids Test, STL-WC-0031
- Preparation of Samples for Gamma Spectroscopy, STL-RC-0025
- Daily Operations of a Germanium Spectroscopy System, STL-RD-0101

C. Data Reporting Package Archiving and Retrieval

STS will store all project records at its Vernon Hills office until directed by EPA to dispose of the records. TRS and the EPA will have access to the data. Any other access will be allowed only after clearance from both TRS and the EPA.

SAMPLING PROCESS DESIGN

ELEMENT B1

The sampling system has been previously described. The project schedule is presented in Element A6, and the sampling design rationale is presented in Element A7.

SAMPLING METHODS REQUIREMENTS

ELEMENT B2

The details of the field sampling procedures for the radiological samples are described in FSP.

In addition to the radiological soil samples, soil sampling will include the following parameters for the Waste Characterization Samples.

Ignitability	Flash Point
Corrosivity	pH
Reactivity	unstable, reacts violently with water, is sufficiently cyanide or sulfide bearing the produce toxic gas, or is capable of detonation.
Toxicity	TCLP analysis for regulated contaminants

Groundwater sampling will consist of the following parameters for the groundwater discharge samples, for discharge to the Chicago city sewers.

Waste or Chemical	Concentration (mg/L)
Cadmium	0.11
Chromium (total)	2.77
Copper	2.07
Cyanide (total)	1.20
Fats, Oils and Greases (FOG) (total)	250.0
Iron	250.0
Lead	0.5
Mercury	0.0005
Nickel	3.98
Zinc	2.61
Dichloromethane	0.294
Chloroform	0.309

1,1,1-Trichloroethane	0.193
Trichloroethylene	0.242
Benzene	0.278
Tetrachloroethene	0.225
Toluene	0.247
Ethylbenzene	0.329
Volatile Organic Compounds (total)*	0.567
Total Toxic Organics**	2.13

pH Range - Not lower than 5.0 or greater than 10.0

Temperatures of liquids or vapors at point of entrance to the sewerage system shall not exceed 150°F.

* Total Volatile Organic Compounds shall be the arithmetic sum of the concentrations of:

dichloromethane
chloroform
1,1,1-trichloroethane
trichloroethylene
benzene
tetrachloroethene
toluene
ethylbenzene
acrolein
acrylonitrile
1,3-butadiene
carbon tetrachloride
chlorobenzene
dichloroethane
dichlorobenzene
1-ethyl 2-methylbenzene
napthalene
styrene
1,3,5-trimethylbenzene
vinyl chloride
xylenes

1,4-dioxane
ethylene dibromide
methyl ethyl ketone

** Total Toxic Organics shall be the arithmetic sum of the concentrations of those pollutants found under Title 40 Part 413.02(i) of the Code of Federal Regulations.

Field sampling procedures for these non-radiological samples are included in the FSP.

SAMPLE HANDLING AND CUSTODY REQUIREMENTS
ELEMENT B3

It is the USEPA and Region 5 policy to follow the USEPA Region 5 sample custody, or chain-of-custody protocols as described in "NEIC Policies and Procedures," EPA-330/9-78DD1-R, revised June 1985. This custody is divided into three parts: Sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A. Field Activity and Sampling Documentation

Field Logbooks will be used to document all sampling activities. Chain of Custody forms shall be completed for all samples (air, soil, and waters). The following information shall be included in the field logbook regarding samples and may be cross referenced with the Chain of Custody Form:

Soil and Water:

- Initial of Technician collecting the sample
- Time and date of sample collection
- Location where sample obtained using appropriated sample grid notations
- Depth where soil sample was obtained
- Count rate (cpm) at the location where sample was obtained
- Unique sample number
- Additional applicable comments pertaining to description of sample matrix, weather, or other factors that may affect sample analysis

Air:

- Initial of Technician collecting the sample

- Time and date of sample collection
- Start and Stop time of air sampler (used to calculate volume)
- Starting and ending flow rate of air sampler
- Location or air sampling station
- Unique sample number

B. Sample Labeling

All samples shall be labeled with the above information and placed into a plastic bag for transfer to the field laboratory. Samples are typically batched in groups depending on their purpose or location (e.g. QC, blanks, close-out, screening).

The technician shall ensure that the information on the sample container is also transferred to the Chain of Custody Form (See Attachment 1). Prior to labeling the containers, the technician shall ensure that the exterior of the sample container is free from loose soils and/or radioactive contamination. All SOPs still apply for samples leaving an Exclusion Zone. To ensure that all information is retained and verifiable, all applicable information shall also be recorded in the field logbook. Once the sample is transferred to the Field Laboratory it shall be assigned a unique sample number in sequential order.

All samples shall be labeled using permanent ink. No whiteout or erasures are allowed. Any entry that is to be deleted will use a single crossout that is signed and dated.

C. Transfer of Samples

Samples shall be collected and transferred to the field laboratory only by trained and authorized Health Physics personnel. Proper Chain of custody shall be demonstrated by documenting that the sample is always in the possession of an authorized person and under custody. Custody is considered to be in someone's direct possession and/or view, or secured in a locked are under the person's control. Each sample custodian shall sign off on the Chain of Custody form (signature, time and date) for each transfer.

D. Laboratory Custody Procedures

When the samples are received in the laboratory, proper Chain of Custody shall be maintained. Samples shall be logged and assigned a laboratory sample number as soon as they are received. The laboratory technician shall sign the Chain of Custody form in the presence of the Transferor. From this point on the samples shall be considered to be in the custody of the field laboratory supervisor. The laboratory sample number shall be recorded on both the Chain of Custody Form and on the sample container label. This sample number will be assigned in a sequential format that allows each sample to be identified in a unique fashion.

A duplicate copy of the Chain of Custody form shall be placed into a binder when received. The original Chain of Custody form shall stay with the samples until they are placed in the final evidence file.

After all required analyses are performed the samples shall be held in a locked storage with limited access. All samples and analyses data shall be maintained until the appropriate regulatory agency approves disposal. Data from analysis shall be maintained in both a hard copy file as well as a backed up computer format.

E. Outside Laboratory Custody Procedures

In the event that samples need to be transferred from the Field Laboratory to another party, they shall be packaged in accordance with Department of Transportation regulations. Sample coolers shall have all necessary packing material to ensure that no leakage occurs. Un addition, a custody seal shall be placed on the cooler opening to identify unauthorized opening or tampering. Sample containers being shipped to outside parties will also be affixed with seals to identify tampering. Samples not being shipped to outside parties will not need to be sealed, as they are still under direct custody. Air bills used by the shipping company along with a duplicate copy of the Chain of Custody form shall be placed on file as documentation of custody.

F. Final Evidence Files

Upon project completion the following documents will be placed into the final evidence file:

- Chain of Custody forms
- Data from sample analysis
- Any applicable air bills

- Detailed description of final sample disposition. Samples shall be maintained until approval is received to dispose of them or return them to the waste generator
- Field logbooks from all applicable personnel

The final evidence file shall be held at the following address in a secure location:

Stan A. Huber Consultants, Inc.
200 North Cedar Road
New Lenox, Illinois 60451

The file custodian shall be Glenn A. Huber

As required by Section V.5 of the UAO, Kerr-McGee, TRS and all their contractors and agents will preserve all documentation for a minimum of six years following completion of the removal action. The content of the evidence file will include all relevant records, reports, correspondence, logs, field logbooks, laboratory sample preparation and analysis logbooks, data packages, pictures, subcontractor's reports, chain-of-custody records/forms, data review reports, etc. The evidence file will be in the custody of the TRS's Project Manager, and kept in a secured area.

ANALYTICAL METHODS REQUIREMENTS

ELEMENT B4

A field laboratory will be used to analyze samples onsite. The Health Physics subcontractor, Stan A. Huber Consultants, Inc., will manage this laboratory. Off-site laboratory services will be provided by Severn Trent Laboratories (STL) of St. Louis; Missouri, RSSI of Morton Grove, Illinois; and Grace Laboratories of Chicago, Illinois. STL will perform waste characterization analyses, RSSI will serve in a back up capacity to STL, and Grace Labs will perform the potential groundwater analysis. Argonne National Laboratory will provide laboratory subcontract services to USEPA for radiological analysis of samples from this project.

Radium analysis (Ra-226 and Ra-228) will be conducted on soil samples. Analysis will be through gamma spectroscopy at fixed laboratory facilities (Severn Trent Laboratory and Argonne National Laboratory) and through NUTRANL at the field laboratory.

Severn Trent Laboratory
13715 Rider Trail North
Earth City, Missouri 63045-1205

Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439-4836

Field Laboratory
341 East Ohio Street
Chicago, Illinois 60611

The following table summarizes the matrices, parameters and methods used for the various analyses. Reference SOPs for the onsite laboratory are contained in Appendix B. Due to the length of the SOPs from STL, one complete copy has been submitted under separate cover to USEPA and is accessible on CD-ROM for convenience. Further details about laboratory responsibilities are contained in Element A4.D of this QAPP.

Table 8. Laboratory Parameters and Methods by Matrixes

Parameter	Matrix	Method	Responsible Lab
NUTRANL	Solid	See SOPs, Appendix B	Field laboratory
Gamma spectroscopy	Solid	HASL AM-02 MOD	STL
Volatiles	Solid	SW846 8260B	STL
Semi-Volatiles	Solid	SW846 8270C	STL
Pesticides (Organochlorine)	Solid	SW846 8081A	STL
Herbicides (Organochlorine)	Solid	SW846 8151A	STL
RCRA Metals	Solid	SW846 6010B	STL
Corrosivity (pH)	Solid	SW846 9045A	STL
Paint Filter	Solid	SW846 9095, free liquids	STL
Reactive Sulfide	Solid	SW 7.3.4	STL
Reactive Cyanide	Solid	SW 7.3.3	STL
Ignitability (Flashpoint)	Solid	SW846 1010, closed cup	STL
Cadmium	Solid	SW846 6010B/7000	Grace
Chromium (total)	Solid	SW846 6010B/7000	Grace
Copper	Solid	SW846 6010B/7000	Grace
Cyanide (total)	Solid	SW846 335.3 modified for Lachat	Grace
Fats, Oils and Greases (FOG) (Total)	Solid	SW846 1664 with Hexane extraction	Grace
Iron	Solid	SW846 6010B/7000	Grace
Lead	Solid	SW846 6010B/7000	Grace

Parameter	Matrix	Method	Responsible Lab
Mercury	Solid	SW846 6010B/7000	Grace
Nickel	Solid	SW846 6010B/7000	Grace
Zinc	Solid	SW846 6010B/7000	Grace
Dichloromethane	Solid	SW846 8260B	Grace
Chloroform	Solid	SW846 8260B	Grace
1,1,1-Trichloroethane	Solid	SW846 8260B	Grace
Trichloroethylene	Solid	SW846 8260B	Grace
Benzene	Solid	SW846 8260B	Grace
Tetrachloroethene	Solid	SW846 8260B	Grace
Toluene	Solid	SW846 8260B	Grace
Ethylbenzene	Solid	SW846 8260B	Grace
Volatile Organic Compounds (total)	Solid	SW846 8260B	Grace

QUALITY CONTROL REQUIREMENTS

ELEMENT B5

A. Field Sampling Quality Control

Assessment of field sampling precision for the radiological verification sampling will be made through collection of replicate subsamples from the verification sample area. Six subsamples will be obtained by splitting one sample in the field. Each subsample will be analyzed separately in the field laboratory. The subsamples will be composited to develop a single sample for analysis by USEPA's contract laboratory at Argonne National Laboratory (Argonne).

Satisfactory precision will be met if the mean of the six subsamples is within 50% (relative percent difference (RPD)) of the result of the Argonne analytical result. Counting statistics for low activity samples will provide for RPD to increase to 100% for samples where all analysis are below the clean-up criteria of 7.1 pCi/g total radium.

QC procedures for field measurements are limited to checking the reproducibility of the measurement by obtaining multiple readings on a single sample or standard and by calibrating the instruments. Gamma radiological survey QC is described in Appendix B.

Two types of QA will be used by the laboratory to ensure the production of analytical data of known and documented usable quality. These types are QA program and QC checks.

B. Analytical Quality Control Checks

The Severn Trent laboratory has a written QA/QC program which provides rules and guidelines to ensure the reliability and validity of work conducted at the laboratory.

The stated objectives of the laboratory QA/QC program are to:

- Ensure that all procedures are documented, including any changes in administrative and/or technical procedures
- Ensure that all analytical procedures are conducted according to sound scientific principles and have been validated
- Monitor the performance of the laboratory by a systematic inspection program and provide for a corrective action as necessary
- Collaborate with other laboratories in establishing quality levels, as appropriate
- Ensure that all data are properly recorded and archived

All laboratory procedures are documented in writing as either SOPs or Method Procedures. Internal QC procedures for analytical services will be conducted in accordance with standard operating procedures and the individual method requirements.

The specifications include the types of QC checks required (reference samples, controls, blanks, interlaboratory comparison), the frequency of each check, and the quality control acceptance criteria for these checks.

The laboratory will document, in each data package provided, that both initial and ongoing instrument and analytical QC functions have been met. Any samples analyzed in non-conformance with the QC criteria will be re-analyzed by the laboratory, if sufficient sample volume is available. It is expected that a sufficient volume of soil will be collected for re-analyses.

INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE REQUIREMENTS

ELEMENT B6

As part of the FSP and the Health and Safety Plan, routine maintenance procedures for equipments used in the field in defined by both action and frequency. Both of these documents are included in the Remediation Work Plan.

As part of the QA/QC program, a routine preventative maintenance program is conducted by the laboratory to minimize instrument failure and other system malfunctions. The laboratory performs routine scheduled maintenance, and repairs or coordinates with the vendor for the repair of all instruments. All laboratory instruments are maintained in accordance with manufacturer's specifications and the requirements of the specific method employed. This maintenance is carried out on a regular, scheduled basis, and is documented in the laboratory instrument logbook for each instrument. Emergency repair or scheduled manufacturer's maintenance is provided by factory representatives. The laboratory SOPs are included in Appendix B.

INSTRUMENT CALIBRATION AND FREQUENCY

ELEMENT B7

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment that are used for conducting tests and laboratory analyses. These instruments and equipment should be calibrated prior to each use or on a scheduled, periodic basis.

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications.

Equipment to be used during the sampling will be examined to certify that it is in good operating condition. This includes ensuring that all maintenance requirements are being observed. Notes from previous sampling trips will be reviewed so that any prior equipment problem is not overlooked, and all necessary repairs to equipment have been completed.

Calibration of instruments is governed by the specific SOP for the applicable analysis method, and such procedures take precedence over the following general discussion. All survey instruments used during the excavation and restoration activities shall be calibrated semiannually or when maintenance is required

that could affect the calibration. Counters used for air samples shall be checked before use or daily, using calibrated reference sources. Vendor calibration procedures shall be in accordance with the American National Standards Institute (ANSI) N323-1978 and calibration shall be traceable to the National Institute of Standards and Technology (NIST).

Alpha counters use an ionizable gas to detect alpha radiation. The instrument measures alpha and beta/gamma present on filter paper. This instrument is checked daily using a reference source. The calibration procedure is described in the attached SOPs. Air pumps used to collect air monitoring samples will be calibrated daily.

Calibration of laboratory equipment will be based on approved written procedures. Records of calibration, repairs, or replacement will be filed and maintained by the designated laboratory personnel performing quality control activities. These records will be filed at the location where the work is performed and will be subject to QA audit. Calibration and record management procedures are presented in the applicable REF SOPs.

INSPECTION/ACCEPTANCE OF REQUIREMENTS FOR SUPPLIES AND CONSUMABLES
ELEMENT B8

Details of the procedures that will be used to ensure supply cleanliness and reagent purity are described in the FSP (Appendix 9 of the Removal Action Work Plan) and the attached SOPs in Appendix B. The inspection/acceptance requirements for consumables and supplies that will be used in the field and laboratory are detailed in SOP-LLII345, Surveys for Contamination and Release of Equipment for Unrestricted Use and in the documented SOPs and Method Procedures for the laboratories.

DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)
ELEMENT B9

The following reports of previous environmental investigations were provided by TRS for the preparation of the Remediation Work Plan.

- Letter dated August 22, 1990 from OHM Corporation to GMO Limited Partnership
- Environmental Site Assessment dated August 28, 1990 prepared by Professional Service Industries, Inc.

- Visual Site Inspection dated December 30, 1993 prepared by USEPA, Region 5, with attached Preliminary Assessment/Visual Site Inspection Report dated December 16, 1993 prepared by PRC Environmental Management, Inc.
- Preliminary Environmental Review dated March 8, 2000, prepared by GaiaTech, Inc.
- A Phase II Soil and Groundwater Investigation Report Time-Life Property, Grand Avenue and McClurg Court, Chicago, Illinois, dated May 11, 2000, prepared by GaiaTech, Inc.
- Summary of Radiological Survey Time-Life Property, Chicago, Illinois, dated May 2000, prepared by B. Koh & Associates, Inc.
- Scanner Van Survey of the Chicago Illinois Streeterville area dated July 12, 2000 prepared by USEPA Radiation and Indoor Environments National Laboratory.

The delineation of the radiologically impacted materials was initiated through an investigation completed by B. Koh and Associates, Inc. as documented in their May 2000 report listed above. The delineation will be further developed in the initial stages of pavement removal and ground survey, as described in Section 4 of the Removal Work Plan.

INSTRUCTIONS FOR DATA MANAGEMENT

ELEMENT B10

A. Data Recording

Two types of data will be collected: Field laboratory analysis using NUTRANL software and gamma spec detectors; and field survey gamma radiation data.

NUTRANL analysis reports are printed directly, one for each sample. A copy is attached.

The detector is calibrated daily. Calibration records are maintained at the field laboratory. Calibration forms are attached.

The Data Quality/Records Manager will review the results. Comparison with field survey data will provide a means of identifying errors. Calibration data will be reviewed weekly.

The field gamma surveys consist of manually collected data as the excavation proceeds. A sample data form is attached. Validation occurs as the soil is resurveyed at 18-inch intervals during excavation. When contamination is detected an exclusion zone is established and closure verification procedures are required.

Closure verification consists of a pre-verification survey when all identified impacted soil is removed. No documents are generated for that survey. A sample is collected, transmitted under chain-of-custody (copy attached) to the field laboratory, and analyzed by NUTRANL. Upon demonstration of the pre-verification sample passing the cleanup criteria, USEPA mobilizes staff to the site, conducts a walkover survey with no written documentation, and collects a set of six sub-samples for every 100 m^2 area to be verified as clean. Those samples are transferred under chain-of-custody to the field laboratory and analyzed by NUTRANL. Upon receipt of results showing the area meets clean closure standards, the results and a Notification of Successful Verification Survey Form is transmitted to USEPA On-Scene Coordinator for signing. A copy of a notification form is attached.

The verification samples are subsequently forwarded under chain-of-custody to USEPA's contract laboratory, Argonne National Laboratory. Reports of that analysis are not provided to be included in the documents generated for this investigation.

B. Data Validation

Data validation of the NUTRANL analysis is provided by comparison of six replicate analysis of subsamples for each verification analysis. Additionally, those data of the samples are provided to USEPA, with the samples reanalyzed at Argonne. The six replicate analysis and the field data from the closure verification surveys are compared to identify anomalous data.

C. Data Transformation/Data Reduction

A transformation is to be used for converting the measured radionuclides activity to the cleanup standard activity. NUTRANL will measure the following:

Uranium 238	(U-238)
Thorium 232	(Th-232)
Radium 226	(Ra-226)
Potassium 40	(K-40)

The cleanup criterion is 7.1 picocuries per gram (pCi/g) total radium, Ra-226 plus Ra-228. Radium 228 will be measured using thorium 232 as a surrogate.

The total radium activity will be calculated as follows:

Ra-226 + Th-232 = Total Radium

All data transformation calculations will be checked by the Data Quality/Records Manager.

D. Data Transmittal/Transfer

Two principal data transmittals will occur during the project: transfer of data from the field laboratory to the project team; and from the project team to USEPA.

Transfer of field laboratory data to the project team will include the following:

1. Field laboratory personnel will make a xerographic copy of the NUTRANL report and file sequentially by sample number.

2. A copy will be transmitted by facsimile to STS's offices in Vernon Hills, Illinois, to the attention of the Project Manager, John S. Esser.

3. The original will be hand delivered to the Data Quality/Records Manager at the project field office.

The field laboratory will also generate data regarding air quality monitoring. Those data will be provided directly from the laboratory in the same fashion as the NUTRANL data.

1. A xerographic copy will be made and filed sequentially by sample number.

2. A copy will be transmitted by facsimile to the STS Vernon Hills, Illinois, office to the attention of the Project Manager, John S. Esser.

3. The original will be hand delivered to the Data Quality/Records Manager at the field office.

These air quality data will be transmitted by the Project Manager to USEPA on a weekly basis with the weekly status report. That report and accompanying data will be transmitted by facsimile.

The verification analytical data for the six subsamples from each area to be closed will be transmitted by facsimile to USEPA with the Notification of Successful Verification forms upon receipt of complying data.

The signed forms are returned by facsimile from USEPA and copies are kept at the field office and at the STS Vernon Hills, Illinois office.

E. Data Analysis/Data Assessment

The data analysis and data assessment will consist of a pass-fail comparison to the cleanup criteria of 7.1 pCi/g total radium. There is no modeling involved. There are no secondary data manipulations involved. All computer data storage will be commercially available spreadsheets (Microsoft Excel) with no manipulation or calculation of the data other than as described above under Data Transformation.

F. Data Tracking

Data will be tracked by geographic grid designation. As a location is identified as thorium-impacted, the following steps will track the data and clean closure.

1. The impacted zone will be marked by rad rope (braided magenta and yellow) as an exclusion zone.

2. The coordinates of the exclusion zone will be marked on a daily report form (copy attached).

3. The exclusion zone(s) will be plotted on a site map daily. This site map will be maintained by the Field Team Leader and Data Quality/Records Manager. An updated copy (xerographic copy) will be couriered to the STS Vernon Hills, Illinois office weekly.

4. The Data Quality/Records Manager, or in his/her absence, the Field Team Leader, will confirm data verification analysis have been received, and Notification of Successful Verification form sent to and returned from USEPA before exclusion zone(s) are backfilled.

5. The field map of exclusion zone(s) will be marked in color to designate identified exclusion zone(s) (perimeter marked in red), and a verified clean exclusion zone(s) (interior shaded in green). The updated map will be copied (xerographic) and provided by courier weekly to the STS Vernon Hills, Illinois office.

6. The Data Quality/Records Manager will be the person responsible for data tracking and to confirm all appropriate data is received and stored at the field office and the STS Vernon Hills, Illinois office.

G. Data Storage/Retrieval/Security

Data will be stored in three locations in addition to whatever storage of transmitted data is provided by USEPA. At the project site, data will be initially stored by the field laboratory subcontractor. That storage will be both an electronic archive on the computer hard drive, and in a hard copy printout filed sequentially by sample number That location will be in a basement office in the Time-Life building adjacent to the project site and will be maintained for the duration of the fieldwork. Upon demobilization, that data will be transferred to the contractor's office in New Lenox, Illinois, and retained for one year.

The second location is in the STS field office at the project site. That data set will be maintained by the Data Quality/Records Manager. That location will be either in a construction-type trailer or a basement office in the Time-Life building. The data will be maintained at that location until completion of the fieldwork and notification from USEPA that all impacted soil has been removed from the site. Upon demobilization, the data files will be transferred to the STS Vernon Hills, Illinois office to be incorporated in the project files and archived for permanent storage.

The third location will be at the STS Vernon Hills, Illinois office. Copies transmitted to the Project Manager will be stored at this location until the field files are received following completion of the fieldwork. At that time, redundant files will be discarded and the permanent files placed in the STS project archives.

STS provides for off-site secure storage of electronic copies of project files. These will include data received by facsimile or email, and electronic tables or text generated for the project documentation. STS also provides for off-site secure storage of hard copies of project files following copying on microfilm after a period of on-site storage of approximately seven years.

The field laboratory space will be in secure, locked offices in the Time-Life building. The daily transmittal of data and weekly updates of site maps to the STS Vernon Hills, Illinois office provides for security with regards to the field office files.

ASSESSMENT AND RESPONSE ACTIONS

ELEMENT C1

Assessment

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the FSP and QAPP. The audits of field and laboratory activities may include two separate, independent parts: internal and external audits. This QAPP provides procedures for those audits that will be conducted by TRS and its contractors.

Two types of QA will be used by the laboratory to ensure the production of analytical data of known and documented usable quality. These types are QA program and QC checks.

The stated objectives of the laboratory QA/QC program are to:

- Ensure that all procedures are documented, including any changes in administrative and/or technical procedures;
- Ensure that all analytical procedures are conducted according to sound scientific principles and have been validated;
- Monitor the performance of the laboratory by a systematic inspection program and provide for a corrective action as necessary;
- Collaborate with other laboratories in establishing quality levels, as appropriate; and
- Ensure that all data are properly recorded and archived.

All laboratory procedures are documented in writing as either SOPs or Method Procedures. Internal QC procedures for analytical services will be conducted in accordance with standard operating procedures and the individual method requirements.

The specifications include the types of QC checks required (reference samples, controls, blanks, interlaboratory comparison), the frequency of each check, and the quality control acceptance criteria for these checks.

The laboratory will document in each data package provided that both initial and ongoing instrument and analytical QC functions have been met. Any samples analyzed in non-conformance with the QC criteria will be re-analyzed by the laboratory, if sufficient sample volume is available. It is expected that a sufficient volume of soil will be collected for re-analyses.

External performance and system audits of the laboratories selected for the project for approval/disapproval may be conducted by personnel from the USEPA Region 5 Air and Radiation Division with assistance from USEPA's National Air and Radiation Environmental Laboratory and/or USEPA's Environmental Monitoring Systems Laboratory. USEPA Region 5 Superfund FSS has the discretion to audit the waste characterization laboratory and these audits may or may not be announced.

Field Audits

Internal audits of field activities (sampling and measurements) will be conducted by the TRS Project Quality Assurance Supervisor. The audits will include, but not be limited to, examination of field sampling records, field instrument operating records, sample collection, handling and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody, etc.

A field audit will take place to determine that personnel are executing required project activities and to verify that all established procedures are being followed. Follow-up audits will be conducted to correct deficiencies and to verify that QA procedures are maintained throughout the excavation and restoration activities. The audits will involve review of field measurement records, instrumentation calibration records, and sample documentation.

External audits may be conducted by personnel from the USEPA Region 5 Air and Radiation Division with assistance from USEPA's National Air and Radiation Environmental Laboratory and/or USEPA's Environmental Monitoring Systems Laboratory.

Laboratory Audits

The internal performance and system audits of the laboratory(ies) will be conducted by a qualified STS auditor. The system audits, which will be done annually, will include examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedure, sample preparation and analysis, instrument operating records, etc.

External performance and system audits of the laboratories selected for the project for approval/disapproval may be conducted by personnel from the USEPA Region 5 Air and Radiation Division with assistance from USEPA's National Air and Radiation Environmental Laboratory and/or USEPA's Environmental Monitoring Systems Laboratory.

Reports

The auditor will prepare a report describing the audit findings. The auditor will review the report with the laboratory and the Project Manager, and provide a copy of the audit to the person responsible for that activity. Copies also will be submitted to the Project Manager and placed in the project quality assurance file.

The responsible party will respond to the audit findings, describing the cause of the finding, the remedy to be implemented to cure the deficiency, the actions to be taken to prevent the reoccurrence of the defect, and the schedule to address these actions.

When the indicated corrective actions have been completed, the responsible party will notify the auditor. When all findings have been addressed, the auditor will prepare a closing report documenting that the audit findings have been resolved, and that the audit has been closed. This report will be submitted to the Project Manager and placed in the project quality assurance file.

Response Actions

STS's QA system employs corrective and preventive action to correct and eliminate root causes of problems which are systemic and/or repetitive, or which could occur at a future time. When solutions require changes to the quality system and its documentation, those changes are recorded and captured within the document control system.

Corrective Action

Corrective action is necessary to remedy nonconformities that occur in the QA System. Nonconformities can be reported by the customer, by any supplier or by a contractor. Corrective action includes:

- Identification of observed nonconformances in supplied product, services, operations, or output product;

- Investigation of the discrepancy;
- Determination of the cause;
- Initiation of actions to correct the nonconformance to a degree appropriate to the magnitude of problems and commensurate with the risks encountered;
- Evaluation of the effectiveness of the corrective action in preventing recurrence; and
- Changing the system and system documentation when necessary.

Responsibility for corrective action is determined organizationally by the area affected. The Project Manager or designee approves all corrective action and periodically reviews corrective action to verify effectiveness. Corrective action involving a supplier or contractor requires that supplier or contractor to provide the following information:

- Description of factors contributing to the deficiency
- Description of the remedy to correct the nonconformance

Conditions adverse to quality, safety, reliability, or performance are documented and reported to appropriate management for corrective action.

Preventive Action

Where corrective action is necessary to eliminate a nonconformance or correct a deficiency within the quality assurance system, preventive action is taken to discover and eliminate potential nonconformance. Preventive action includes:

- Periodically reviewing work operations, audit results, quality records, service reports, and customer complaints to detect and eliminate potential causes of nonconformities
- Discovery and evaluation of alternative solutions to prevent nonconformance to a level corresponding to the risks encountered
- Implementation of an appropriate solution alternative

- Evaluation of the effectiveness of the preventive action to prevent recurrence
- Changing the system and system documentation when necessary
- Assuring that Management reviews all preventive actions
- Establishing procedures to assure that the preventive action process occurs continually

Responsibility for preventive action is the same as for corrective action discussed above.

Sample Collection/Field Measurements

All project personnel will be responsible for reporting all suspected technical or QA nonconformances or suspected deficiencies of any activity or issued document to the Project Manager or designee. The Project Manager will be responsible for assessing the suspected problems. The assessment will be based upon the potential for the situation to impact the quality of the product. If it is determined that the situation warrants a reportable nonconformance requiring corrective action, then a nonconformance report will be initiated by the Field Team Leader.

The Project Manager will be responsible for ensuring that corrective action for nonconformances are initiated by:

- Evaluating all reported nonconformances
- Controlling additional work on nonconforming items
- Determining disposition or action to be taken
- Maintaining a log of nonconformances
- Reviewing nonconformance reports and corrective actions taken
- Ensuring nonconformance reports are included in the final site documentation in project files

If appropriate, the Project Manager will ensure that no additional work that is dependent on the nonconforming activity is performed until the corrective actions are completed.

When it becomes necessary to modify a program, the responsible person notifies the Project Manager of the anticipated change and implements the necessary changes after obtaining the approval of the Project Manager. The change in the program will be documented on the field change request that will be signed

by the initiators and the Field Team Leader. The field change request for each document will be numbered serially as required. The field change request shall be attached to the file copy of the affected document. The Project Manager must approve the change in writing or verbally prior to field implementation, if feasible. If unacceptable, the action taken during the period of deviation will be evaluated in order to determine the significance of any departure from established program practices and action taken.

The Project Manager for the Site is responsible for controlling, tracking, and implementation of the identified changes. Reports on all changes will be prepared by the Project Manager and distributed to all affected parties that include the USEPA OSC. The USEPA OSC will be notified whenever program changes in the field are made.

Laboratory Corrective Action

Implementation of corrective actions for the laboratory will be the responsibility of the laboratory personnel.

REPORTS TO MANAGEMENT
ELEMENT C2

In addition to the audit reports submitted to the Project Manager in accordance with QAPP Element C1, a report summarizing QA activities and issues will be included with the final Excavation Closure Report. This report will be an attachment to the final Excavation Closure Report and will contain QA sections that summarize data quality information collected during the project.

The QA activities report in the final Excavation Closure Report will be a written report produced by STS and will contain the following information:

- Changes in QAPP
- Summary of QA/QC programs, training and accomplishments
- Results of technical systems and performance evaluation audits
- Significant QA/QC problems, recommended solutions, and results of corrective actions
- Data quality assessment in terms of precision, accuracy, representativeness, completeness, comparability, and method detection limit
- Indication of whether the QA objectives were met
- Limitations on use of the measurement data

DATA REVIEW, VALIDATION AND VERIFICATION REQUIREMENTS

ELEMENT D1

Data review, validation and verification requirements are presented in Elements B1, B2, B3, B4, B5 and B7. The Project QA Supervisor is responsible for validation of the laboratory data, as outlined in the Project Management Section. No deviations from the procedures presented in these Elements is anticipated.

DATA REDUCTION, VALIDATION, AND REPORTING PROCEDURE

ELEMENT D2

PURPOSE

The purpose of this procedure is to present protocol for data reduction, validation, and reporting. The procedure includes data listing and tables, validation for field and laboratory data, calculations, and statistical analyses.

SCOPE

This procedure applies to field and laboratory data generated at the Site.

REFERENCES

STS Consultants, Ltd. Quality Assurance Manual

EQUIPMENT AND MATERIALS

Chain-of-Custody Sheet

INSTRUCTIONS

Data Reduction Schemes

Data reduction schemes will be used to structure, analyze, simplify, and present collected data. These procedures assure a systematic approach to data reduction and analysis. Procedures to be used to manage these data are:

- Listing of data;
- Summary statistical tables; and
- Data simplification.

Listing Data

Data, as originally recorded in the field at the time of sampling or as reported and verified by the analytical or testing laboratory, are to be compiled in sampling reports for each sampling event or period. These data are to include the information pertaining to QC (e.g., field blanks, split samples). Laboratory reports are to indicate that the laboratory has performed and reported standard control procedures (e.g., duplicates, recovery analyses) and should include the data that were used to determine the method detection limit.

Data will be listed in an orderly and logical format. A computerized database system may be used. Accuracy of data lists and computerized databases, if used, are to be verified by treating the tabulations and entries as calculations.

Summary of Statistical Tables

Where appropriate for reporting purposes, data may be summarized and presented in tabular form. Appropriate summary statistics would be calculated and presented in a summary table. These statistics may include:

- total number of values
- mean
- median
- standard deviation

- minimum value
- maximum value
- minimum detectable activity concentration

Other statistics may be included in data summaries where appropriate.

The listing of data will be combined with the statistical summary. Sample sizes, ranges, and minimum and maximum values allow evaluation of spatial and temporal changes in parameter values. Statistical summaries will be developed as calculations are subjected to the requirements of the calculation procedures included in this document.

Data Simplification

Data simplification will be used as a tool for data reports. Data simplification is the presentation of data using ranking procedures. Rankings can be performed using mean, median, maximum, or minimum values. Rankings can be developed based on the information that the analyst wishes to convey. This procedure often is complimentary to graphical displays of data.

Validation Criteria

Data will be validated at each step of collection, reduction, and reporting using procedures summarized below.

Laboratory Validation

Laboratory validation of data will follow standard operating procedures specified in the laboratory QA plan. Data that do not meet validation criteria will be identified by the laboratory when the data report is issued.

Laboratory validation of data will consist of monitoring the variations in the accuracy and precision of routine analytical procedures through the use of surrogate recoveries, certified check standards, and instrument blanks. QC sample recoveries must fall within the upper and lower control limits for each control parameter. Instrument blanks are used to determine the method detection limit per NRC regulatory Guide 4.14. Calculations will be checked using the procedures in this document.

Field Data

As specified in this document, standardized data collection procedures, including calibration procedures will be used. Each person assigned to each data collection task is responsible for understanding and employing the standard procedures to be used. Field data collected will be recorded on appropriate data collection forms or a field logbook.

The Quality Assurance Supervisor will review representative data collection forms to confirm that proper data forms are used, that required information is recorded, and that calibrated equipment is used where appropriate.

Receipt of Laboratory Data

Data received from analytical and soil laboratories will be reviewed by the laboratory supervisor(s) for obvious discrepancies. The laboratory generating analytical data for this project will be required to submit results that are supported by sufficient backup and QA/QC data to enable the reviewer to determine conclusively the quality of the data. Validity of laboratory data will be determined based on the precision and accuracy of the objectives presented in this document. The data validation process also will include an assessment of holding-time compliance, laboratory instrument performance, calibration procedures, results of calibration, and results of instrument and method blanks. Upon completion of the review, the laboratory will be responsible for developing a QA/QC report for each analytical data package. All data will be stored and maintained according to the standard procedure of the laboratory QA plan. Where test data have been reduced, the reduction method will be described in the report provided by the laboratory or will reference the applicable section of the laboratory QA plan.

Laboratory data will be reported in the measurement units indicated in the analytical procedures. For tasks for which measurement units have not yet been determined, laboratory data will be reported in the measurement units specified in the appropriate work plan. Issuance of a laboratory report will indicate that requisite calculations specified in the laboratory QA plan have been completed and validated.

Where applicable, outlier treatments and statistical and trend analysis may be applied to the data for validation purposes. Verification criteria for these methods are described in this procedure.

Calculations

Calculations include data manipulations that can be checked and that are made in conjunction with the analysis or interpretation of data, engineering design, cost estimate, or any other related activity. Calculations include: solution of mathematical equations; preparation of input and checking of output of computer models; drawings of cross-sections, isopachs, contour maps; and other geologic, hydrologic, and engineering interpretations. Calculations also include any process or reasoning used to develop a conclusion used or expressed in a report. Calculations will be reviewed according to the applicable procedures in this document.

Database Entries

Upon receipt of data reports from the laboratories, data will be reviewed for obvious discrepancies. After screening, the data will be entered into the appropriate database. After data entry, the entries will be printed and checked against the original data. Errors will be corrected and the corrections verified by checking against the original data.

USABILITY/RECONCILIATION WITH DATA QUALITY OBJECTIVES
ELEMENT D3

Element A7 describes data reconciliation with data quality objectives. Element C1 describes assessment and response actions to be put in place when data do not meet the project quality objectives.

ATTACHMENT 1

PROJECT MANAGEMENT ORGANIZATION CHART

PROJECT MANAGEMENT ORGANIZATION CHART

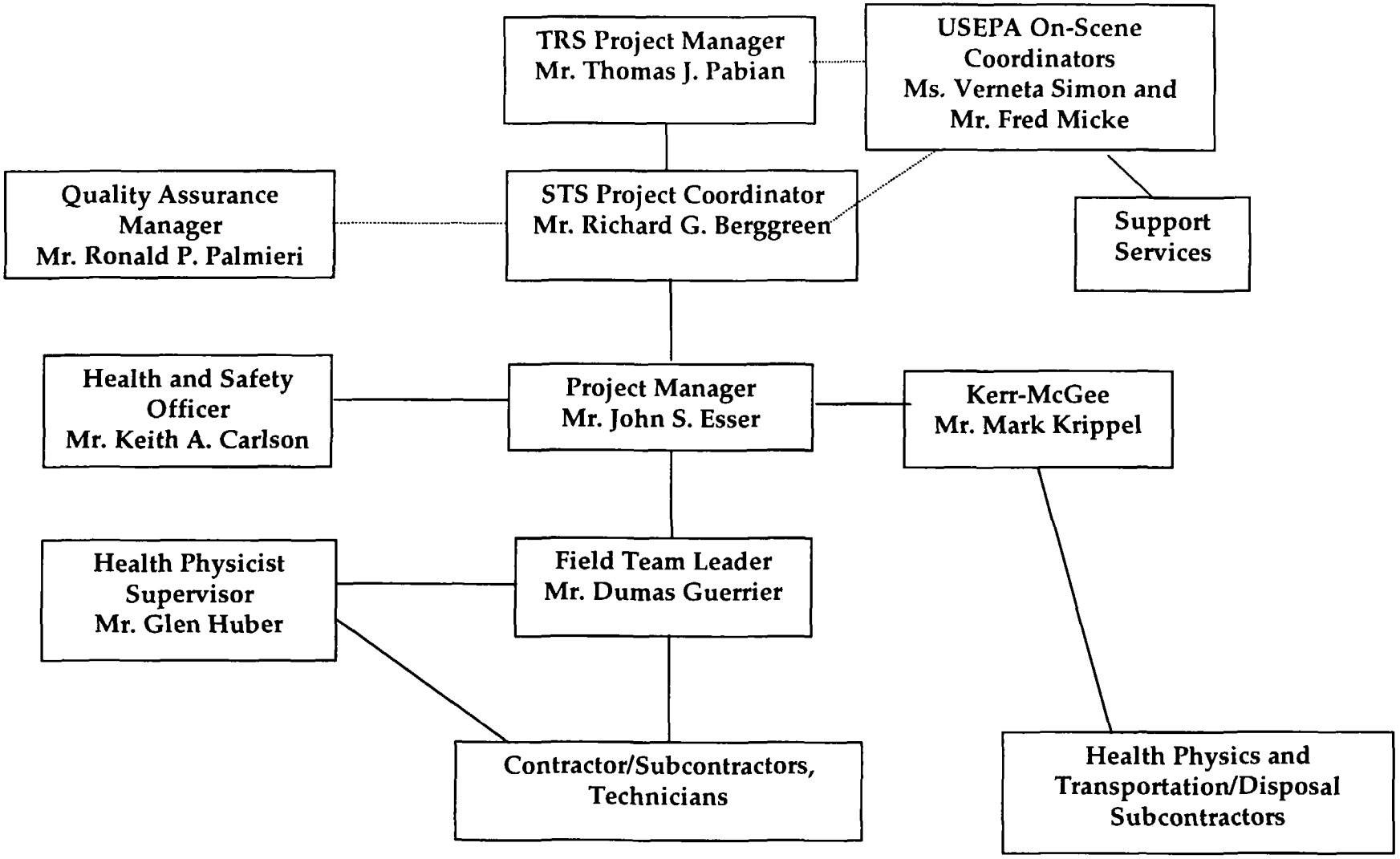


Figure 2-1

ATTACHMENT 2

CHAIN OF CUSTODY FORM
STAN A. HUBER CONSULTANTS, INC.

Stan A. Huber Consultants, Inc.
200 N. Cedar Rd.
New Lenox, IL 60451
(815) 485-6161
Fax (815) 485-4433

Results To:
Company STS Consultants, Inc.
Name Rich Berggreen
Address 750 Corporate Woods Pkwy.
City Vernon Hills ST IL Zip 60061
Phone (847) 279-2572 Fax

Bill To:
Company STS Consultants, Inc.
Name Rich Berggreen
Address 750 Corporate Woods Pkwy.
City Vernon Hills ST IL Zip 60061

Company STS Consultants, Inc.
Client Contact Rich Berggreen
Address 750 Corporate Woods Pkwy.
City Vernon Hills ST IL Zip 60061
Phone (847) 279-2572 Fax

P. O. #
Project #
Project ID: **Grand Pier/North Columbus**

Sample I.D. Location	Sample Type	Container Size	Container Type	Container Number	Sampling Date	Sampling Time	Lab I.D.	Analysis Ordered: NUTRANL					Comments/Description
	Soil	20 ml	Plastic Vial										

Chain-of-Possession

Relinqushed By:	Received By:	Date/Time	Relinquished By:	Received By:	Date/Time
Relinqushed By:	Received By:	Date/Time	Relinquished By:	Received By:	Date/Time
Relinqushed By:	Received By:	Date/Time	Relinquished By:	Received By:	Date/Time

ATTACHMENT 3

CHAIN OF CUSTODY FORM
QUANTERRA

Quanterra®

FIGURE 8.5-1
Example Quanterra® Chain-of-Custody Form

Reference Document No. _____
Page 1 of _____

Project Name/No.: _____
Sample Team Members: _____
Profit Center No.: _____
Project Manager: _____
Purchase Order No.: _____
Required Report Date: _____

Sample Shipment Date: _____
Lab Destination: _____
Lab Contact: _____
Project Contact/Phone: _____
Carrier/Waybill No.: _____

Bill To: _____
Report To: _____

ONE CONTAINER PER LINE

Sample Number	Sample Description/Type	Date/Time Collected	Container Type	Sample Volume	Preservative	Requested Testing Program	Condition on Receipt	Disposal Record No.

Special Instructions:

Possible Hazard Identification:
Non-hazard ❑ Flammable ❑ Skin Irritant ❑ Poison B ❑ Unknown ❑

Sample Disposal:
Return to Client ❑ Disposal by Lab ❑ Archive _____ (mos.)

Turnaround Time Required:
Normal ❑ Rush ❑

QC Level:

1. Relinquished by: *(Signature/Affiliation)* Date: _____ Time: _____	1. Received by: *(Signature/Affiliation)* Date: _____ Time: _____
2. Relinquished by: *(Signature/Affiliation)* Date: _____ Time: _____	2. Received by: *(Signature/Affiliation)* Date: _____ Time: _____
3. Relinquished by: *(Signature/Affiliation)* Date: _____ Time: _____	3. Received by: *(Signature/Affiliation)* Date: _____ Time: _____

Comments:

ATTACHMENT 4

CHAIN OF CUSTODY FORM
GRACE ANALYTICAL LAB, INC.

HONE (708) 449-9449 • FAX (708) 449-3663
300-B McDermott Drive • Berkeley, IL 60163

CLIENT INFORMATION

Project Manager:
Company:
Phone: Fax:
Project Name:
Project ID#:
Sampler:

SAMPLE RECEIVING RECORDS

Samples Received "On Ice" ☐ YES ☐ NO
Sample Temperature(If not "On Ice") _____c
Samples Intact/Not Leaking ☐ YES ☐ NO

SAMPLE CHARACTERISTICS

☐ NONHAZARDOUS
☐ Special Handling Required (Please Describe)

TURNAROUND

Date Required:
Schedule in advance to insure RUSH Processing

Comments / Special Instructions

QC Levels
___ None
___ Level 2
___ Level 3
___ Level 4

	FIELD ID, LOCATION / DESCRIPTION	DATE	TIME	MATRIX	Number of Containers	PRESERVATIVE		ANALYSIS NEEDED							REMARKS

MATRIX: Soil (S), Surface Water (SW), Ground Water (GW), Waste Water (WW), Waste/Solid (W/S), Waste/Liquid (W/L), Drinking Water (DW), Air Cassettes (AC); Note if COMPOSITE (C) or GRAB (G)
PRESERVATIVE: Nitric Acid (HNO_3), Hydrochloric Acid (HCl), Sodium Hydroxide (NaOH), Sulfuric Acid (H_2SO_4), Sodium Bisulfate ($NaHSO_4$), Methanol(CH_3OH), None

Relinquished By (Signature):	Date/Time:	Received By (Signature):	Date/Time:	Relinquished By (Signature):	Date/Time:	Received For Lab By (Signature):	Date/Time:
Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time	Relinquished By (Signature):	Date/Time	Received For Lab By (Signature):	Date/Time

WHITE - ORIGINAL FILE COPY

ATTACHMENT 5

NUTRANL LABORATORY REPORT

U-238	-.08	+/-	1.31
TH-232	.34	+/-	.36
RA-226	1.73	+/-	.61
K-40	22.83	+/-	11.61

S2618
K-(-8)-8'
10/31/00 13:08

NUTRANL RESULTS

ATTACHMENT 6

NUTRANL DAILY CALIBRATION FORM

Day-of-Use Constancy Record
Accuspec Gamma Counter – NUTRANL Analysis

For the Month of: _____

Standard Used: _____
Manufacturer Model Serial # Isotope Date Activity

Mean counts source standard: _____ σ: _____

Mean counts background (empty vial): _____ σ: _____

From χ^2 Test performed on: performed by:

Acceptable Range = 95.5% Confidence Interval $= x \pm 2\sigma$

Source Standard Range: _____ to _____
Background Range: _____ to _____

Date	Standard Count (5 min)	Background Count (5 min)	Within Acceptable Range Y or N?	Performed By:

This data was reviewed and approved by _____ on_____
as being complete and correct.

Review Notes:_____

Continue on back of page if needed.

ATTACHMENT 7

FIELD GAMMA SURVEY FORM

STS Consultants, Ltd.

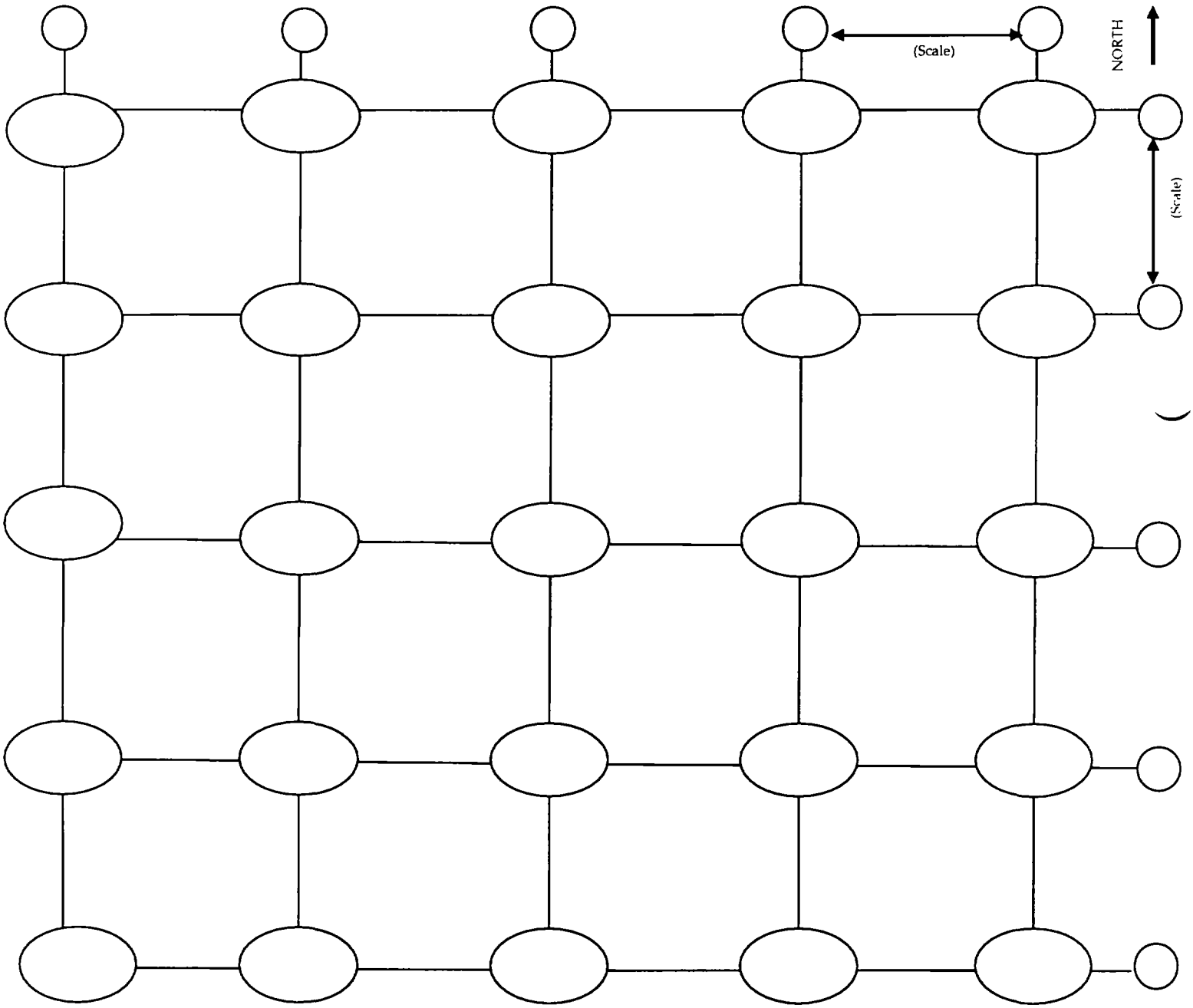
Project # _____ Project Name _____ Sheet ____ of ____

Date _____ Technician _____

Inst. Model _____ Serial No. _____

Inst. Calibrated (Y/N)? _____ Lift Elevation _____

Write grid designations in circles. Indicate excavated area with heavy line. Record counts at intersections in CPM. Indicate areas with audible alarms by shading the area.



ATTACHMENT 8

CHAIN OF CUSTODY FORM
STS CONSULTANTS, LTD.

CHAIN OF CUSTODY RECORD

№ 39293

RECORD NUMBER _____ THROUGH _____

Contact Person _____
Phone No. _____ Office _____
Project No. _____ PO No. _____
Project Name _____

Special Handling Request

- ☐ Rush
- ☐ Verbal
- ☐ Other

Laboratory _____
Contact Person _____
Phone No. _____
Results Due _____

Sample I.D.	Date	Time	Grab	Composite	No. of Containers	Sample Type (Water, soil, air, sludge, etc.)	Preservation		Field Data				Analysis Request	Comments on Sample (Include Major Contaminants)
									PID/FID		PH	Special Cond.		
							Y	N	Ambient	Sample				

Collected by:	Date	Time	Delivery by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received for lab by:	Date	Time	Relinquished by:	Date	Time

Laboratory Comments Only: Seals Intact Upon Receipt? ☐ Yes ☐ No ☐ N/A

Final Disposition:	Comments (Weather Conditions, Precautions, Hazards):

Distribution: Original and Green - Laboratory Yellow - As needed Pink - Transporter Goldenrod - STS Project File
Instructions to Laboratory: Forward completed original to STS with analytical results. Retain green copy.

6/99cp10k

STS Consultants
Consulting Engine

ATTACHMENT 9

NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY FORM

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: _____

Date of Verification Survey: _____

Time of Verification Survey _____ am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed:

Date _____

Print Name _____

Print Title _____

STS Consultants, Ltd.

The attached Verification Survey documents were reviewed by USEPA, Region 5 on _____. The results of this survey indicate that the verification criteria as contained in the UAO, have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date _____

Print Name _____

Print Title _____

For USEPA Region 5

ATTACHMENT 10

DAILY FIELD REPORT FORM

FIELD REPORT

Construction Technology Group

NOTE: The responsibilities and authority of STS and STS' Field Personnel include neither the responsibilities nor the authority of the "Competent Person" for the project site as defined by OSHA Regulations: 29CFR 1926 Subpart P.

Page _____ of _____

Project _____ Project No. _____

Location _____ Day/Date _____

Summary of technical and/or engineering services performed, including field test data. Locations, elevations and depth are estimated

* Field Test Data is Estimated - Pending Final Laboratory Test Results

Field Representative _____ By _____

Position _____ Title _____

Company _____ STS Consultants Ltd.

White - Office White - Field Yellow - Time Card

STS Consultants Ltd.
Consulting Engineers

STS Construction Technology Group

Field Location Diagram

Project _____ STS Project No. _____

Location _____ Date _____

TEACHERS' RETIREMENT SYSTEM - GMO SITE

POSITION DESCRIPTIONS

APPENDIX A

Title: Position Descriptions

Revision Number: 0

Date:

Replaces: New

TABLE OF CONTENTS

Project Coordinator	1
Project Manager	2
Field Team Leader	3
Project Quality Assurance Supervisor	5
Health and Safety Coordinator	7
Radiological Technician	9

POSITION DESCRIPTIONS

The following details the duties for which each position will be responsible. Resumes for assigned personnel are attached.

PROJECT COORDINATOR

The Project Coordinator is Mr. Richard G. Berggreen, C.P.G.

Duties

Approve all external reports before their submission to the USEPA.

Develop mechanisms to review and evaluate task products with respect to planned requirements, work orders and authorizations. Major responsibilities will include performing reviews of checklists prepared by the Field Team Leader and the Project Manager and cross-checking to ensure all necessary permits and testing have been done and filed, reviewing daily reports, reviewing files to determine work is properly documented, and working with the Project Manager to negotiate changes to standard procedures.

Acquire and provide technical and corporate resources as needed to ensure performance within budget and schedule constraints.

Main point of contact with regulatory agencies and the public. Represent the project team at meetings and public hearings.

Be responsible for the preparation and quality of interim and final reports.

PROJECT MANAGER

The Project Manager is Mr. John S. Esser.

Duties

Approve all external reports before their submission to the Project Coordinator.

Evaluate preliminary data to estimate time and needs for additional investigations and evaluate additional data to estimate time, needs and costs for surveying, excavation and restoration work.

Provide general guidance to the Field Team Leader for properly completing the work, and provide specific guidance for problems which arise during excavation and restoration activities.

Prepare and modify the master project schedule and cost estimate. Work directly with Project Coordinator on describing and justifying, as necessary, modifications to the schedule and costs.

Communicate with USEPA personnel on matters concerning the technical aspects and progress of the project. Make formal requests to the USEPA when work is ready for verification testing or agency inspection.

Be responsible for the preparation and technical quality of interim and final reports.

FIELD TEAM LEADER

The Field Team Leader is Mr. Dumas Guerrier

Duties

Coordination and management of field staff including surveying, excavating, sampling and restoration. Contact the Project Manager and the Project Coordinator if any changes to the approved work order or the specifications are necessary.

Preparation of the Work Order for Site, including: confirming estimates of extent of contamination; selecting, as necessary, locations for decontamination facilities, runoff controls, stockpile areas and staging areas (where equipment, materials, etc. will be put during the day or if left overnight); and determining starting points and direction(s) of excavation.

Provide day-to-day direction for the excavation and restoration work at the Site.

Work with the appropriate technical staff to determine if excavation has been properly completed.

Review test result sheets supplied by the laboratories, subcontractors, and construction personnel (such as the pre-verification radiological testing by the Radiological Technicians).

Work with the subcontractor's quality control testing personnel to ensure all required testing is properly done and documented, and review specifications as necessary prior to and during the work to ensure all work is properly done and documented.

Prepare daily construction reports describing the work completed, any testing, the results of monitoring at the Site, and any problems or unusual conditions which occurred and their resolution.

PROJECT QUALITY ASSURANCE SUPERVISOR

The Project Quality Assurance Supervisor is Mr. Richard G. Berggreen, C.P.G.

Duties

The principal responsibility of the Project Quality Assurance Supervisor is to implement and monitor compliance with established quality assurance program. This includes developing and supervising programs to implement quality assurance, to monitor the quality controls used for compliance with these programs, and to work with other project management personnel to identify and correct areas of non-compliance.

Quality Assurance implementation for the GMO Site project includes:

- developing and implementing a quality assurance program that governs quality controls application to project activities.
- developing audit, checklists, schedules, corrective actions tracking and other tools to summarize and manage the quality assurance and quality control requirements.
- developing, scheduling, and conducting training sessions to familiarize project personnel with applicable quality requirements.
- coordinate and scheduling a program of announced and unannounced audits of project activities and project records.
- conducting or leading announced and unannounced quality audits as required by the audit plan.
- assisting Project Management in identifying and resolving areas of non-compliance with the QAPP, the CQA Plan, or the Specifications.
- reporting the status of quality assurance and quality control compliance to Project Management Personnel according to the quality assurance implementation plan.
- reviewing submittals as requested by project management.
- making site visits and inspecting the construction site to review the work in progress, the completed work, and plans for future work.
- reviewing the test results supplied by the laboratories, subcontractors, and construction personnel to verify the completeness of the reports.

HEALTH AND SAFETY COORDINATOR

The Health and Safety Coordinator is Mr. Keith Carlson

Duties

Advises the Field Team Leader on all aspects of health and safety on site.

Administration of the Project Health and Safety Program.

Oversees or conducts periodic inspection of workers and work areas.

Plans and oversees or conducts site training/orientation and daily health and safety meetings.

Oversees or selects and periodically inspects protective clothing and equipment.

Oversees or conducts monitoring for on-site noise hazards and the use of hearing protection.

Approves storage and maintenance of protective clothing and equipment.

Oversees monitoring work parties for signs of stress, such as cold exposure, heat stress, and fatigue.

Oversees monitoring for on-site hazards and conditions.

Conducts periodic reviews to determine if the Site Health and Safety Plan is being followed.

Establishes emergency procedures, evacuation routes, and maintains the list of telephone numbers for the ambulance, local hospital, poison control center, fire department, and police department.

Participates in accident/incident investigations and prepares accident reports for Management.

RADIOLOGICAL TECHNICIAN

The Radiological Technicians are to be provided through the Health Physics Subcontractor, Stan A. Huber Consultants, Inc. The resumes of proposed technicians will be provided for review prior to beginning work.

Duties:

Provide day-to-day radiological monitoring of air and soil. Collect air and soil samples. Perform initial and verification surveys. Operate on-site laboratory: Ensure workers comply with regulatory requirements and that radiological controls protect the environment.

Assist Field Team Leader as required with other aspects of the project including but not limited to inspection, health and safety, field logbook entries, and reporting.

AREAS OF SPECIALIZATION

- *Environmental Geology*

EDUCATION

M.S., Geology, San Diego State University, 1976

B.A., Geology, Occidental College, Los Angeles, 1971

Graduate Studies, Geology, UCLA

REGISTRATION

Registered Professional Geologist: Illinois, California, Kentucky

Certified Professional Geologist: Indiana

AFFILIATIONS

Association of Engineering Geologists

Sigma XI

Representative Experience

Principal Geologist in the Environmental Sciences Group. Responsible for environmental and hazardous waste evaluations including municipal and hazardous waste landfill investigations, soil and groundwater monitoring and remediation projects at industrial facilities, and remedial investigations at controlled and uncontrolled waste disposal sites. Previous experience includes 11 years with major engineering consulting firm.

Representative project experience includes the following:

- Managed Phase I and Phase II environmental assessments for property transfers or refinancing on commercial and industrial real estate nationwide, including properties in AR, AZ, CA, CO, CT, DE, FL, GA, HI, IL, IN, KS, LA, MD, ME, MA, MN, MI, MO, MS, NC, NM, NY, OH, OR, PA, TN, TX, UT, VA, WA, and WI.
- Principal in charge of assessment and closure of underground storage tanks (USTs) at more than 40 sites for an Illinois utility. Included supervision of tank removal contractor, field sampling, subcontractor laboratory logistics, closure report preparation, and application for leaking underground storage tank (LUST) Trust Fund reimbursement.
- Supervised groundwater exploration program and design of first site to qualify under Illinois LUST Trust fund. Included design of monitoring well system, recovery well and water treatment system.
- Project Manager and Principal in charge of removal, closure, and remediation of more than 100 UST sites including retail service stations removing and upgrading USTs; industrial sites involving hazardous materials above-ground storage tanks (ASTs) and USTs, fuel oil USTs and motor vehicle fuel USTs; warehouse and commercial facilities removing USTs; and USTs encountered in the course of site development which require removal and soil/groundwater remediation.
- Principal involved in removal and disposal of TCE-contaminated soil and sludge classified as a

Resource Conservation and Recovery Act (RCRA) hazardous waste from a mining equipment re-manufacturing facility in central Indiana.

- Managed preparation of geologic, hydrogeologic and geotechnical reports at operating hazardous waste and municipal waste co-disposal facilities in Cook and Will Counties for state permit applications and USEPA Part B permit applications. Supervised the field installation and sampling of monitor well networks at site expansions and proposed sites in northeastern Illinois.
- Principal overseeing exploration, design and installation of remediation system to address toluene and xylene contaminated groundwater from a paint solvent release. The remediation consists of soil vapor extraction and ground water pump and treat.
- Principal on assessment of extent, design and installation of remediation system for volatile organic compounds contamination at an underground storage tank facility at a chemical manufacturing plant in the Chicago area. System consists of soil vapor extraction water treatment and NPDES discharge permit.
- Principal in charge of soil and groundwater investigation of pharmaceutical chemical manufacturing plant involving more than 700 soil borings, 40 monitoring wells and hydrologic assessments in site conditions in response to an administrative consent order. Included management of STS and subcontract personnel, coordination with client representatives and meetings with state agency representatives.
- Project Manager on an evaluation of groundwater contamination at a creosote wood-treating plant in Illinois. Included computer modeling of groundwater migration, assessment of contaminant migration rates, both vertically and horizontally, and potential contaminant retardation due to organic carbon partitioning in the site soils.
- Prepared annual RCRA groundwater monitoring reports for several facilities including a lead processing plant hazardous waste landfill and a sulfuric acid disposal pond in Missouri.

- Project Manager on hydrogeologic and permitting studies for six wood-treating facilities throughout eastern United States. Included aquifer assessments through tracer studies and pump tests; contamination assessments of soils, groundwater and surface water; and remedial investigation/feasibility studies (RI/FS) programs to provide recommendations on-site remediation.
- Project Geologist on an evaluation of a hazardous waste site with potential leakage into a developed aquifer in south central Kansas. Participated in the assessment and remedial measures design and installation.
- Project Manager and coordinator of the preparation of land use and land cover maps for more than 400 square miles of densely developed Cook County, Illinois. The maps were prepared on the basis of aerial photographic interpretation, topographic map assessments, and correlation with Cook County zoning maps.
- Project Geologist on a U.S. Army Corps of Engineers project of safety inspections for more than 65 dams in southeastern Missouri. These dams included both earthen and mine tailings dams and all had been classified as high hazard dams. Responsibilities included coordination of scheduling, field support services, liaison with the Corps of Engineers, geologic field explorations and report preparation.
- Worked on fault studies for critical structures such as hospitals, dams and nuclear reactor foundations, feasibility studies for underground storage of compressed air, environmental impacts of the siting of a large missile complex, and siting studies for liquified natural gas import terminals. The fault studies involved aerial photograph analysis, field mapping, trench logging and petrographic analysis of fault zones in Washington State, central and southern California, Argentina and Mexico. Involved evaluation of such hazards as on-site faulting, coastal and fluvial erosion, and slope stability. Participated in extensive aerial photograph reconnaissance in southeastern Alaska to evaluate fault potential for the Alaska-Canada pipeline.
- Project Manager on an evaluation of construction

resources, specifically construction grade sand and gravel, in California. Included evaluation of the potential resources in alluvial sediments, sedimentary rock formations, and crystalline bedrock units.

- Project Manager and supervisor of the geophysical surveying of more than 40 miles of flood control levees along the Illinois River in Central Illinois. The surveys were performed to identify potential sites for exploration of under-seepage problems due to permeable construction materials.

Publications

"Old Contamination, New Regulations, Close Cooperation, and Recent Remediation at a Chicago Lumberyard Brownfield Success," Proceedings of the TAPPI International Environmental Conference, Vancouver, B.C., Canada, co-authored, 1998.

"Polynuclear Aromatic Hydrocarbon Contamination in Downtown Chicago Fill Soils," Proceedings of the Association of Engineering Geologists Annual Meeting, Chicago, Illinois, co-authored, 1991.

"Characterization of Hydrogeology and Groundwater Contamination at a Creosote Wood Treating Plant in Southern Illinois," Annual Meeting Association of Engineering Geologists, Winston-Salem, North Carolina, 1985.

"Hydrogeologic Model of a Hazardous Waste Site, South-Central Kansas," International Association of Engineering Geologists International Symposium, Management of Hazardous Chemical Waste Sites, Winston-Salem, North Carolina, co-authored, 1985.

"In-Situ Measurement of Hydraulic Conductivity and Recharge through Wisconsinan Age Till, Northeastern Illinois," Annual Meeting Geological Society of America, Reno, Nevada, 1984.

"Recent Landslides in San Onofre Bluffs State Park," South Coast Geological Society Guidebook, Oct. 20, 1979 Field Trip, Guidebook to Selected Geologic Features Coastal Areas of Southern Orange and Northern San Diego Counties, California, 1979.

"Recency of Faulting on the Mount Soledad Branch of the Rose Canyon Fault Zone in Northwestern Metropolitan San Diego," Annual Meeting Geological Society of America, San Diego, California, co-authored, 1979.

"Geology of the Proposed Camp Pendleton LNG Site, San Diego, California," American Association of Petroleum Geologist Guidebook No. 46, Geologic Guidebook of San Onofre Nuclear Generating Station and adjacent regions of southern California, 1979.

"Sandstones Cemented by a Relict Phyllosilicate, San Diego, California," Transactions of the San Diego Society of Natural History, Vol. 18, No. 15, co-authored, 1977.

"Petrography and Metamorphism of the Morena Reservoir Roof Pendant, Southern California," California Division of Mines and Geology Special Report 129, co-authored, 1976.

"Petrography, Structure and Metamorphic History of a Metasedimentary Roof Pendant in the Peninsular Ranges, San Diego County, California," Cordilleran Section Annual Meeting, Geological Society of America, Pullman, Washington, co-authored, 1976.

AREAS OF SPECIALIZATION

- *Geotechnical Engineering*
- *Environmental Assessments*
- *Landfill Design/CQA*

EDUCATION

M.S. Civil Engineering, University of Illinois at Urbana-Champaign, 1983

B.S. Geology, University of Illinois at Urbana-Champaign, Magna Cum Laude, 1982

REGISTRATION

Professional Engineer: Illinois, Pennsylvania, Wyoming

AFFILIATIONS

American Society of Civil Engineers

Chemical Industry Council of Illinois

Representative Experience

Has worked on a variety of environmental and geotechnical projects in varying capacities, including project manager, staff engineer/geologist, resident engineer, and field and laboratory technician.

Geotechnical Engineering

Listed below is a sampling of engineering and project management experience on geotechnical projects.

- Various Clients and Locations-Project manager for numerous geotechnical investigations and reports for building construction projects in Massachusetts, Minnesota, New York, and Illinois. Typical project involvement included planning, coordination, geotechnical analyses and report and technical specification preparation.
- Various Clients, Boston, Massachusetts-Field engineer for construction inspection of numerous foundation projects ranging from shallow spread footings to rafts, piles, and caissons.
- Technical analyses and expert opinion reporting for legal institutions on geotechnical failures associated with foundation design and construction in Illinois.
- Central Artery North Area Section 1, Boston, Massachusetts-Task manager responsible for detailed evaluation of foundation improvement recommendations for the proposed I-93 and Route 1 interchange. Activities included evaluation of surcharge and vertical drainage to accelerate consolidation settlements of organic and low-strength clay soils.
- Southwest Corridor Project, Boston, Massachusetts-Field engineer during construction of a major cut-and-cover railway and transit tunnel in Boston. Duties included monitoring of foundation construction; installation, monitoring, and interpretation of geotechnical instrumentation (including sondexes, inclinometers, vibrating wire strain gauges, earth pressure cells, extensometers, and piezometers); and consulting and recommendation services to project owner.
- Bulkhead Construction, Lynn, Massachusetts-Field

CERTIFICATIONS

OSHA 40-Hour, Level B, Site Supervisor, and Annual Refresher Courses, 1986-1995

Statistics and Data Quality Objectives for Environmental Projects, University of Wisconsin Engineering Extension, 1996

Natural Resources Damage Assessment, WCG Professional Development Institute, 1995

Hydrologic Evaluation of Landfill Performance, USEPA/USACOE, 1995

Geosynthetics, Geosynthetic Research Institute, 1992

Clayey Barriers for Mitigation of Contaminant Impact and POLLUTE Software Training, University of Western Ontario, 1991

Clay Liners for Waste Containment Facilities, University of Texas, 1990

engineer during installation of an anchored bulkhead at the Boston Gas Company LNG storage facility. Specific duties included supervision of contractors on behalf of owner, monitoring field instrumentation, and providing field design services.

- Structural Condition Surveys, Boston, Massachusetts and Minneapolis, Minnesota-Field engineer responsible for pre-construction condition surveys of numerous structures in Boston, including historic landmark structures surrounding the International Place project and ground and basement levels of the Prudential Tower complex surrounding the proposed Hynes Auditorium Expansion Project. Included coordination of subcontracted electrical, mechanical, and settlement survey work.
- Multiple Dam Sites, Massachusetts-Project engineer for the field inspection and evaluation of over ten state-owned reservoirs and associated dams, dikes, spillways, and water distribution piping. Responsible for field condition survey and documentation report preparation.

Environmental Projects

Listed below is a sampling of engineering and project management experience on environmental projects.

- Confidential Client, Eastern U.S.-Project manager for development of operation and closure plans for multiple industrial waste landfills at a paper manufacturing mill.
- Janesville Disposal Facilities, Wisconsin-Project manager for the remedial design/remedial action work plan preparation and design development at the JDF SUPERFUND site. Responsibilities included RCRA/ CERCLA remedial design work plan preparation, site investigation planning and coordination, RCRA ground-water compliance monitoring and preliminary design.
- Amoco Corporation, Wyoming-Project manager for a solid waste landfill construction and RCRA hazardous waste solidification/stabilization at a former oil refinery. Responsible for design review, construction monitoring/documentation, construction-phase engineering, and closure certification.
- Amoco Corporation, Illinois-Technical peer review of

RCRA Facility Investigation Reports for a former oil refinery site. Technical issues included application of risk-based screening levels to Phase I investigation data and statistical evaluation of chemical data.

- Amoco Corporation, Illinois-Project manager for closure planning investigations at six former wastewater treatment system surface impoundments at a chemical manufacturing facility in Illinois. Responsible for project scoping and proposal preparation, project coordination, engineering analyses of remedial options, and coordination of risk-based corrective action level development.
- Quantum Chemical, Illinois-Evaluation of alternative statistical methods for a groundwater detection monitoring program with recommendations for implementation.
- British Petroleum, Ohio-Assisted in revising previous consultants' RCRA Phase I Facility Investigation Work Plan for an oil refinery. Responsible for drafting response to previous consultants' Notice of Deficiency and developing revised investigation strategies for selected SWMU's using DQO process.
- Various Landfills-Served as project/task manager for several landfill-related projects in Wisconsin and Pennsylvania. Projects included construction plans and specification preparation and/or construction quality control and quality assurance services, and certification. Facilities included clay and composite liners and covers, leachate collection, and gas control systems.
- MSW Facility, Illinois-Performed technical and engineering review of landfill permit application of facility owner on behalf of County Board. Provided comparison to applicable regulatory standards and standards of practice.
- NCR Corporation, Ohio-Project manager for soil and groundwater investigation of a RCRA facility. Duties included planning and management of Phase II installation and sampling of shallow and deep monitoring wells, and site characterization report.

- Various Projects-Provided statistical analysis of groundwater and soil chemical data for detection,

assessment, and compliance programs and remediation planning.

- Phase I and II Environmental Assessments-Project manager for Phase I and II environmental property assessments involving historical records search and field investigations.
- RCRA and MSW Landfill Sites, Illinois, Texas, and Wisconsin-Served as engineering technician and resident engineer for landfill construction projects. Activities included test liner programs, sealed double ring infiltrometer testing, liner and cover construction, and gas extraction system installation.
- Reynolds Metals, New York-Site engineer for expedited removal and remediation of PCB-contaminated soils. Responsible for field design assistance, monitoring of contractor activities, field documentation and report preparation for regulatory submittal.
- NIKE Missile Bases, Michigan and Illinois-Prepared work plans and served as field geologist for soil and groundwater exploration at former NIKE missile bases.
- SUPERFUND Sites, Michigan and Ohio-Planned and managed field activities associated with RI/FS programs at the two sites. Investigations and interpretative reports addressed geology, hydrogeology, and contaminant characterization using drilling, seismic, or electromagnetic surveys.

AREAS OF SPECIALIZATION

- *Troxler Nuclear Density Testing*
- *Heavy Equipment Operator*
- *CERCLA Hazardous Waste Training*
- *48-Hour Supervisor*
- *Certified Well Driller*
- *Environmental Technician*
- *CPR and First Aid Training*
- *Commercial Drivers License, Class B*
- *RAD Worker Level II Training*
- *Certified OSHA Safety Supervisor*
- *Soil*
- *Concrete*
- *Geotechnology*

FOREIGN LANGUAGES

- *Fluent in French and Spanish*

Representative Experience

Serves as field supervisor on environmental projects with over 25 years of experience in soil boring, well installation and special testing. Responsible for the safety of drill crews and environmental protocol.

- Master Driller in charge of field drilling operations for world's tallest building. Responsibilities included drilling, sampling, preparing borings for pressuremeter testing and Goodman Jack testing.
- Performed as Master Driller for the United Center and Comisky Park. Involved with drilling, sampling, pressuremeter testing and the installation of inclinometers.
- Acted as crew leader for borings performed at Fermi National Accelerator Laboratory. These borings included coring and sampling and were completed under difficult access and working conditions inside the enclosure for the B0 project.
- Master Driller involved with a project for Ohio Department of Transportation involving borings performed on alum sludge ponds where an all-terrain drill rig was driven on to the alum ponds with the help of geotextiles. Special testing procedures including vane shear testing, Osterberg piston sampling and over fifty 3 inch undisturbed samples.
- Responsible for drilling and coring on the Dresden Island Dam spillway with all-terrain drill and gas powered skid rigs.
- Master Driller in charge of drilling at O'Hare International Airport retention pond. Borings were performed at night under winter drilling conditions. Special sampling procedures were needed to account for full sample recovery from 80 foot borings. Sampling methods included Moss sampler, Osterberg sampler, Giddings sampler, and Pitcher Barrel sampler.
- Has provided drilling expertise for geotechnical high-rise foundation projects throughout the City of Chicago.
- Served as Master Driller for an environmental project in

Kalamazoo, Michigan with borings in excess of 350 feet depth. Special sampling included the use of a hydropunch water sampling device.

Versed in the operation of the following drill rigs:

Mobile B-61HD, B-57, B-47
CME 750, 550, 55, 45
Diedrich D-50
Joy 12B
Joy 12B gas skid rig
Acker air powered skid rig
Electric skid rid
Longyear 65

Drilling and sampling methods utilized:

Rotary
Solid Flight Augers
Hollow Stem Augers
Rock Coring
Shelby Tube Sampling 2"/3"/5"
Split Spoon Sampling 2"/3"/5"
Osterberg Piston Sampling
Giddings Sampling
Packer Testing
Pitcher Barrel Sampling

- Serves as field supervisor in the operation and maintenance of STS' 23-ton cone penetrometer vehicle. Responsible for the performance of electric standard and piezocone tests, installation of PVC mini-wells, direct push soil sampling with two and three inch split spoons and shelby tubes, and gamma logging. Representative projects include:
- Supervisor of direct push soil sampling, mini-well installation and gamma logging to depths of 40 feet for the DOE Palos Park Environmental Project near Chicago, Illinois. Performed over 90 test locations over a 2 month period under stringent environmental and radioactive guidelines.
- Operator of electric CPT test equipment to delineate stratigraphy to depths of 75 feet at a plant in Superior, Wisconsin. Work was performed in January during hard

ground conditions and included automatic decontamination of rods and self-grouting of holes in creosote impacted soils.

- Assistant in the performance of electric piezocone, mini-well installation and hydropunch groundwater sampling in very dense glacial till at the Argonne National Laboratory 317/319/ENE site characterization.
- Site Safety Officer for Kerr-McGee radioactive project in West Chicago, Illinois.
- Supervisor at Lindsay Light project in Chicago, Illinois.
- Water treatment monitoring for KMRC in state and out-of-state.
- Monitoring soil remediation site.

Keith A. Carlson, CIH
Senior Industrial Hygienist

AREAS OF SPECIALIZATION

- *Health and Safety Compliance*
- *Indoor Air Testing*
- *Local Exhaust Ventilation Design*
- *Indoor Air Quality (Sick Building Syndrome/Building-Related Illness*

EDUCATION

M.S., Industrial Hygiene, University of Minnesota, 1978

B.A., University of Minnesota, 1974

CERTIFICATIONS

Certification in the Comprehensive Practice of Industrial Hygiene, by the American Board of Industrial Hygiene, 1980

40-Hour Hazardous Material/Emergency Response Training

8-Hour Hazardous Material Site Supervisor Training

Certified Asbestos Building Inspector, State of Minnesota

Representative Experience

Mr. Carlson serves as the Certified Industrial Hygienist for the Environmental Services Group. With over 24 years in the health and safety consulting industry and over 20 years of experience with Sick Building Syndrome issues, Mr. Carlson enables the air quality team to provide a truly comprehensive package of air quality services. Mr. Carlson's clients include a wide variety of industrial clients, schools, hospitals, laboratories and government clients. Representative experience includes:

- Oversight and implementation of indoor air quality investigations.
- Development and presentation of safety training courses/classes (e.g. Employee Right to Know, Confined Space Entry, Lock-out Tag-out, Personal Protective Equipment, Process Safety, Hazmat/Spill Training).
- Development of written safety programs (e.g. AWAIR, Employee Right to Know, Respirator Lock-out Tag-out, Confined Space Entry).
- Occupational Safety and Health (OSHA) type safety and health inspections. This includes both safety and chemical exposure compliance activities.
- Site Safety Plan Development (for hazardous material sites).
- Instructor for Midwest Center for Occupational Health and Safety (1982 – Present)
- Design and testing at local exhaust ventilation systems.
- Expert witness testimony.

AFFILIATIONS

American Academy of Industrial Hygiene

American Industrial Hygiene Association (National and Upper Midwest Chapter)

American Conference of Governmental Industrial Hygienists

Midwest Center for Occupational Health and Safety (Instructor)

Minnesota Safety Council

Publications and Presentations

Presentation at the American Industrial Hygiene Association, "Facility Surface Dust Containing Lead from Soldering Operations", Atlanta, Georgia, May 1998.

Indoor Air Quality, Minnesota RIMS Seminar, February 1998.

OSHA Safety and Health Care Facilities, Minnesota Health Care Facilities, Minnesota Health Care Conference, September, 1997.

"Risk Assessment in the Clinic and Ambulatory Setting", Safety for Health Risk Management, November 1996.

"Indoor Air Quality", Internal Facilities Manager's Association, August, 1995.

TEACHERS' RETIREMENT SYSTEM - GMO SITE

STANDARD OPERATING PROCEDURE

APPENDIX B

Title: Standard Operating Procedure

Revision Number: 0

Date:

Replaces: New

STANDARD OPERATING PROCEDURE

GAMMA RADIOLOGICAL SURVEYS

Title: Gamma Radiological Surveys

Document SOP-210

Revision Number: 0

Date:

Replaces: New

Gamma Radiological Surveys

1. PURPOSE

This procedure provides protocols for pre-verification or verification gamma radiological surveys.

2. SCOPE

Radiological surveys will be performed at the designated Site as part of the pre-excavation, excavation, pre-verification, and/or verification surveying programs.

3. REFERENCES

3.1 None.

4. EQUIPMENT AND MATERIALS

The following equipment may be used as part of the survey programs. Other equipment may be substituted if necessary because of availability of the items listed or the conditions encountered at the site.

4.1 Trimble Pathfinder Pro XL 4.1 GPS (optional).

4.2 2-inch by 2-inch NaI (T1) gamma detector.

4.3 Ludlum Model 2221 portable scaler ratemeter analyzer.

5. INSTRUCTIONS FOR RADIOLOGICAL SURVEY

5.1 Land Survey Procedure

5.1.1 Two perpendicular baselines will be established.

5.1.2 A grid along the baseline will be established using cloth or steel tape and a compass, if necessary. Stakes, survey flags, or paint will be placed as needed to delineate grid or traverse lines. The grids will be spaced about one (1) meter apart.

5.1.3 The baseline, permanent structures, areas of remediation, and other areas of interest will be illustrated in the field logbook.

5.2 Gamma Survey Procedure

5.2.1 The Ludlum ratemeter is set for 2-second time-weighted average count rate.

5.2.2 Hold the survey meter probe parallel to the ground surface at a height of approximately two to six inches.

5.2.3 Walk along grid lines at a maximum speed of about 0.5 meters per second (1 mile per hour).

5.2.4 Continue surveying until all survey grids have been traversed.

5.3. Radiological Survey of On-Site Materials

5.3.1 Material that is excavated and placed in the clean stockpile will be surveyed two times. The first survey will be performed prior to excavation activities.

5.3.2 The second survey will be performed during the excavation of the non-contaminated soil.

The soils will be surveyed before they are placed in the stockpile. Based on the gamma scan, the material will either be designated as contaminated material and immediately loaded for transportation and disposal or tentatively designated as clean and stockpiled for subsequent soil sampling per SOP-214.

5.4. Daily Surveys

5.4.1 Routine daily surveys shall be performed for each day of operations at the site.

5.4.2 The routine surveys will monitor areas in the immediate vicinity of excavations and along soil movement paths to ensure that radiation levels are not affected by activities.

5.4.3 Routine surveys shall be documented by preparing a drawing of the survey results in the field logbook, indicating either the location and value of individual measurements, or contours of the measured gamma field.

5.4.4 Surveys of excavation areas will be made at the request of the Field Team Leader to assess the progress of the removal. These surveys will not be documented, but will be used by the Field Team Leader to manage the excavation.

5.5 Pre-Verification or Verification Survey

5.5.1 Upon completion of excavation activities, either a pre-verification survey shall be performed to ensure that the excavation is ready for a final verification survey by U.S. EPA or a verification survey shall be performed to ensure that the excavation that the excavation is ready for backfill based on U.S. EPA approval.

5.5.2 The survey is conducted at the same time as the excavation work phase. The survey method is performed as specified in Sections 5.1 and 5.2. Upon completion of the survey and excavation phase, a Notification of Successfull Pre-Verification or Verification is sent to the U.S. EPA requesting a final verification survey or approval to backfill.

STANDARD OPERATING PROCEDURE

AIR MONITORING PROCEDURE

Title: Air Monitoring Procedure

Document SOP-212

Revision Number: 0

Date: Replaces: New

Air Monitoring Procedure

1. PURPOSE

This procedure describes the methods to be used for sampling and measurement of airborne radioactive materials. The measurement data will be used to evaluate the effectiveness of health and safety measures at the work site. Controls will be established as necessary based upon the measurements to ensure regulatory compliance and appropriate protective measures for workers and the public.

2. SCOPE

This procedure applies to field activities that may generate dust or airborne emission from the site. The Respondents will establish background and/or site environmental monitoring stations to measure background air quality in the area. The objectives of the air sampling program described in this plan are to collect sufficient air samples during soil excavation to assure that excessive airborne contaminated dust is not being released.

3. REFERENCES

3.1 Code of Federal Regulations, Title 10, Part 20, Standards for Protection Against Radiation.

3.2 IAC application (page 6-2 of environmental analysis).

3.3 Kerr-McGee Environmental Air Monitoring Program Appendix I.

4. EQUIPMENT AND MATERIALS

The following equipment may be used as part of the survey programs. Other equipment may be substituted if necessary because of availability of the items listed or the conditions encountered at the site.

4.1 Environmental Monitoring Stations (EMS).

4.2 Alpha Counter (Ludlum Model 2000 Scaler with a 43-10 scintillation detector).

4.3 Low-Level Alpha Counter (Gamma Products G5000 or equivalent).

4.4 Daily Work Area Air Monitoring Sheet, Form SOP 212-1.

5. INSTRUCTIONS

5.1 Background Air Monitoring Locations

If background air monitoring stations are used, Kerr-McGee will use the REF background air monitoring station #17, located 2 miles north of the REF, to measure background air quality in the area. Information from this station will be interpreted to be representative of area-wide background air quality.

5.2 Site Air Monitoring Locations

5.2.1 A minimum of four air monitoring stations shall be used during the excavation activities.

5.2.3 Air monitoring locations will be located near the center of each quarter of the Site.

Workers will wear personal air monitors to evaluate the air quality at the worker's breathing zone. The high volume air samples are intended to monitor the amount of contaminants leaving the site and the personal air monitors are intended to monitor a workers exposure.

5.3 Air Sampling Requirements

5.3.1 Air shall be drawn into the sample at a height between 1 and 2 meters above the ground.

5.3.2 The minimum detectable activity (MDA), measured in μCi/ml, shall be re-established following equipment modification or replacement.

The two Gamma Products G5000 systems are the primary counters used for alpha counting. The Ludlum Model 2929/43-10 is used only for backup in the event both G5000 systems are down for repair. The alpha counting effectiveness and MDAs for the G5000 and Ludlum systems are similar.

5.3.3 Air samples filters shall be collected at least daily during excavation activities.

5.3.4 Flow rate through samples should be between 4 and 6 cubic feet per minute (cfm).

5.4 Radiological Analysis

5.4.1 Radiological analysis shall be performed in accordance with the West Chicago Facility Quality System procedures.

5.4.2 Samples will be analyzed for gross alpha concentration with counting performed at the REF. Air filters are counted for 30 minutes for Th-alpha and three minutes for Pb-212.

5.4.2.1 A five-hour minimum waiting period from the time of collection to the time of counting will be observed to allow decay of short-lived uranium progeny and ingrowth of short-lived thorium progeny.

5.4.3 Contribution of site activities to airborne radioactivity shall be determined as follows:

5.4.3.1 The net counts are divided by the counter efficiency and volume of the sample to obtain the air concentration.

5.4.3.2 The air concentration will be compared to the most limiting effluent concentration limit for Thorium-232 (4×10^{-15} µCi/ml).

5.4.3.3 Samples exceeding the effluent concentration limit will be further evaluated to ensure that doses to individual members of the public are in compliance. Evaluations may include additional analyses to determine specific isotopic concentrations.

5.4.3.4 Annual average concentrations of radioactive material released in airborne effluents shall not exceed the effluent concentrations as specified in the January 1, 1994 revision of 32 IAC 340.

5.5 Investigation

5.5.1 The Offsites Manager or designee will perform investigations and responses consisting of one or more of the following actions in the event that Action Levels are exceeded.

5.5.1.1 Verification of laboratory data and calculations.

5.5.1.2 Analyze and review probable causes.

5.5.1.3 Evaluate need for reanalysis or additional analysis on original sample.

5.5.1.4 Evaluate need for resampling.

5.5.1.5 Evaluate need for sampling of other pathways.

5.5.1.6 Evaluate need for notifications to regulators.

5.5.1.7 Dose assessments.

5.5.2 All investigations shall be documented.

5.6 Quality Control

5.6.1 All air samplers shall be in current calibration.

5.6.2 Sample chain-of-custody standard operating procedures will be followed for all samples.

5.7 Sample Archive and Disposal

5.7.1 All samples will be archived on-site in a suitable area until released by the Offsites Manager.

FORM SOP 212-1

DAILY WORK AREA MONITORING SHEET

Sample Location	Reason for Sample	Date Time Sampler On:	Date Time Sampler Off:

Average Flow Rate _____ X Total Sample Time _____ = Sample Volume _____

DATE	TIME	INSTRUMENT/ SERIAL NUMBER	GROSS FILTER WEIGHT	TARE FILTER WEIGHT	NET FILTER WEIGHT	TSP (mg/m³)	TOTAL COUNTS	COUNT TIME	CPM	BKGD CPM	CCPM	CF	µCi/ml	SIGNATURE

REMARKS;

Reviewed By;	Date:	Approved By:	Date:

STANDARD OPERATING PROCEDURE

SOIL SAMPLING PROCEDURE

Title: Soil Sampling Procedure

Document SOP-214

Revision Number: 0

Date:

Replaces: New

Soil Sampling Procedure

1. PURPOSE

The purpose of this procedure is to present protocol for collecting soil samples for the Site.

2. SCOPE

This procedure applies to samples collected for radiological or geotechnical analysis. Soil samples may be collected of potential backfill soils or other soils. The Field Team Leader will coordinate the sampling efforts.

3. REFERENCES

3.1 Soil Sampling Procedure for Field Verification System and the Field Portable Units at the Kerr-McGee Rare Earths Facility, August 1994.

3.2 U.S. Nuclear Regulatory Commission, NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, June 1992.

4. EQUIPMENT AND MATERIALS

4.1 Equipment and Materials Management

Downhole tools and samplers are cleaned in accordance with the Decontamination Procedure (SOP-LLII347) included in the Procedures Section of Appendix C of the QAPP.

Cuttings, fluids, samples, and water are placed in 55-gallons drums, labeled, properly stored on-site, and disposed of in a manner that does not violate local, state or federal rules or regulations and in a manner that does not damage public or private property.

4.2 Sampling Equipment and Materials

Equipment used for soil sampling includes the following:

- Auger or other Coring Tool
- Shovel and Trowel
- Plastic Collection Bags
- Plastic Sheets (optional)
- Sampling Tracking Form (Form SOP-214-1)

- Field Logbook (SOP-215)
- Field Sample Screening Form (Form SOP-214-2 or holding samples)
- Pin Flags (for marking sample locations)
- Container (for collecting potentially contaminated waste generated during the sampling process) (e.g., gloves, plastic sheets, etc.)
- Bucket (filled with clean rinse water)
- Bucket (for homogenizing samples)
- Stainless Steel Brush
- Moist Towelettes
- Paper Towels
- Latex Gloves
- Survey Instrument (for verifying clean sampling equipment and hands)

Other equipment may be substituted if necessary because of availability of the items listed or the conditions encountered at the site. Substitute equipment shall be documented in the Field Logbook and approved by the Field Team Leader.

5. SAMPLING PLAN

Selection of the sampling plan to characterize a soil is a function of the goals of the investigation, the variability of the parameters being measured, and the impact of the variability on the conclusions. Samples may be collected randomly or they may be collected from specific areas deliberately chosen to represent the range of conditions expected or unusual conditions of particular interest. In general, randomly chosen samples are appropriate to assess overall site conditions. However, there may be instances where the significance of an observed condition is of interest. The choice of method will, therefore, depend on the specific goals of the sampling activity.

The procedure presents sampling methods based on random sampling. For the reasons stated above, variations to the methods provided in this procedure may be requested by the Field Team Leader. Such variations shall be documented in the Field Logbook by field personnel.

6. ON-SITE STOCKPILE SOIL SAMPLING

The following are the steps to be followed for on-site stockpile soil sampling.

6.1. Excavated soil may be stockpiled. Samples from the stockpiles may be analyzed.

6.2. The soil may be stockpiled in piles varying from a few to several thousand cubic yards. Because of this potential variation in pile size, no single method for sampling or type of equipment can be prescribed that will work for every situation. The two basic methods that can be used for sampling stockpiles, core sampling method and lift sampling method, are described in paragraphs 7.3 and 7.4, respectively. Both methods are based on the premise that in order for a sample to be representative of the pile, every particle in the pile must have an equal probability of being included in the sample.

6.3. One of the methods, the core sampling method, assumes that the pile can be completely penetrated using a coring tool (i.e., sampling probe or drill rig). On conical shaped piles, the sample is to be taken approximately perpendicular to the surface of the pile, midway between the peak and the base, to the center of the pile. On piles with flattened tops, the sample is to be taken perpendicular to the surface from the top to the bottom of the pile.

6.4. The other stockpile sampling method, the lift sampling method, assumes that the pile can not be completely penetrated with a sampling tool, and therefore must be sampled either as the soil is placed in lifts onto the pile or before the soil is removed in lifts for use. The samples will, therefore, only be representative of the discrete layer of soil that is exposed to the sampling.

6.5. With either sampling method, to identify the areas to be sampled, the pile shall always be faced looking north. For flat topped piles, divide the stockpile into an imaginary grid with square or rectangular shaped sections approximately equal in area; the grids on flat topped piles should be numbered from left to right, top to bottom. For conical shaped piles, divide the stockpile into an imaginary grid with pie shaped sections of equal areas; the grids on conical shaped piles should be numbered in clockwise pattern.

6.6. Determine the initial number of grids and samples as follows:

Pile Size (cubic yards)	Number of Grids	Number of Lift Samples[1]	Number of Core Samples[2]
< 50	3	3	3
50 to 100	5	5	5
101 to 500	6	5	6
500 to 1,000	7	5	7
1,000 to 2,000	8	6	8
2,000 to 4,000	9	6	9
4,000 to 6,000	10	7	10
6,000 to 8,000	11	7	11
8,000 to 10,000	13	8	13
10,000 to 20,000	16	8	16
20,000 to 40,000	20	10	20
40,000 to 70,000	30	15	30
70,000 to 100,000	36	15	36
100,000 to ---[3]	36+	15+	36+

Notes:

1 Take one sample from each grid randomly chosen. In order to choose the grids to be sampled randomly, use some blank sample identification tags and number the tags from one (1) to (n), where (n) represents the number of grids in each pile. Put the tags into a sample bag, shake the bag and reach in and blindly select a tag. Continue selecting tags until the required number of grids are selected. The numbers will be chosen without replacement, that is, without returning the used number to the bag. The samples shall be taken from the grids that correspond to the randomly chosen numbers. An alternative method would be to use a computer generated random numbering system available in various spreadsheet programs (i.e., Excel).

2 From the randomly chosen grids, take one composite sample for approximately every ten (10) feet of soil depth to obtain the required number of samples. For example: if a 98 cubic yard pile is 10 feet high, according to the above table, five (5) composite samples are required (i.e., one for each grid). If an 11,000 cubic yard pile is 30 feet deep, three composite samples, one composite sample at each ten feet of depth, will be taken from 5 of the grids and one composite sample will be taken from a sixth, randomly chosen grid.

3 Add one sample for each additional 10,000 cubic yards.

6.7. Take the sample and submit it to the laboratory for analysis.

6.8. Statistically test the results of the sample analyses to determine how much uniformity the samples show and whether more samples must be taken.

6.9. If necessary, take additional samples and analyze. Continue to repeat steps 6.7 and 6.8 until there are enough samples to characterize the pile.

6.10. As directed by the Field Team Leader, identify materials suitable for backfill or other purpose for which the sampling was done.

6.11. To compare the sample data with the desired criteria, calculate the average (X bar of all the samples) in the pile using:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

6.12. If the average satisfies the desired criteria, the results can be further evaluated to determine whether the data provide a 95 percent confidence level that the true mean (μ) meets the relevant criteria. The Field Team Leader will consult with the Offsites Manager to determine if this further evaluation is required.

7. IN-SITU SOIL SAMPLING

This section describes the methods for choosing sample locations and sampling methods.

7.1 Sample Location Selection

Appropriate in-situ soil sample locations are determined by the size and uniformity of the deposit being sampled. The sampling pattern depends upon the size of the area, the uniformity of the soil stratum being sampled, and the volume of soil that is being sampled.

Sampling plans for particular purposes may specify a pre-established sampling frequency in terms of the maximum volume of soil represented by a sample. If the soil being sampled is statistically homogeneous, then the locations for samples can be selected randomly over the area and thickness of the deposit. If the soil is not statistically homogeneous, then the area must be broken into subareas within which the soils are statistically homogeneous, and each area sampled separately. The issue of statistical homogeneity is resolved by comparing the range of variation of the property being judged to the acceptability criteria. For example, a deposit of sand and gravel may be statistically homogeneous when judged against a standard that the material not contain boulders and not be homogeneous when judged against a standard that no gravels be larger than one inch.

Clearly, also, the number of samples required to resolve the second comparison may be larger than the number required to resolve the first. The sampling frequencies given in the Sections 10.3 and 10.4 (Stockpile Sampling) may be used as a guide in estimating an initial number of samples, but the actual number required for a particular purpose depends very strongly upon the requirements and materials being sampled.

7.2 Drilling Procedures

No drilling is planned.

8. Operational Support Sampling

Sampling may be required to support the excavation and restoration action. This sampling may be performed in instances when the Field Team Leader is interested in the significance of an observed variation or when looking for cursory information to provide operational guidance. The choice of the method will, therefore, depend on the specific goals of the sampling activity as determined by the Field Team Leader. This sampling is not a quality activity, and may be performed outside the requirements of this procedure. However, all deviations requested by the Field Team Leader must be documented in the Field Logbook by field personnel.

The sampling technique for surface sampling, subsurface sampling, and stockpile sampling, as described in this procedure, shall be used when sampling in these instances.

9. Sample Tracking

To establish the documentation necessary to track the sample from the time of collection, the sample identification and Sample Tracking Forms must accompany samples that are sent to the laboratory.

All potentially contaminated samples to be submitted to the laboratory will be screened for radiation in the field. Information obtained from this survey will be documented on the Sample Tracking Form (Form SOP 214-1). Samples taken from potential borrow areas generally are not screened.

10. Sampling Methods

10.1 Surface Soil Sampling

10.1.1. If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled; assemble the sampling equipment required.

10.1.2. Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant

- Collected by (your name)

10.1.3. Mark the collection bag or prepare the identification tag for the sample.

10.1.4. Collect the soil samples that are representative of the soil in the area surveyed. Use a shovel or trowel to collect soil from the depth required.

10.1.5. Remove rocks, sticks, and foreign objects greater than approximately one (1) inch.

Stir and homogenize the soil in a bucket as much as practicable. Using the hand trowel, randomly scoop the soil from the bucket. Save alternating scoops of material to collect the required sample size; return the other material to the sampling locations.

10.1.6. Attach the identification tag to the sample bag if appropriate and place the bag in the sample container.

10.1.7. Decontaminate the sampling equipment as required by Section 11.

10.1.8. Return any location markers (such as pin flags) that were removed in order to sample. Fill in all sampling holes to eliminate a possible tripping hazard.

10.1.9. If specific data are not available, mark a pin flag with the sample identification number and place the flag at the center of the sampling location before leaving.

10.2 Subsurface Sampling (Undisturbed Soils)

10.2.1. If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled; assemble the sampling equipment required.

10.2.2. Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant
- Collected by (your name)

10.2.3. Mark the collection bag or prepare the identification tag for the sample.

10.2.4. Sample the material using a hand core sampling tool or hammer driven split spoon sampler.

Alternatively, an auger method may be used.

Cut a hole, approximately six (6) inches in diameter, in the center of a plastic sheet. Center the sheet of plastic over the area to be sampled. Using an auger, drill through the hole in the plastic to the desired sampling depth; keep the auger turning until no more material comes up. The soil around the hole, on the plastic sheet, is fairly well mixed and representative of the interval just drilled.

If the soil sample is to be obtained from a particular depth (not a composite from surface to depth), and the material refuses to pass into the coring tool, the following sampling method will be performed. Drill through the hole in the plastic to the top of the desired sampling depth; keep the auger turning until no more material comes up. Remove the auger and sample the material using a hand core sampling tool or hammer driven spilt spoon sampler. The first three inches of the sampled obtained will be considered slough and not part of the desired sample.

NOTE: If, due to the conditions of the sampling area, this method does not work, an alternative method(s), approved by the Field Team Leader, may be used. Alternative methods, when used, will be documented by the field personnel in the Field Logbook.

10.2.5. Remove rocks, sticks, and foreign objects greater than approximately one (1) inch in diameter.

NOTE: The removed rocks will be collected and submitted as a separate sample.

10.2.6. Using a hand trowel, collect approximately one (1) quart of the augured soil in the plastic sample bag or jar. For core segments, place each 6-9 inch (nominally 5-7 inch) segment in the plastic sample bag or jar.

10.2.7. Label the sample container.

10.2.8. Return unused material to the sampling hole and fill in the hole to eliminate possible tripping hazard.

10.2.9. Decontaminate the sampling equipment as required by Section 11.

10.2.10. When required, mark a pin flag with the sample identification number and place the flag at the center of the sampling location before leaving.

10.3 Stockpile Sampling (Core Sampling Method)

10.3.1. If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled and assemble the sampling equipment required.

10.3.2. Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant. Identify the approximate size of the stockpile. (A 70 cubic yard pile of soil is approximately ten feet high with a base diameter of approximately 26 feet.) Include a brief description of the equipment used to obtain the sample (i.e., sub-soil sampler, drill rig, etc.).
- Collected by (your name)

10.3.3. Before sampling, determine the number of grids and samples as described in Section 6.6. Record the information in the Field Logbook.

10.3.4. Mark the collection bag or prepare the identification tags for the samples.

10.3.5. Using an auger or other coring tool, take the required number of samples from the pile. A hollow stem auger will be used when discrete, rather than composite, samples are collected.

10.3.6. Place the sample material in the sample bag and attach the identification tags. Place the sample bag in the container.

10.3.7. Decontaminate the sampling equipment as required by Section 11.

10.4 Stockpile Sampling (Lift Sampling Method)

10.4.1. If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled and assemble the sampling equipment required.

10.4.2. Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection

- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant. Identify the approximate size of the stockpile. (A 70 cubic yard pile of soil is approximately ten feet high with a base diameter of approximately 26 feet.) Include a brief description of the equipment used to obtain the sample (i.e., sub-soil sampler, drill rig, etc.).
- Collected by (your name)

10.4.3. Before sampling, determine the number of grids and samples as described in Section 6.6. Record the information in the Field Logbook.

10.4.4. Mark the collection bag or prepare the identification tags for the samples.

10.4.5. Using the appropriate sampling tool, take the required number of samples from the lift approximately perpendicular to the surface of the lift at the appropriate locations. Composite the sample through the entire lift thickness.

10.4.6. Place the sample material in the sample bag and attach the identification tags. Place the sample bag in the container.

10.4.7. Decontaminate the sampling equipment as required by Section 11.

10.5 Soil Sample Size

10.5.1. Each soil sample will be a minimum of four (4) pounds and the sample may exceed 10 pounds. Sample size requirements are detailed in Sample Preparation Procedure for Gamma Spectral Analysis (SOP-LLII364).

11. Equipment Cleaning

To avoid cross-contamination, the sampling equipment will be cleaned prior to and between samples. The following steps will be followed to clean equipment.

Remove loose contamination by gently tapping/shaking the item.

Using the stainless steel brush or paper towels, remove material that did not dislodge.

If the item appears to be clean (i.e., no visible clinging soil), proceed to the next sampling area.

If the item does not appear to be clean or if a survey with the appropriate instrument does not verify that it is, scrub the item with water. While holding the item over the sampling location, rinse the item with water.

Dry the item with paper towels or repeat the scrubbing sequence as necessary.

Rinse gloved hands. Change gloves when changing sampling areas if a self-frisking indicates that contamination is present after rinsing.

Approximately one percent of the time, swipe the item as described in the Gamma Radiological Survey SOP (SOP-210). Submit the swipes to the laboratory for analysis to confirm the effectiveness of the decontamination protocol. (This step is necessary only when sampling soils where radiologic contamination is suspected.)

Dispose of cleaning materials, plastic sheeting, and gloves as contaminated materials in accordance with instructions provided by the Field Team Leader.

12. Quality Control

12.1 QC Samples

To evaluate the variance in the soil sampling protocol, field duplicates will be collected at specified intervals. These QC samples will be identified and noted in the Field Logbook.

To validate the sampling protocol used for surface sampling, initially one (1) area on every twenty (20) sub-grids sampled.

For surface sampling, the duplicates shall be randomly selected and identified before sampling activities begin. The duplicate sample material will be collected using the next scoop full of material each time the initial sample is saved.

For subsurface samples, one duplicate subsurface sample will be taken for every twenty (20) samples.

For subsurface sampling, the duplicate will be collected from the representative augered material.

For stockpiles, one duplicate will be taken for every twenty (20) stockpile samples, or one each day that stockpile sampling takes place, whichever is greater.

The stockpile duplicate will be taken from the node of two grids. The duplicates will be randomly selected and identified before the sampling begins.

The Field Team Leader will calculate the mean and the standard deviation for the samples analyzed. If the duplicate sample results are within three (3) standard deviations of the sample population, the sampling protocols can be considered acceptable.

If the Offsites Manager approves, the Field Team Leader can reduce the frequency of the QC duplicate sampling based on the results obtained. Changes shall be documented in the Field Logbook.

12.2 Data Review

Entries in the Field Logbook will conform to the Field Logbook Standard Operating Procedures.

Daily, the Field Team Leader will review the Field Logbook, resolve any discrepancies that were noted by field personnel, and sign the book to indicate the pages reviewed. If the Field Team Leader recorded the discrepancy, the Quality Assurance Supervisor will review the Field Logbook and resolve any discrepancies that were noted.

NOTE: Discrepancies relating to reported data will be brought to the attention of the Field Team Leader.

13. Health and Safety

- Personal protective equipment and clothing, as required by the Health and Safety Plan, will be used when collecting and handling contaminated soils.

The site radiological conditions will be determined and documented before sampling begins. During the sampling process, the principles of As Low As Reasonably Achievable (ALARA) will be followed.

14. Records

The following documents will be maintained as quality records:

- Field Logbooks
- Sampling Tracking Forms
- Results of all Calculations and Statistical Analyses Performed

FORM SOP-214-1

SAMPLE TRACKING FORM

Date: _____ Page ___ of ___

Sample Number	Matrix (S/W)	Location	Collected For	Comments	Collected By

Released by/Company	All samples listed above are hereby released except for:	Date/Time
Received by/Company	All samples listed are hereby received except for:	Date/Time
Received by/Company	Data for all samples listed above are hereby received except for:	Date/Time

FORM SOP-214-2

FIELD SAMPLE SCREENING FORM

Sample Type:	Sample ID Number:
Date:	Time:
Counting Instrument:	Sample Date:
Reading Units:	
Signature of Technician:	Date:
Signature of Reviewer:	Date:

TEACHERS' RETIREMENTS SYSTEM - GMO SITE

FIELD LOGBOOK PROCEDURE

Title: Field Logbook Procedures

Document SOP-215

Revision Number: 0

Date: Replaces: New

FIELD LOGBOOK PROCEDURE

1.0 PURPOSE

This procedure describes standard protocol for the use and control of the Field Logbooks used during the Site remediation.

2.0 SCOPE

This procedure applies to field activities that are associated with the Site cleanup.

3.0 REFERENCES

STS Consultants, Ltd. Quality Assurance Manual

4.0 EQUIPMENT AND MATERIALS

Field Logbook.

Indelible pen or pencil.

5.0 INSTRUCTIONS

5.1 Field Logbook Format

5.1.1 Prior to entering the field, page numbers shall be assigned to the pages of the Field Logbook. Pages shall include the date. STS may use pre-printed Field Logbooks in which some of these items are filled in. Each Field Team Leader and other field personnel taking measurements, observing tests, or performing other related work, will be issued a Field Logbook.

5.1.2 The first set of pages for a day will include the following items (in the order indicated):

- personnel on site
- contractor personnel on site (names of employees for the companies represented)
- others on site (e.g., regulators, visitors)
- weather
- equipment used
- equipment calibration
- sketch of work area
- summary of work.

5.1.3 The remaining pages for a day will record the field activities and should include the following:

- meetings (meeting attendees, person who called the meeting, time, location, decisions, and decision makers)
- start and end time of activities
- visits by others
- regulator - directed activities
- comments made by regulator, visitor, or other persons visiting Site
- weather and working conditions
- general description of work area
- sketch work areas and show significant relative locations, etc.
- progression of work (e.g., faster or slower, reason for delays)
- description of equipment used, including general name, brand name, model number and, calibration
- description of amount of material excavated and levels of contamination observed (if known)

5.2 Quality Control

5.2.1 The Field Team Leader, or his designee, will review field logbooks for completeness, proper field note correction (single line strikeout), and content.

5.2.2 Field logbooks will be audited at the discretion of the Project Quality Assurance Supervisor.

STANDARD OPERATING PROCEDURE

VERIFICATION SURVEY

Title: Verification Survey

Document SOP-223

Revision Number: 0

Date:

Replaces: New

Verification Survey Procedure

1. PURPOSE

The purpose of this procedure is to present protocol for conducting verification surveys at the excavations at the Site.

2. SCOPE

This procedure applies to all completed excavations that are done as a result of the excavation area being identified as containing soil exceeding the cleanup criteria.

3. REFERENCES

3.1 SOP 210, Gamma Radiological Survey

3.2 Quality Assurance Project Plan

4. EQUIPMENT AND MATERIALS

None

5. PROCEDURE

5.1 EQUIPMENT AND MATERIALS

Equipment used for verification survey may include the following:

5.1.1 Compass or theodolite

5.1.2 Cloth or steel tape

5.1.3 Stakes, survey flags, or spray paint

5.2 GRID LAYOUT

5.2.1 The verification survey will be conducted at all excavations.

5.2.2 The grid used for the STS Survey, or similar locations will be re-established for the verification survey.

5.2.3 The diagonals across each grid square will be located.

5.2.4 The location halfway between the grid corner and the center of the grid will be surveyed.

5.3 VERIFICATION

5.3.1 Measurements will be made according to the procedures described for Gamma Radiological Surveys (SOP-210).

5.3.2 If all measurements within a grid are less than the cleanup criteria limit, then grid is clean. No further excavation is required in this grid.

5.3.3 If any measurements within an excavation are greater than the action criteria limit, then the Field Team Leader shall guide additional soil removal until the excavation measures below the cleanup criteria.

6. DOCUMENTATION

6.1 A scale drawing of the survey area showing the locations and results of the gamma measurements will be created.

6.2 The drawing and gamma measurements will be delivered to the U.S. EPA with a Notice of Successful Verification and a request for approval to backfill the excavation (Form SOP 223-1).

7. QUALITY CONTROL

7.1 Quality control for the verification documentation will be in accordance with applicable quality assurance SOPs in the Quality Assurance Project Plan for the Site.

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: _____

Date of Verification Survey: _____

Time of Verification Survey _____am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the U.S. EPA.

Signed:

_____ Date _____

_____ (Print Name)

_____ (Print Title)

STS Consultants, Ltd.

_____

The attached Verification Survey documents were reviewed by U.S. EPA, Region V on _____. The results of this survey indicate that the verification criteria as contained in the UAO, have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Signed:

_____ Date _____

_____ (Print Name)

_____ (Print Title)

For U.S. EPA Region V

TEACHERS' RETIREMENT SYSTEM - GMO SITE

STANDARD OPERATING PROCEDURE

Title: Radioactive Material Shipments

Document SOP-LLII320

Revision Number: 0

Date: Replaces: New

RADIOACTIVE MATERIAL SHIPMENTS

1.0 SCOPE

1.1 Purpose

To establish a procedure that will insure the safe and proper shipment of radioactive ***waste*** material off-site in compliance with IDNS, NRC, and DOT regulations.

1.2 Applicability

This procedure is applicable at all times for all limited quantity, LSA, and Type A-Yellow II shipments of radioactive materials destined for off-site locations.

2.0 REFERENCES

2.1 32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection Against Radiation

2.2 32 Illinois Administrative Code, Part 400, Notices, Instructions and Reports to Workers; Inspections

2.3 West Chicago Project, Health and Safety Plan for Decommissioning Activities at the Kerr-McGee Chemical Corporation Rare Earths Facility, West Chicago, Illinois

2.4 State of Illinois Department of Nuclear Safety License Number STA-583

2.5 10 CFR Part 20.1906

2.6 10 CFR Part 71.47 and 71.87

2.7 10 CFR Part 71 Statements of Consideration

2.8 I&E Information Notice 85-46: Clarification of several Aspects of Removable Radioactive Contamination Limits for Transport Packages

2.9 49 CFR Parts 172 and 173

2.10 32 Illinois Administrative Code, Part 341, Transportation of Radioactive Material

2.11 Utah Radioactive Material License No. *SMC-1559* with current amendments issued to Envirocare of Utah, Inc.

2.12 West Chicago Project, Operations' Radioactive Waste Shipment & Disposal *Record* Procedure - WCP 617.

2.13 DOT exemption #E11075 granted to Kerr-McGee Chemical Corporation, Oklahoma City, Oklahoma, September 2, 1994.

2.14 Operations' Bill of Lading Procedure - WCP-614.

2.15 Survey and Decontamination of Railcars Procedure, WCP-632.

3.0 DEFINITIONS

3.1 A_1

This is the maximum activity of special form radioactive material permitted in a Type A package.

3.2 A_2

This is the maximum activity of radioactive material, other than special form radioactive material, permitted in a Type A package.

3.3 Limited Quantity of Radioactive Material

This is the quantity of radioactive material that does not exceed the materials package limits specified in 49 CFR 173.423 and which conforms with the requirements specified in 49 CFR 173.421.

3.4 Low Specific Activity (LSA)

LSA material is any of the following:

3.4.1 Uranium or thorium ores and physical or chemical concentrates of those ores.

3.4.2 Unirradiated natural or depleted uranium or unirradiated natural thorium.

3.4.3 Tritium oxide in aqueous solutions provided the concentration does not exceed 5.0 millicuries (185 MBq) per milliliter.

3.4.4 Material in which the radioactivity is essentially uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:

a. 0.0001 millicurie (3.7 kBq) of radionuclides for which the A_2 quantity in Appendix A of 32 IAC 341 is not more than 0.05 curie (1.85 GBq).

b. 0.005 millicurie (185 kBq) of radionuclides for which the A_2 quantity in Appendix A of 32 IAC 341 is more than 0.05 curie (1.85 GBq), but not more than 1 curie (37 GBq); or

c. 0.3 millicurie (11.1 MBq) of radionuclides for which the A_2 quantity in Appendix A of 32 IAC 341 is more than 1.0 curie (37 GBq).

3.4.5 Objects of non-radioactive material externally contaminated with radioactive material, provided that the radioactive material is not readily dispersible and the surface contamination, when averaged over an area of 1 square meter, does not exceed 0.0001 millicurie (220,000 transformations per minute) (3.7 kBq) per square centimeter of radionuclides for which the A_2 quantity in Appendix A of 32 IAC 341 is not more than 0.05 curie (1.85 GBq), or 0.001 millicurie (2,200,000 disintegrations per minute) (37 kBq) per square centimeter for other radionuclides.

3.5 Package

This is the packaging together, with its radioactive contents as presented for transport.

3.6 Packaging

This is the assembly of components necessary to ensure compliance with the packaging requirements of 32 IAC 341. It may consist of one or more receptacles, absorbent materials, spacing structure, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie down system, and auxiliary equipment may be designated as part of the packaging.

3.7 Radioactive Material

Any material having a specific activity greater than 2.0 E-03 μCi/g. (49 CFR 173.403); ***2000 pCi/g***

3.8 Transport Index (TI)

This is the dimensionless number (rounded up to the first decimal place) placed on the label of a package to designated the degree of control to be exercised by the carrier during transportation. The transport index is the number expressing the maximum radiation level in millirem per hour at 1 meter from the external surface of the package.

3.9 Type A Quantity

This is a quantity of radioactive material, the aggregate radioactivity of which does not exceed A_1 for special form radioactive material or A_2 for normal form radioactive material, where A_1 and A_2 are given in Appendix A of 32 IAC 341 or may be determined by procedures described in Appendix A of 32 IAC 341.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 A copy of ***the consignee's*** up-to-date radioactive material license ***shall*** be on file at the Kerr-McGee West Chicago Facility, ***so the Site Manager or his designee can verify*** that the consignee is licensed to receive the radioactive material.

4.1.2 All containers shall be inspected by the Site Manager ***or designee*** prior to loading ***and*** palletizing, to insure that the container's integrity is adequate, and ***then inspected again to insure*** that the containers have been loaded and closed in accordance with applicable Kerr-McGee procedures.

4.1.3 For shipments of radioactive material for disposal, compliance with disposal site facility criteria and specific state and federal license provisions applicable to the material shall be verified by Site Manager.

4.1.4 For packages of ***radioactive*** waste material intended for shipment to Envirocare of Utah for disposal, the Site Manager or ***designee*** shall verify that the pre-shipment characterization ***process has*** been completed.

4.2 Tools, Material, Equipment

4.2.1 Calculator.

4.2.2 ***Packaging, lables and containers***

4.3 Precautions, Limits.

4.3.1 ***Radioactive waste material that is to be*** shipped for disposal must be classified according to 32 IAC 340.1052 and meet the requirements of 32 IAC 340.1055.

4.3.2 The maximum permissible limits for removable contamination for a package:

Contaminant	$\mu Ci/cm^2$	dpm/cm^2
Beta/gamma emitting nuclides; nuclides with $T_{1/2}$ <10 days; natural uranium; natural thorium; U-235; U-238; Th-232; Th-228; and Th-230 when contained in ores or physical concentrates.	10^{-5}	22
All other alpha emitting nuclides	10^{-6}	2.2

<u>NOTE</u>: In cases of packages transported as exclusive use shipments by rail or highway, the non-fixed radioactive contamination must not exceed the above limits at the beginning of transport, and, at any time during transport, must not exceed 10 times the above limits.

4.3.3 The radiation levels at any point on the external surface of the package must not exceed 200 mrem/hr and the Transport Index must not exceed 10. Packages transported as <u>exclusive use</u> by rail or highway may exceed these limits provided that the following conditions are met:

	Open Vehicle	Closed Vehicle
Package Surface	≤ 200 mrem/hr	≤ 1000 mrem/hr
Vehicle	≤ 10 mrem/hr at 2 meters from vertical planes ≤ 2 mrem/hr in cab	≤ 200 mrem/hr at any point on the outer surface of the vehicle ≤ 10 mrem/hr at 2 meters from vertical planes ≤ 2 mrem/hr in cab

4.3.4 Under DOT Exemption #E11075, the radiation levels at any point on the external surface of a railcar carrying ***radioactive waste material*** to ***disposal facility***, must not exceed 10 mrem/hr.

4.4 Acceptance Criteria

4.4.1 Radioactive material has been properly prepared, packaged, marked, labeled, and loaded onto a vehicle and is in proper condition for transport.

4.4.2 All necessary forms, surveys, and manifests have been prepared and the "shipping papers" packet is complete.

4.4.3 All necessary state and local authorities and material receivers have been properly notified of the shipment.

4.4.4 All necessary paperwork has been completed and signed and a copy of the "shipping papers" packet has been filed for Kerr-McGee's records.

4.4.5 For ***radioactive*** waste shipments for disposal, confirmation of receipt at the disposal facility is acknowledged within 20 days of shipment, or an investigation is initiated.

4.4.6 Deleted

5.0 PROCEDURE

5.1 Verify that the intended consignee (receiver) of the material has a valid license to accept the type and quantity of radioactive material.

> NOTE
>
> Typically, groundwater samples, surface water samples, and environmental air samples that are shipped offsite do not meet the regulatory definition of "Radioactive Material" and therefore do not require radioactive material shipping paperwork.

5.1.1 The A_1 and A_2 values for radionuclides are the limits in curies from which a shipment type is determined.

5.2 If the package activity does not exceed 10^{-3} A_2 curies, the radiation level on the external surface is $\leq$ 0.5 mrem/hr, and the package meets the other requirements of 49 CFR 173.423 and 49 CFR 173.421, it may be shipped as "LIMITED

QUANTITY," and a bill of lading will normally be used, although they are not required by regulation. Go to Step 5.5. for "LIMITED QUANTITY" shipments.

5.3 Determine the following information for inclusion on the bill of lading ***and/or the radioactive waste shipment & disposal record*** form for each package in the intended shipment:

5.3.1 Proper shipping name and hazard class from 49 CFR 172.101, Columns 2 and 3.

5.3.2 Proper UN identification number from 49 CFR 172.101, Column 3.a.

5.3.3 Principal radionuclides (greater than 1% of total activity).

5.3.4 Determine whether or not RQ (Reportable Quantity) must appear on the bill of lading per 49 CFR 173.201(a)(1)(iii).

a. Using Table 2 of Appendix to 49 CFR 172.101, determine if a single radionuclide exists as a reportable quantity.

b. If a mixture of nuclides exists, use the sum of the ratios of the quantity of a nuclide per package and the RQ for the nuclide. A package contains an RQ of a hazardous substance when the sum of the ratios is ≥ 1.

c. If the quantities or identities of some of the nuclides in a package are unknown, follow the instructions found in the Appendix to 49 CFR 172.101 step 6 for RQ determination.

d. If not exempted from specification marking, a package with a capacity of 110 gallons or less must have the letters RQ in association with the proper shipping name.

5.3.5 Physical and chemical form of material.

5.3.6 Net quantity (activity) in each package.

5.3.7 Category of RADIOACTIVE label applied to each package.

a. Any package requiring a RADIOACTIVE YELLOW II label must be identified on the bill of lading.

5.3.8 Transport Index for all packages labeled RADIOACTIVE YELLOW II.

5.3.9 For each shipment of radioactive material, emergency response information must be maintained during transportation and at facilities where hazardous

materials are loaded for transportation or otherwise handled during any phase of transportation.

a. Emergency response information is not required for shipments of radioactive materials excepted from the shipping paper requirements of subchapter C of 49 CFR, such as those shipments designated as limited quantity.

b. Complete form, Emergency Response Information (Attachment 2) and include with the shipping papers for the radioactive material shipment.

5.4 If the package of radioactive material is to be shipped for disposal, the following are additional required steps:

5.4.1 Use form, ***Radioactive Waste*** Shipment Checklist (Attachment 3), ***for shipments to a disposal facility***.

5.4.2 Verify that the ***radioactive waste material*** has been classified in accordance with 32 IAC 340.1052.

5.4.3 Verify ***that the package's records meets the radwaste material*** form requirements of 32 IAC 341.1055.

5.4.4 Use Envirocare***'s*** Radioactive Waste Shipment & Disposal Record form (see Reference 2.12) as the manifest form for all shipments of radioactive ***waste material going*** to Envirocare of Utah, Inc.

5.4.5 Mail or otherwise send, separate from the shipment, a copy of the disposal site shipping manifest to the disposal facility operator. This copy of the shipping manifest may be sent the same day that the shipment leaves the site.

5.4.4.1.1 The disposal site operator is required to acknowledge receipt of the shipment within seven days of arrival by returning a signed copy of the first page of the shipping manifest (or equivalent) to the shipper.

5.4.6 Verify and document on form Radioactive Waste Shipment Checklist, (Attachment 3), that the return receipt for the shipment has been received within 20 days of shipment.
For shipments whose receipt has not been acknowledged within 20 days, initiate a trace investigation in accordance with 32 IAC 340.1060(h).

5.5 *P*ackages shipped as "LIMITED QUANTITY" in accordance with 49 CFR 173.421, ***are excepted from*** specification packaging, package marking, labeling, ***and shipping paper requirements*** provided:

a. Package meets "strong, tight" requirements of 49 CFR 173.24.

b. Inner liner, if present, or outer packaging, if not, is marked with the word "RADIOACTIVE."

c. Package activity does not exceed $10^{-3}A_2$ for solids and gases, or $10^{-4}A_2$ for liquids.

d. Package external contamination levels do not exceed 2200 dpm/100 cm^2 ß and 220 dpm/100 cm^2 ∝.

e. Package contact radiation level ≤ 0.5 mR/hr.

f. Form, Shipment Certification (Attachment 4), is either included within each package, with the packing slip, or provided to the vehicle operator.

5.5.1 Deleted

5.5.2 If the limited quantity shipment involves an environmental sample being shipped for analysis, ensure that a copy of the Chain of Custody Record ***(ref. Kerr-McGee form #KM-4775)*** accompanies the sample being shipped.

5.6 For packages shipped by rail or highway under the "EXCLUSIVE USE" provisions of 49 CFR 173.403 (i), the following additional steps are required:

5.6.1 Verify that the certification statement of 49 CFR 172.204: "This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulation of the Department of Transportation," appears on the shipping paper, and is signed by the Site Manager, or his ***designee***.

5.6.2 If a Radioactive Yellow II label is required, record the package contents (radionuclides), number of curies, and Transport Index (TI) on the label. Affix label to two opposite sides of the package (excluding the bottom) near the proper shipping name.

5.6.3 Verify that the radioactive material has been properly prepared, packaged, marked, labeled, and loaded on the vehicle.

5.6.4 Ensure that package radiation and contamination surveys have been performed and documented, and that package radiation and contamination levels are within the limits specified in Section 4.3.

5.6.5 Ensure that the vehicle has been completely tarped, blocked and braced, or the packaged material sufficiently restrained to preclude movement within the vehicle during normal transport.

5.6.6 Ensure that the vehicle or rail car is properly placarded per Subpart F of 49 CFR 172. If placarding is required and shipment is by vehicle, all four sides must have placards.

5.6.7 Verify that a radiation survey of the loaded vehicle has been performed and documented on Shipment Load Diagram (Attachment 5).

5.6.8 Complete Form Exclusive Use Vehicle Instructions to Carrier (Attachment 6), and have the vehicle operator read the exclusive use statement and acknowledge compliance his or her signature, and include a signed copy with the shipping papers.

5.6.9 For closed vehicles, install tamper seals on all cargo area doors and padlocks.

5.6.10 Contact the Site Manager, or his *designee*, for final inspection of the vehicle, cargo and paperwork.

5.6.11 Insure that the carrier (vehicle operator) has all the required shipment papers, and appropriate copies have been retained for the site files.

5.7 For packages shipped as other than exclusive use, ensure completion of the following:

5.7.1 Certification statement of 49 CFR 172.204: "This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation," appears on the shipping paper and is signed by the Site Manager or his ***designee***.

5.7.2 Package external radiation level is less than 200 mR/hr contact and 10 mR/hr at one meter.

5.7.3 Package external contamination level does not exceed 2200 dpm/100 cm^2 ß and 220 dpm/100 cm^2 ∝.

5.7.4 If the radiation level on the external surface of the package is greater than 0.5 mR/hr and less than 50 mR/hr, and the radiation level at 1 meter is less than 1 mR/hr the package may be shipped as a Radioactive Yellow II shipment.

Ensure that the shipping container meets the DOT Specification 7A Type A general packaging requirements per 49 CFR 173.415.

5.7.5 If a Radioactive Yellow II label is required, record the package contents (radionuclides), number of curies, and TI on the label. Affix label to two opposite sides of the package (excluding the bottom) near the proper shipping name.

5.7.6 Package is marked correctly in accordance with 49 CFR 172 Subpart D.

5.7.7 Ensure vehicle radiation and contamination surveys have been performed.

5.7.8 Placarding requirements in Subpart F of 49 CFR 172 are met.

5.7.9 Final inspection of the vehicle, cargo, and paperwork is performed by Site Manager, or his ***designee***.

5.7.10 For ***radioactive*** waste shipments, the disposal facility operator is required to acknowledge receipt within one week by returning a signed copy of the manifest.

5.8 For shipments of railcars to the ***disposal*** facility of Envirocare of Utah, refer to ***2.15 above.***

5.9 Laundry shipments (e.g. used personnel protective equipment)

5.9.1 Used coveralls and rubber boots shall be packaged in plastic bags, at the Contamination Reduction Zone, prior to shipment. HP Technicians shall perform a radiation and loose surface contamination survey on each plastic bag.

5.9.2 The loose surface contamination level shall be less than 33dpm/100 cm^2 α gamma.

5.9.3 If the radiation level is equal to or less than 360 cpm the laundry is not considered radioactive and therefore can be shipped as a non-radioactive shipment. If the radiation level is greater than 360 cpm, contact the HP Supervisor to determine the way the laundry is to be shipped.

5.9.4 The HP technicians shall assist the driver in loading the truck.

5.9.5 The HP technician shall initiate a bill of lading stating that the laundry is not radioactive material but contains small amounts of thorium tailings.

5.9.6 After the truck is loaded, the HP technician shall perform a radiological survey of the vehicle. Notify the HP Supervisor immediately of any abnormal readings / indications observed (ref. Attachment 5).

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Shipping records shall be maintained by the Site Manager. A complete shipment record packet includes copies of all completed and signed paperwork that accompanied the shipment.

6.2 In the event that a trace investigation has been initiated per Step 5.10, the Site Manager, or his ***designee***, will file a written report with the Illinois Department of Nuclear Safety within 2 weeks after the investigation has been completed.

6.3 Anyone who observes a deficiency in complying to this procedure shall initiate a nonconformance report per WCP QPM Document #9.

7.0 ATTACHMENTS

7.1	Attachment 1	***Example Bill of Lading-Short Form (for Exclusive Use)***
	Attachment 1A	***Deleted***
7.2	Attachment 2	Form - Emergency Response Information.
7.3	Attachment 2A	Form - Emergency Procedure
7.4	Attachment 2B	Form - Evaluation Questionnaire
7.5	Attachment 3	Form - ***Radioactive Waste Shipment Checklist.***
7.6	Attachment 4	Form - Shipment Certification.
7.7	Attachment 5	Form - Shipment Load Diagram - Truck.
7.8	Attachment 6	Form - Exclusive Use Vehicle Instructions To Carrier.

ATTACHMENT 1

STRAIGHT BILL OF LADING - SHORT FORM - Original - Not Negotiable

RECEIVED, subject to the contract in effect on the date of the issue of this Bill of Lading

From: KERR-McGEE CHEMICAL CORPORATION

the property described below in apparent good order, marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all terms and conditions of the contract in effect on the date of the issue of this Bill of Lading

SHIPMENT NUMBER

FULL NAME OF SHIPPER:

Kerr-McGee Chemical Corporation

CARRIER:	TRUCK #:	DATE:	FROM NO. STATION: STATE
SHIPPED FROM:	CONSIGNED TO:		

ROUTE: **DELIVERING CARRIER:**

This material is routed "exclusive use". The vehicle is to remain closed between origin and destination. No material may be added to the vehicle or removed from the vehicle in route.

LINE NO.	DESCRIPTION AND CLASSIFICATION	ESTIMATED QUANTITY
	(Proper Shipping Name, Reportable Quantity, if applicable/ Hazard Class) (Proper UN identification number) (Net activity in each package) (Principal Radionuclides) (Physical and chemical form of material) (Indicate Yellow II on any applicable packages)	

TRUCK SHIPMENTS: **PLACARDS REQUIRED**

THIS IS TO CERTIFY THAT THE ABOVE-NAMED MATERIALS ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AN LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF TH DEPARTMENT OF TRANSPORTATION.

KERR-McGEE CHEMICAL CORPORATION PER PER

Shipper Permanent post office address of shipper,

Oklahoma City, OK 73125 AGENT

ATTACHMENT 2

KERR-MCGEE CHEMICAL CORPORATION

EMERGENCY RESPONSE INFORMATION

Shipment I.D. No. _____

1. Proper Shipping Name and Hazard Class
(Check (✓) one of the two types listed below)

_____ Radioactive Material, Low Specific Activity, n.o.s. - Radioactive Material UN 2912

_____ Radioactive Material, n.o.s. - Radioactive Material UN 2982

DRIVER EMERGENCY PROCEDURE

A) RESCUE and LIFESAVING may be done with little fear of the hazards from the cargo on this truck. If possible, avoid breathing dust from any spilled cargo.

DO NOT DELAY RESCUE EFFORTS!

B) After providing needed rescue, lifesaving, first aid or fire-fighting, please read the attached instructions in the event of cargo spillage.

TO THE DRIVER:

Keep these emergency procedures with your shipping papers.

By my signature I certify that I have read and understand these emergency procedures.

Driver's Signature:_____

ATTACHMENT 2A
KERR-MCGEE CHEMICAL CORPORATION
EMERGENCY PROCEDURE

This vehicle contains _____ which are contaminated with natural thorium. In the event of an accident involving spillage of ***radioactive material***, the following actions are recommended, if appropriate:

1. LIFESAVING, RESCUE AND FIREFIGHTING

   This may be done with little fear towards the hazards from the debris contaminated with thorium. If possible, avoid breathing dust and avoid swallowing it. Thorium on the skin or clothing is relatively harmless and simple washing methods will remove it. If you come into contact with the debris, please wait for advice from health officials. To avoid ingestion of thorium, do not eat, drink, or smoke while near the spill.

2. CONTACT THE LOCAL LAW ENFORCEMENT AGENCY

   Tell the police of the accident with spillage of "LOW SPECIFIC ACTIVITY" (LSA) radioactive material called natural thorium. Ask them to notify the state health department. Give them the location of the accident site and tell them of any injuries to persons.

3. Fill Out Attached Questionnaire

   Please obtain all of the information asked for on the attached form. You will need to relay this information to the carrier and the shipper.

4. Telephone the Carrier and Shipper (call collect)

   a) The Trucking Carrier is _____
      Telephone No. _____

   b) The Shipper is: Kerr-McGee Chemical Corporation

      Telephone No. _____

   Read the completed questionnaire to whomever answers your calls. It may be necessary to read the questionnaire a second time for complete understanding.

5. When Help Arrives Please cooperate with all Civil Authorities and Carriers and Shipper's personnel who arrive at the scene. Follow their health-safety instructions for checking possible contamination of your clothing or body.

   Please be assured that your exposure to this material will be relatively harmless, particularly if you have followed these instructions. The health and safety personnel who will arrive will be glad to answer any questions you have about this matter.

ATTACHMENT 2B
KERR-MCGEE CHEMICAL CORPORATION
EVALUATION QUESTIONNAIRE

1. Name of truck driver _____

2. Name of trucking company _____

3. Bill of lading number _____

4. Destination of shipment _____

5. Date and time of accident _____

6. Place of accident _____

7. Name of Police Dept. notified _____

8. Phone No. of Police notified _____

9. Is the driver injured? _____ Others? _____

10. Is or was there a fire ? _____

11. Is the truck road worthy? _____

12. Are boxes off of the truck? _____ How many? _____

13. Estimate the number of square feet of spilled material _____

14. Has the spill been covered? _____

15. Is the spill on the ground? _____ Pavement? _____

16. Is the spill in water? _____ Lake? _____ Stream? _____

17. Is the spill near a building? _____ Sewer? _____

18. Is the accident place illuminated at night? _____

19. Other comments: _____

20. Where can you be reached by phone?

    a) Near the accident site _____

    b) Home or business phone _____

    c) Your name: _____

ATTACHMENT 3

RADIOACTIVE WASTE SHIPMENT CHECKLIST

DATE _____ BY _____

SHIPMENT No._____ *CONSIGNEE* _____

NOTE: Initial each statement ***as being completed*** or fill in the blank ***with appropriate comment(s)***. N/A is acceptable for those steps not required for this particular shipment.

1. General description _____

2. Consignee license reviewed and consignee authorized to receive type and quantity of material in shipment. _____

3. Number of packages in shipment. (Indicate number of packages of each type of waste.) _____

4. All containers inspected by Site Manager, or ***designee***, to ensure compliance with all applicable laws, rules and regulations, including: labeling, obliteration of old markings, ***rad***waste classification/stability, gross weight, and package specifications. _____

5. A determination has been made whether or not any package in this shipment is a Reportable Quantity. _____

6. If this is an "Exclusive Use" shipment, the packages are loaded and blocked and braced or otherwise restrained to prevent movement. _____

7. Placard the vehicle per Subpart F of 49 CFR 172. For tractor-trailers, placard each side of the trailer and place one on the front of the tractor. For rail shipments, a placard must be visible on each side of a rail car not coupled to another car. _____

8. If applicable, the required tamper proof seals are installed. _____

9. ***KMCC***'s ***Straight Bill of Lading- Short Form, (attachment 1)*** has been completed. Normal copy distribution if applicable is as follows: _____

   a. ***WCP Project*** files.

   b. With shipment, ***Note: if radwaste material***, the copy goes in the disposal site paperwork package.

   c. With driver paperwork package.

NOTE: The following step applies to ***shipments for disposal at*** the Envirocare of Utah facility only.

10. The Envirocare of Utah facility***'s Radioactive Waste Shipment Record,*** is complete. _____

Copy distribution:

a. Original with shipment paperwork package.

b. Copy with driver paperwork package.

c. Copy to ***WCP Project*** files.

11. The "EXCLUSIVE USE" Vehicle Instructions to Carrier, ***(attachment 6)***, has been completed. _____

Copy distribution:

a. Original with drivers paperwork package.

b. Copy with shipment paperwork package.

c. Copy to ***WCP Project*** files.

12. Deleted

13. Radiation surveys have been performed.

Copy distribution:

a. Original to ***WCP Project*** files.

b. Copy with driver's paperwork package.

13. Receipt of ***radwaste*** material has been acknowledged by the disposal site operator ***within allotted time (20 days).*** _____

Copy distribution:

a. Original with shipment paperwork

b. One copy with driver's paperwork

c. One copy to ***WCP Project*** files

15. Vehicle check performed. _____

16. ***Deleted*** _____

Reviewed by:_____***Date***_____
Site Manager or Designee

ATTACHMENT 4

SHIPMENT CERTIFICATION

Shipment # _____

THIS PACKAGE CONFORMS TO THE CONDITIONS AND LIMITATIONS SPECIFIED IN 49 CFR 173.421 FOR RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - LIMITED QUANTITY OF MATERIAL, N.O.S., UN 2910.

_____

Signature/Date
KERR-MCGEE CHEMICAL CORPORATION
WEST CHICAGO, ILLINOIS

ATTACHMENT 5
KERR-McGee CHEMICAL CORPORATION
WEST CHICAGO FACILITY

SHIPMENT LOAD DIAGRAM - TRUCK

SHIPPER	CAB NUMBER	TRAILER NUMBER
SURVEY BY	SHIPMENT NO.	DATE

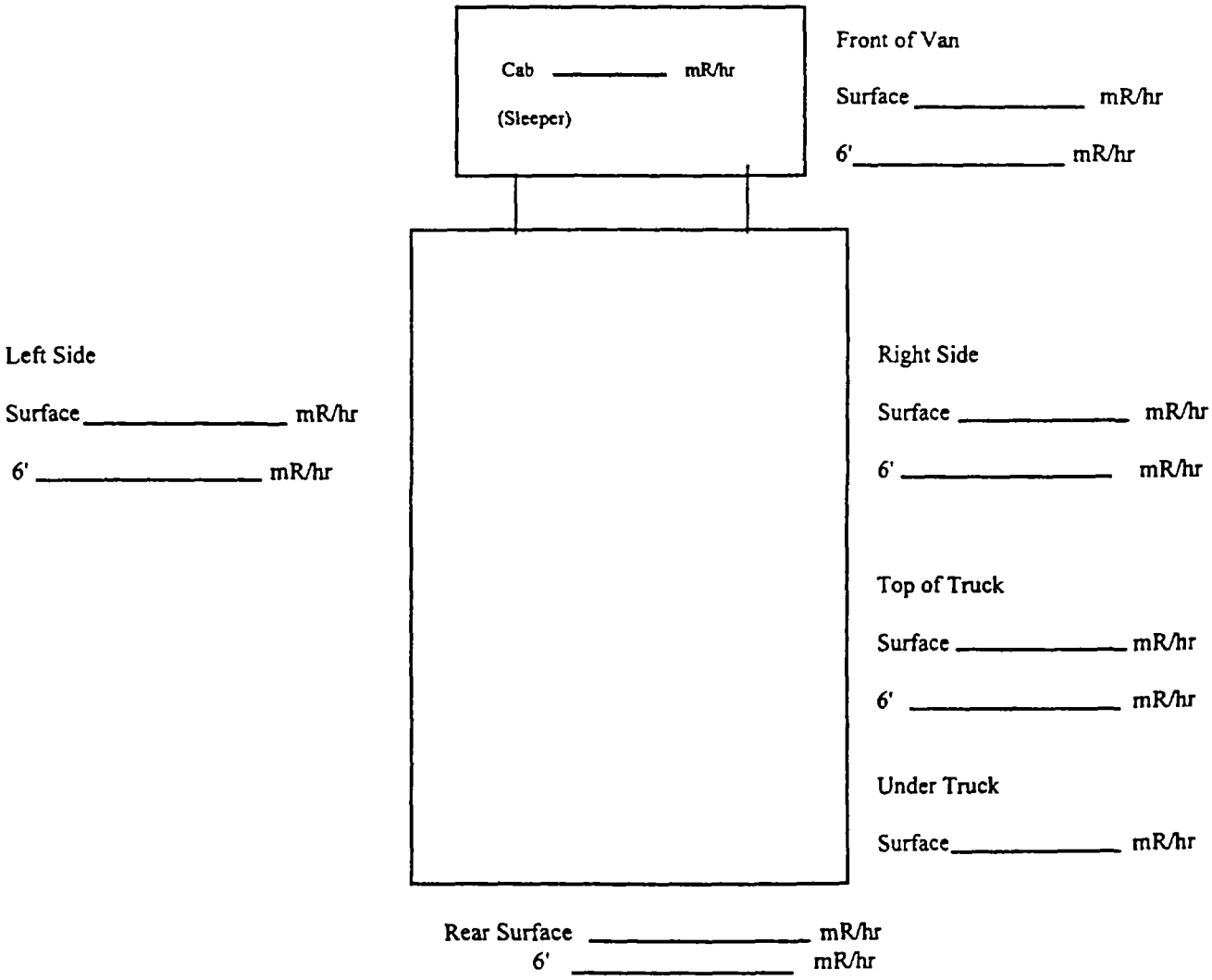
TRUCK CHECKED FOR CONTAMINATION:

BEFORE LOADING: ☐ <2200 dpm/100 cm² beta-gamma ☐ <220 dpm/100 cm² alpha

☐ CONTAMINATED TO

RADIATION LEVEL, MR/hr	CONTAMINATION LOCATION

AFTER LOADING: ☐ <2200 dpm/100 cm² beta-gamma ☐ <220 dpm/100 cm² alpha



ATTACHMENT 6
KERR-MCGEE CHEMICAL CORPORATION
"EXCLUSIVE USE" VEHICLE INSTRUCTIONS TO CARRIER

SHIPMENT NO._____ DATE _____

1. This shipment of radioactive material is being transported as an EXCLUSIVE USE shipment, loaded by Kerr-McGee Chemical Corporation (the consignor) and may only be unloaded under the direction of the consignor or consignee [49 CFR 173.403 (i)].

2. Any removal, addition to, or movement of, any material in this shipment by anyone, except under the direction of the consignee or consignor, shall constitute a violation of federal law.

3. A closed van shipment shall not be opened, nor shall any shipment be changed or modified in any manner, except by the consignee, without the prior authorization of Kerr-McGee Chemical Corporation. No change of tractor is authorized without prior approval of Kerr-McGee Chemical Corporation. Do not move the 5th wheel of the tractor once the shipment has left the Kerr-McGee West Chicago site.

In the event of an emergency, accident, or contemplated deviation from any of the above instructions, notify Kerr-McGee Chemical Corporation at: ( )_____-_____. Routine inspection of placarding is required at all "off the road" stops.

Kerr-McGee Chemical Corporation Authorization

_____
Signature Date

CARRIER ACKNOWLEDGEMENT:
I have read and understand the foregoing instructions. I agree that this shipment will be made in full accordance with these instructions.

_____
Signature Date

_____
Print Name

LINDSAY LIGHT II SITE

Standard Operating Procedure

Title: Surveys for Surface Contamination and Release of Equipment for Unrestricted Use

Document Number: SOP-LLII345

Revision Number: 0

Approved By:

Date: October 23, 1996 **Replaces:** None

SURVEYS FOR SURFACE CONTAMINATION AND RELEASE OF EQUIPMENT FOR UNRESTRICTED USE

1.0 SCOPE

1.1 Purpose

This procedure provides the methods for the detection and measurement of radioactive contamination within the site areas, it provides the methods for evaluating contamination, and establishes the criteria for releasing equipment or materials out of the Exclusion Zone. These methods are to be used to minimize the spread of radioactive contamination.

1.2 Applicability

This procedure applies to surveys that are performed on building surfaces, vehicles, equipment, materials (herein referred to as equipment) at the site and to the site personnel, who are required to monitor and release the equipment.

2.0 REFERENCES

2.1 32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection Against Radiation

2.2 32 Illinois Administrative Code, Part 400, Notices, Instructions and Reports to Workers; Inspections

2.3 West Chicago Project, Health and Safety Plan for Decommissioning Activities at the Kerr-McGee Chemical Corporation Rare Earths Facility, West Chicago, Illinois

2.4 NUREG CR5849 Manual for Conducting Radiological Surveys in Support of License Termination

2.5 State of Illinois Department of Nuclear Safety License Number STA-583

3.0 DEFINITIONS

3.1 Beta-Gamma to Alpha Decay Ratio

A thorium-232 decay series produces about 0.5 beta-gamma decays for every one alpha decay. This ratio allows the limits for alpha contamination to be verified using beta-gamma survey instruments.

3.2 Clean Area

This term defines radiation conditions within a specified area. An area where the radiation levels and contamination levels are maintained below 2 mrem/hr and 33 dpm/100 cm^2 alpha respectively.

3.3 Contamination Surveys

An assessment that may include, as appropriate, surveys for loose and fixed contamination through the use of direct frisks, large area wipes and smears, to locate and quantify the radioactive material present.

3.4 Exclusion Zone

The area on one side of the Control Line that includes Contamination Control Areas, Radiation Areas, and Airborne Radioactivity Areas.

3.5 Large Area Wipes

Paper towels or maaslin used to wipe large areas to identify the presence of loose contamination.

3.6 Lower Limit of Detection (LLD)

The smallest amount of a radionuclide in a sample that will be detected with a probability of non-detection (Type 1 error) while accepting a probability of erroneously detecting that radionuclide in a blank sample (Type II error). These probabilities are 0.05 (5% chance of Type I or II errors). See Attachment 5 - "LLD Calculation" sheet.

3.7 Smears

Typically 2 inch disk type paper material. Smears are normally taken to identify and quantify loose contamination.

3.8 Unrestricted Release

Release of equipment or materials from the Exclusion Zone to any destination other than a licensed facility.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 Health Physics personnel shall ensure that all portable survey equipment used for this procedure are properly functioning and have a valid calibration sticker.

4.1.2 The Health Physics Supervisor or designee shall ensure that all personnel who are required to perform this procedure are properly trained and understand this procedure.

4.1.3 Equipment, vehicles and areas should be free of visible dirt, mud or dust prior to performing a contamination survey.

4.2 Tools, Material, Equipment

4.2.1 The following counting equipment, or their equivalents, should be used for performing contamination surveys on equipment and materials:

- Eberline PAC-4G gas proportional survey meter coupled to an AC-21 probe or equivalent.
- Eberline PRM6 rate meter coupled to an HP-210 shielded GM detector or equivalent.
- Gamma Products G5000 automatic alpha/beta counting system or equivalent.
- Eberline E-530 survey meter with an HP-270 tissue equivalent GM detector or equivalent.
- Eberline RD-14 Alpha counting system or equivalent.

4.2.2 Survey Maps (or lists) should be produced for each applicable type of equipment. Sketches of building surfaees (walls, floors, etc.), identifying the surveyed grids, should be produced for each surveyed building.

4.3 Precautions, Limits

4.3.1 Direct and removable surveys should not be performed on wet surfaces. for alpha contamination. Wet surfaces should be surveyed only for beta-gamma contamination. ***However, the Health Physics Supervisor shall*** make the final determination as to when a wet surface is to be surveyed.

4.4 Acceptance Criteria

4.4.1 Prior to unrestricted release from the Exclusion Zone, all vehicles, equipment and materials shall be surveyed for contamination. If contamination is found, then the vehicle, equipment, or material should be decontaminated in order to be within the applicable surface contamination release limits per Attachment #3 ***and Attachment 6 (Beta-Gamma Survey of Truck Tires) shall be used as a guideline for meeting Department of Transportation (49CFR173.443) release criteria, when performing surveys on wet surfaces.***

4.4.2 The release of items from clean areas within the Exclusion Zone will be controlled by specific criteria established on a case by case basis and approved by the Health Physics Supervisor.

5.0 PROCEDURE

5.1 Routine Surface Contamination Surveys

5.1.1 Routine surveys shall be performed by trained personnel (typically by Health Physics Technicians), in accordance with this procedure and as scheduled by theHealth Physics Supervisor.

5.1.2 Routine contamination surveys are not required in the Exclusion Zone.

5.1.3 Support Zone and Contamination Reduction Zone shall be surveyed at least weekly to ensure that cross contamination is not occurring. The clean side of the Contamination Reduction Zone should be surveyed each work day.

5.1.4 Other surveys will be performed, as appropriate, to support Special Work Permits, the movement of equipment from radioactive material areas to clean areas, and to evaluate radiological conditions in specific work areas when directed by the Health Physics Supervisor.

5.2 Support/ Contamination Reduction Zone- Surface Contamination Surveys

5.2.1 Survey techniques may employ the use of large area wipes, smears, or direct frisks as appropriate to the area being surveyed.

5.2.2. Large area wipes may be used to assess floor areas for contamination. A sufficient number of large area wipes should be used to evaluate approximately 10% of the floor area being surveyed.

5.2.3 If contamination is found with the large area wipes, a more detailed smear survey should be performed.

5.2.4 Counter tops, office furniture, laboratory equipment, etc., should be included in the contamination surveys. The area immediately on the clean side of the Control Line should be included in the survey.

5.2.5 Smears shall cover approximately 100 cm^2 and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequential number corresponding to the Smear Number on the "Radiological Survey Data Sheet -West Chicago Facility" (see Attachment 1).

5.2.6 The smears shall be analyzed for alpha contamination.

5.3 Equipment- Surface Contamination Surveys

5.3.1 Equipment shall be surveyed for contamination by using large area wipes, smear and by direct frisk as appropriate.

5.3.2 Take an appropriate number of smears to adequately assess the radiological conditions of the item being surveyed.

5.3.3 A large area wipe may be used as an indication of the presence of contamination.

5.3.4 Smears shall cover approximately 100 cm^2 and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequencial number corresponding to the Smear Number on the "Radiological Survey Data Sheet -West Chicago Facility" (see Attachment 1).

5.3.5 The smears shall be analyzed for alpha contamination.

5.4 Unrestricted Release

5.4.1 Materials, equipment and vehicles shall be surveyed for contamination prior to unrestricted release from the site, using large area wipes, smears, and by direct frisk.

5.4.2 All building surfaces, large concrete pieces, and other materials having large smooth surfaces shall be surveyed prior to unrestricted release. A sufficient number of large area wipes and/or smears shall be taken to adequately assess any contamination present.

5.4.3 All equipment intended for unrestricted release from contaminated areas shall be surveyed for removable and fixed contamination. A sufficient number of large area wipes and/or smears shall be taken to adequately assess any contamination present. If removable contamination is within the release criteria, then perform a direct alpha frisk. Particular attention should be given to areas of the vehicle most likely to have become contaminated such as tire exterior surfaces, occupied areas, load areas, wheel wells, and the bottom of the equipment.

5.4.4 Vehicles intended for unrestricted release from contaminated areas shall be surveyed for removable contamination with large area wipes. If no contamination is found, take a confirmatory smear to document each large area wipe. If contamination is found, take an appropriate number of smears to evaluate the removable contamination present. If removable contamination is within the release criteria, then perform a direct alpha frisk. All survey results must be documented.

5.4.5 Vehicles intended for unrestricted release from clean areas in the Exclusion Zone

shall be surveyed with large area wipes on accessible tire/track surfaces, with a direct frisk of tire/track surfaces, and with one smear each for two tires. The results of the direct frisk and the large area wipes must indicate that the release criteria is met. The smears shall be added to the survey documentation when the results become available.

5.4.6 Large area wipes may be used as an indication of the presence of contamination.

5.4.7 If no contamination is found with a large area wipe, a confirmatory smear shall be taken for documentation.

5.4.8 If contamination is found with the large area wipe, a representative number of smears shall be taken to quantify the removable contamination present.

5.4.9 Smears shall cover approximately 100 cm^2 and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequencial number corresponding to the Smear Number on the "Radiological Survey Data Sheet-West Chicago Facility" (see Attachment 1).

5.4.10 The smears shall be transported to the - Site Laboratory for analysis.

5.4.11 Perform a direct frisk on all material being surveyed for unrestricted release.

5.4.12 Personal equipment and articles (radios, pens, paper, clipboards, etc.) can be surveyed with either the large area wipes or by direct frisk, as appropriate.

> **NOTE**
> Items that have irregular surfaces, such as radios, should be wiped and frisked. Items with relatively smooth surfaces, such as paper, pens, etc., may be direct frisked only.

5.5 Documentation of Results

5.5.1 The smear counting results and data shall be documented on the "Radiological Survey Data Sheet-West Chicago Facility" (see Attachment 1). The documentation of the release survey shall include a drawing of the item to be released.

5.5.2 The instructions for completion of the Radiological Survey Data Sheet are contained in Attachment 2.

5.5.3 A request for equipment release form (Attachment 7) shall be initiated by the equipment owner to track the decontamination process.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 The Health Physics Supervisor and the Site Manager (RSO) shall review and approve all completed survey forms required by this procedure, to comply with reference 2.5 above.

6.2 The survey maps shall be uniquely numbered and retained by Health Physics for project filing. Single item survey maps shall be attached to the survey results.

7.0 ATTACHMENTS

7.1	Attachment 1	Radiological Survey Data Sheet -West Chicago Facility(example)
7.2	Attachment 2	Radiological Survey Data Sheet Instructions (2 pages)
7.3	Attachment 3	Surface Contamination Release Limits
7.4	Attachment 4	Large Area Wipes on Truck Tires
7.5	Attachment 5	LLD Calculation
7.6	Attachment 6	Beta- Gamma survey of Truck Tires (wet surfaces)
7.7	Attachment 7	Request For Equipment Release

Attachment 1

RADIOLOGICAL SURVEY DATA SHEET - WEST CHICAGO FACILITY

PAGE	OF

ITEM DESCRIPTION	00 __ Vehicle	98 __ Equipment	__ __ Building	99 __ Other

REFERENCE #	YR	MO	DAY	ITEM	NO.	PERFORMED BY

ALPHA SURVEY INSTRUMENTATION	BETA SURVEY INSTRUMENTATION

LOCATION	SMEAR NUMBER	ALPHA ACTIVITY (dpm/100cm²)			BETA-GAMMA DIRECT (CPM)
		DIRECT	REMOVABLE	FIXED	

REMARKS

REVIEWED BY:	DATE:

Attachment 2

RADIOLOGICAL SURVEY DATA SHEET INSTRUCTIONS

1. Select the appropriate survey category.

2. Enter the purpose of the survey in the "ITEM DESCRIPTION" section. Be specific:

   - Vehicle survey for release from the site.

   - Tools and equipment for use in the clean area.

   - SWP support, include the SWP number.

3. Enter the survey date.

4. Enter the reference number - Year, Month, Date, Item (Use coding for categories at the top of the form) and Number (Individual survey number issued to each technician by Kerr-McGee).

5. Enter your signature in the "PERFORMED BY" section.

6. Enter the instrument(s), serial number(s), and background reading(s) for the survey instruments used for this survey.

7. Enter the "LOCATION OF READING." Enter descriptions such as, the location and item being surveyed, vehicle number, smear location on vehicle, etc.

8. Enter the number of the smear or large area wipe in the "SMEAR NUMBER" section.

9. All data in the "ALPHA ACTIVITY" section is recorded in dpm/100cm^2, except large area wipe data.

   - If equipment/material is directly frisked, the reading from the PAC-4G is converted to dpm/100cm^2 by multiplying ccpm by a factor of 4 (Gross cpm - Background cpm X 4) and enter the result in the "DIRECT" column. If the instrument response cannot be distinguished from background enter <200 dpm/100cm^2.

Attachment 2 (Cont.)

RADIOLOGICAL SURVEY DATA SHEET INSTRUCTIONS

- The "REMOVABLE" column may contain the result from a smear or the result from a large area wipe. Smear results that are less than the LLD shall be recorded as less than the numerical LLD value for the instrument in use. As an example, if the LLD for the G5000 is 3 dpm, then the result will should be recorded as <3 dpm/100cm^2. All results should be rounded to the nearest whole number. Results from LAWS should be recorded as dpm without regard to area, unless specific instructions are given to calculate the result per area, as in Attachment 4. Results that do not exceed background should be recorded as BKG (Background).

- Fixed contamination is the difference between the direct frisk results and the removable contamination results. If no fixed contamination is detectable, enter N/A in the "FIXED" column.

10. If a "BETA-GAMMA DIRECT" survey is performed, record the results as ccpm.

11. In the "REMARKS" section, record any identifying data on counting equipment and any other information needed for explanation or interpretation of survey data. If large area wipes are included in the removable contamination data without regard to area, note this in the "REMARKS" section.

Attachment 3

SURFACE CONTAMINATION RELEASE LIMITS

Average Removable (dpm/100 cm²)	Maximum Removable (dpm/100 cm²)	Average Fixed (dpm/100 cm²)	Maximum Fixed (dpm/100 cm²)
33	100	1,000	5,000
Equivalent Beta-Gamma Measurements[b,c]			
17	50	500	2,500

[a] The contamination levels may be averaged over one (1) square meter provided the maximum activity per any 100 cm^2 area within the one (1) square meter is less than the maximum applicable release limit.

[b] Beta-gamma release limits derived from the beta-gamma to alpha ratio.

[c] Beta-gamma surveys are not normally performed for release purposes. If alpha contamination is verified to be within specified release limits, the alpha to beta-gamma ratio indicates that the beta-gamma is also within limits.

Beta-gamma frisks may be used as appropriate to:

- Estimate contamination levels prior to performing release surveys.
- Estimate levels of contamination present on equipment, materials and work areas.

The results of direct beta-gamma frisks should be quantified on survey records as CCPM (Corrected Counts Per Minute).

Results that are less than 100 CCPM should be recorded on the survey record as <100 CCPM.

Attachment 4

LARGE AREA WIPES ON TRUCK TIRES

Large area wipes are used to wipe an area of approximately 2000 cm^2 on truck tires. The wipes are then frisked with a PAC-4G.

Assuming that 50 cpm above background is readable, it can be assumed that 100 dpm is detectable on a wipe. If the area of the wipe requires two probe areas to cover the wipe, then it can be assumed that we can assess with each measurement approximately half of the total area wiped, or 1000 cm^2, or approximately 100 dpm/1000 cm^2, which is equivalent to 10 dpm/100cm^2.

Frisk results on LAWs, from truck tires, that are nondetectable may be recorded as <10 dpm/100cm^2 in the removable column of the survey report.

ATTACHMENT 5

LLD CALCULATION

$$LLD = \frac{2.71}{T_s} + 3.29\sqrt{\left(\frac{C_b}{T_b}\right)\left(1 + \frac{T_b}{T_s}\right)}$$

Where C_b = Background Counts Per Minute
T_b = Background Counting Time in minutes
T_s = Sample Counting Time in minutes

EXAMPLE: The background count rate for a given counter is 1.56 cpm over a 50 minute counting time and samples are counted for 2 minutes. The counter has an efficiency of 40.3%.

$$LLD = \frac{2.71}{2} + 3.29\sqrt{\left(\frac{1.56}{50}\right)\left(1 + \frac{50}{2}\right)}$$

$$LLD = 4.32\ cpm$$

$$LLD = \frac{4.32\,cpm}{.403} = 10.7\,dpm$$

ATTACHMENT 6

Beta-Gamma Survey of Truck Tires

The ***Department of Transportation*** removable contamination limits ***in 49CFR 173.443*** are 220 dpm alpha contamination and 2200 dpm beta contamination. The most restrictive is the alpha limit. If weather prevents surveying for alpha contamination, then beta-gamma surveys will have to be utilized. The alpha to beta ratio ***for the thorium chain is approximately 2:1. Using an alpha*** to beta ratio of 2, the beta equivalent activity for the alpha limit would equal 110 dpm. 110 dpm times the probe efficiency of 0.14 cpm/dpm equals 15.7 cpm. 15.7 cpm above background is not discernable in the field. The diameter of a truck tire is 43 inches. The tread width is 9 inches. The surface area of a truck tire equals 7843.8 cm^2. Approximately 12 inches of tread is on the ground and not surveyable. This represents 3.5% of the surface area of the tire. The remaining 96.5% equals a surface area of 7569.5 cm^2. The typical area of contact for a wipe is about 3.5 inches by 4 inches. This is equal to about 90 cm^2. If the conservative area of 100 cm^2 is used the each cm^2 of wipe is equal to 57.7 cm^2 of tread area. The manufacturer lists the surface area of the probe face as 15.5 cm^2. The tread area survey under the probe equals 894.4 cm^2. To correct the measured counts to an activity/100 cm^2 the counts indicated on the meter face must be multiplied by 8.9. If 15.7 cpm/100 cm^2 beta-gamma activity equals 220 dpm/100 cm^2 alpha contamination then the measured cpm when surveying a wipe would equal 139 cpm. The manufacturer recommends limiting the background count rate to less than 300 cpm in order to see 100 cpm above background. Due to the changing background conditions this value is being reduced to 200 cpm. Therefore if background is 200 cpm or less and the wipe on a truck tire reads less than 100 cpm above background the truck tire has less than 220 dpm/100 cm^2 removable alpha contamination.

ATTACHMENT 7
REQUEST FOR EQUIPMENT RELEASE

FROM:_____ **DATE:**_____

TO: HEALTH PHYSICS SUPERVISOR

1. Equipment type & ID #_:_____

2. Usage history (locations on site):_____
_____
_____
_____

3. Scheduled date to start decontamination: _____

4. HP check for survey readiness:: Technician:_____ **date:**_____

5. Equipment ready for survey: YES:_____ **NO:**_____

Actions required: _____
_____
_____

6.Date & Time ready for survey: _____

7. Survey date & time: _____

results: Pass:_____ **fail:**_____

8. equipment release date: _____

9.Approved for release: HP supervisor:_____**date:**_____

NOTE; On large earth moving equipment, substantial cleaning may be required prior to HP checking for survey readiness. Once vehicle has been checked and is ready for release survey, it may take as much as 24 hours from the time the survey is initiated until survey results are available. If fixed or removal is located,additional decontamination and surveys are required.

LINDSAY LIGHT II SITE

Standard Operating Procedure

Title: Decontamination

Document Number: SOP-LLII347

Revision Number: 0

Approved By:

Date: October 23, 1996 **Replaces:** None

DECONTAMINATION

1.0 SCOPE

1.1 Purpose

The purpose of this procedure is to provide instructions for the decontamination of personnel and equipment.

1.2 Applicability

This procedure is applicable for all equipment and personnel that may become contaminated at the GMO Site.

2.0 REFERENCES

2.1 32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection Against Radiation

2.2 32 Illinois Administrative Code, Part 400, Notices, Instructions and Reports to Workers; Inspections

2.3 West Chicago Project, Health and Safety Plan for Decommissioning Activities at the Kerr-McGee Chemical Corporation Rare Earths Facility, West Chicago, Illinois

2.4 Kerr-McGee Procedure ***WCP-345*** "Surveys for Surface Contamination and Release of Equipment for Unrestricted Use"

3.0 DEFINITIONS

3.1 Airborne Radioactivity Area

This term defines radiation conditions within a specified area. An area where the average concentration of airborne radioactivity could allow an individual to exceed 12 DAC-hrs over a one week period.

3.2 Clean Area

This term defines radiation conditions within a specified area. An area where the radiation levels and contamination levels are maintained below 2 mr*em*/hr and 33 dpm/100 cm^2 alpha respectively.

3.3 Contamination Control Area

This term defines radiation conditions within a specified area. An area that may be contaminated to a level greater than a Clean Area.

3.4 Contamination Reduction Zone

The area ***on one side*** of the Control Line where personnel ***can decontaminate,*** remove their personal protective clothing and equipment. ***(See "Support Zone Layout" drawing #200-CV-007.)***

3.5 Control Line

The ***demarcation*** that separates ***a*** Clean Area from ***a Contamination Control Area. The control line is located in the personnel decon facility.***

3.6 Craft Personnel

Employees and contractors who physically perform the activities described on the SWP.

3.7 Derived Air Concentration-Hour (DAC-hour)

DAC-hour is the product of the concentration of radioactive material in air and the time of exposure to that radionuclide.

3.8 Exclusion Zone

The area ***on one side of*** the Control Line that includes Contamination Control Areas, Radiation Areas, and Airborne Radioactivity Areas.

3.9 Film Badge

Similar to the TLD, it is used to measure radiation dose.

3.10 Frisking

A personal survey of an individual's clothing and exposed body performed to determine if contamination is present.

3.11 Protective Clothing

Reusable or disposable coveralls, boots and gloves that provide a barrier between contamination and personnel.

3.12 Radiation Area

This term defines radiation conditions within a specified area. An area where the whole body radiation level is greater than 5 mrem/hr.

3.13 Special Work Permit (SWP)

A document which describes the radiological conditions of the work area or task and delineates safety and radiation protection requirements to be followed in the work area or when performing the task.

3.14 Support Zone

The area on one side of the Control Line at the entrance to the Exclusion Zone. ***(See "Support Zone Layout" drawing #200-CV-007.)***

3.15 Thermoluminescent Dosimeter (TLD)

A device that measures radiation dose.

4.0 REQUIREMENTS

4.1 Prerequisites

None.

4.2 Tools, Material, Equipment

4.2.1 Decontamination facility.

4.2.2 Soap, water, high pressure spray, scrub brushes and other material as necessary to decontaminate personnel and equipment.

4.3 Precautions, Limits

Decontamination of personnel with material other than soap and water will only be done when authorized by the Site Manager, Health Physics Supervisor, or a medical doctor.

4.4 Acceptance Criteria

4.4.1 Personnel shall be free of contamination after decontamination.

4.4.2 Material and equipment ***being decontaminated, for unrestricted release, shall meet the release limits established in Reference 2.4.***

5.0 PROCEDURE

5.1 Personnel Decontamination

5.1.1 Personnel who are contaminated to greater than 100 ***ccpm*** shall notify the health physics technician (HPT) assigned to the Control Line.

5.1.2 The HPT shall resurvey the individual to determine the exact location of the contamination and document it on the Contaminated Personnel or Personal Effects Report (Attachment 1).

5.1.3 If the contamination is spotty, the HPT shall attempt to decontaminate the individual using swabs or soap and water. If the decontamination is successful, document the results on Attachment 1.

a. If contamination is determined to be in an individual's eyes, the eyes may be flushed, using an eye wash station.

b. If contamination remains in the eyes after flushing or is determined to be in an individual's nose or ears, decontamination will be performed under the direction of the Health Physics Supervisor or qualified medical personnel.

c. Cleansing methods for skin decontamination, in order of harshness are as follows:

1. Lifting off with sticky tape.

2. Flushing with water.

3. Soap and cool water.

4. Mild abrasive soap, soft brush, and water.

5. Detergent (soap powder).

6. Mixture 50% powdered detergent and 50% cornmeal.

5.1.4 If the contamination cannot be easily removed or the contamination is wide spread, the HPT shall escort the individual to the decontamination facility and notify the Health Physics Supervisor and the Site Manager.

5.1.5 The contamination shall be removed by having the individual wash with soap and cool water several times if necessary. The methods listed above may be used by the HPT.

5.1.6 If the decontamination is successful, document the results on Attachment 1.

5.1.7 If, after several attempts, the contamination is not successfully removed, notify the Health Physics Supervisor.

5.2 Tool Decontamination

5.2.1 All tools being removed from the Exclusion Zone shall be checked by the HPT.

5.2.2 Tools that are contaminated shall be decontaminated before they can be released from the Exclusion Zone.

5.2.3 Tools shall be decontaminated by the users under the direction of the HPT.

5.2.4 Tools can be decontaminated using scrub brushes and soap and water, wiping with damp rags or wipes, soaking in a decontamination solution, using abrasive materials ultrasonic cleaners, or any other method approved by the HPT.

5.2.5 All interior surfaces of the tools must be decontaminated as well prior to the tool being unconditionally released.

5.2.6 If the tool is decontaminated and released by the HPT, the survey results shall be documented on a Radiological Survey Data Sheet **(Reference 2.4).**

5.2.7 If the tool cannot be decontaminated after several tries, then the tool shall be painted or sprayed with yellow paint to indicate that the item is radioactive material and kept in the Exclusion Zone.

5.3 Equipment Decontamination

5.3.1 Heavy equipment, such as backhoes, bulldozers, trucks, cranes, shall be washed with high pressure water spray prior to being surveyed by the HPT.

5.3.2 The washing of heavy equipment shall be performed in an area designated by health physics.

5.3.3 Once the equipment is washed, it will be surveyed by the HPT. The HPT will identify any areas on the equipment that need further decontamination and will make recommendations on how to further decontaminate.

5.3.4 All surfaces of the equipment must be decontaminated and surveyed. This includes air intakes, air filters and any internal surface that is likely to be contaminated.

5.3.5 Once the equipment has been surveyed and released by the HPT, the survey results shall be documented on a Radiological Survey Data Sheet ***(Reference 2.4).***

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Release surveys and personnel decontaminations shall be documented on the appropriate form.

6.2 Personal contaminations shall be reported to the Health Physics Supervisor and the Site Manager.

7.0 ATTACHMENTS

7.1 ***Attachment 1 Contaminated Personnel or Personal Effects Report***

ATTACHMENT 1

CONTAMINATED PERSONNEL OR PERSONAL EFFECTS REPORT

DATE OF INCIDENT	TIME OF INCIDENT
NAME	BADGE NO
LOCATION OF INCIDENT (SPECIFIC AREA)	

DESCRIPTION	DESCRIBE IN DETAIL ANATOMICAL LOCATION, CONTAMINANT, TYPE OF INJURY, OR CONTAMINATED ARTICLE:

CONTAMINATED ARTICLE OR AREA	DECONTAMINATION AGENT USED	INSTRUMENT	SURVEY RESULTS BEFORE	SURVEY RESULTS AFTER	FINAL DISPOSITION OF ARTICLES

WOUND COUNT /5 MIN	BKGD COUNT /5 MIN	SOURCE COUNT /5 MIN

SAFETY MEASURES	PERTINENT SAFETY MEASURES IN EFFECT ☐ YES ☐ NO	IF NO, EXPLAIN

REMARKS	

EMPLOYEE SIGNATURE	HEALTH PHYSICS SIGNATURE

STANDARD OPERATING PROCEDURE

SAMPLE PREPARATION PROCEDURE FOR GAMMA SPECTRAL ANALYSIS

Title: Sample Preparation Procedure for Gamma Spectral Analysis

Document SOP-LLII364

Revision Number: 0

Date: Replaces: New

SAMPLE PREPARATION PROCEDURE

1.0 SCOPE

1.1 Purpose

The purpose of this procedure is to provide guidance for the preparation of samples for analysis of moisture or radioactive nuclides.

1.2 Applicability

This procedure applies to all soil-type environmental samples, including, soil, rocks, concrete, and construction debris.

2.0 REFERENCES

2.1 32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection Against Radiation

2.2 West Chicago Project, Health and Safety Plan for Decommissioning activities at the Kerr-McGee Chemical Corporation Rare Earths Facility, West Chicago, Illinois

2.3 State of Illinois Department of Nuclear Safety Radioactive Material License Number STA-583

2.4 West Chicago Project, Facility Procedure #WCP-365 "Moisture Analysis"

2.5 West Chicago Project, Facility Procedure #WCP-380 "Use of Laboratory Standard Reference Methods Procedure"

3.0 DEFINITIONS

NONE

4.0 REQUIREMENTS

4.1 Prerequisites

NONE

4.2 Tools, Material, Equipment

4.2.1 The following equipment is needed to perform this procedure:

a. 20 ml sample vials

b. A set of sieves ranging from one-inch to 100 mesh.

c. Bico-Braum Pulverizer

d. Riffle splitter

e. ***2 qt plastic jars***

f. aluminum pans

g. 4-inch Braum-Chipmunk Crusher

h. analytical balance

i. Marinelli beakers

j. zip-lock bags

k. labels

l. drying oven

4.3 Precautions, Limits

4.3.1 Personnel are to use extreme caution when using the "Jaw Crusher" and the"Pulverizers" because they can cause a serious injury.

4.3.2 All samples not known to be homogeneous must be homogenized prior to analysis.

4.4 Acceptance Criteria

Proper preparation ensures that the samples submitted to the laboratory are representative of the material sampled and suitable for the requested analysis.

5.0 PROCEDURE

5.1 All Samples

5.1.1 All samples are brought to the sample receiving area and the following information is documented in the *"Sample Prep Log"*.

a. *Number of samples*

b. *Originator of samples*

c. *Date received*

5.1.2 If the samples are not uniquely identified, assign a unique number to each sample and identify the number(s) on each sample and in the Sample Prep. Log.

5.1.3 Prepare the sample in accordance with the requirements of the analysis requested.

5.1.4 Sample(s) received for IDNS and/or USEPA are logged as received in the Sample Prep. Log Book. The appropriate agency is notified to pick up the sample(s) from the site laboratory. When samples are picked up, note the date and time in the Sample Prep. Log Book.

5.2 Lot Samples for Railcar shipment.

5.2.1 The lab technician should: log Receipt of Samples from lots in the Sample Prep. Log Book, then sign the associated Sample Tracking Form.

5.2.2 Label appropriate # of Liquid Scintillation Containers (LSC Vials).

5.2.3 Prepare samples to 20 g ± 0.5 g after homogenizing each sample.

5.2.4 Perform moisture analysis if requested in accordance with reference 2.4.

5.2.5 Perform pH analysis if required in accordance with reference 2.5.

5.3 Shared Samples

5.3.1 If the sample appears to be "dry," divide the sample into 2 or 3 sub-samples (2 if a QA sample is needed; 3 if a QA and an IDNS sample split

is also needed) using the riffle splitter. If the samples appears to be "wet", homogenize and manually divide into 2 or 3 sub-samples

5.3.2 Label ***uniquely*** each sub-sample ***and log the numbers in Sample Prep. Log book.***

5.3.3 ***Submit samples for analysis.***

a. Samples for the soil lab shall be 20 ± 0.5 grams and placed into 20 ml vials ***for nutranl analysis.***

b. Samples for the IDNS shall weigh one if prepared by Kerr-McGee.

c. Samples placed in Marinelli beakers shall ***be in a*** 1.00 liter ***geometry.***

d. The net weight of the Marinelli beaker shall be noted on the sample label attached to the beaker. Note: Do not write directly on the beaker.

e. Samples for an outside laboratory or "reserved sample" shall weigh 1000-1100 grams and be placed ***into storage jars and labeled.***

5.*3*.4 Submit the ***vial*** samples to the soil lab for gamma pulse height analysis by Nal-NURTANL.

5.*3*.5 Samples for IDNS shall be submitted to state personnel for analysis.

5.3.6 ***If moisture analysis is required perform analysis in accordance with reference 2.4.***

5.*3*.7 Submit the "Marinelli-beaker" samples for gamma pulse height analysis by GE.

5.*3*.8 ***Place*** the ***jar*** samples in storage.

5.*4* QA Sample

5.*4*.1 Place the sample in an ***tared*** aluminum pan and weigh before drying.

5.*4*.2 Dry the sample for 8-16 hours at 105-110°in a drying oven.

5.4.3 Weigh the sample after drying and calculate the moisture content.

$$\% \text{ Moisture} = \frac{\text{weight of water} * 100}{\textit{Net}\text{ weight as-received sample}}$$

5.4.4 Remove non-native, non-crushable debris (including pieces of metal, wood, etc., but excluding crushable brick, concrete, glass, etc.) and detritus (grass, etc.) from the samples.

5.4.5 Samples must pass through a ¼ inch mesh to be acceptable for gamma spectral analysis. Sample components greater than ¼ inch shall be crushed using a 4-inch chipmunk crusher.

NOTE: If sample contains material greater than ¼" crush to less than ¼" with the chipmunk crusher.

5.4.6 Riffle-split the sample down to 3000-5000 grams for analysis by Marinelli beaker, GE Detector.

5.4.7 Using the Bico-Braum Pulverizer, grind the samples to less than 10 mesh.

5.4.8 Blend the pulverized sample by rolling it ***in a jar and place jar in storage for Radon ingrowth.***

5.4.9 ***After allowing time for radon in growth, transfer 1.0 liter of material to a Marinelli beaker and determine net weight.***

5.4.10 Transfer 20 ± 0.5 grams into a 20 ml LSV. Cap the LSV tightly. Place the remainder of the material into a two liter polyethylene bottle. Cap the bottle tightly and label "This is a reserve sample".

5.4.11 ***Perform Gamma Pulse Height Analysis on samples.***

5.5 ***Verification of Samples***

5.5.1 ***Transfer equal weight of sample from each grid sample point into bucket.***

5.5.2 ***Homogenized sample***

5.5.3 ***Fill labeled sample jar with sample***

5.5.4 ***Transfer 20.0g ± 0.5g to label LSC vial.***

5.5.5 Perform moisture analysis in accordance with reference 2.4.

5.5.6 If grid selected for QA Analysis transfer ≈ 3000g of sample to aluminum pan and place into oven for drying.

5.5.7 Place jar into storage and submit Lbc vial for Gamma Pulse Height Analysis.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Notify the laboratory technician when the samples are properly labeled and ready for analysis.

6.2 Samples shall be retained until all evaluations have been completed and the sample is no longer needed.

6.3 Log Books shall be maintained by the Lab Supervisor until complete and then forwarded to Document Control for storage in the project files.

7.0 ATTACHMENTS

NONE

OPERATION OF THE ACCUSPEC GAMMA COUNTER

DOCUMENT SOP-LLII366

Reviewed By: _____ Date: _____
Quality Assurance Supervisor

Reviewed By: _____ Date: _____
Site Manager

Reviewed By: _____ Date: _____
Project Manager

OPERATION OF THE ACCUSPEC GAMMA COUNTER

1.0 SCOPE

1.1 Purpose

This procedure describes the step for performing gamma spectral analysis of samples utilizing the Accuspec Gamma Spectroscopy system.

1.2 Applicability

This procedure applies to the analysis of samples utilizing the Accuspec Gamma Spectroscopy system.

2.0 REFERENCES

2.1 32 Illinois Administrative Code, Parts 310 and 340,
Standards for Protection from Radiation.

2.2 32 Illinois Administrative Code, Part 400,
Notices Instructions and Reports to Workers; Inspections

2.3 West Chicago Project, Health and Safety Plan for Decommissioning Activities at the Kerr- McGee Chemical Corporation Rare Earths Facility, West Chicago Illinois

2.4 PC1-NUTRANL OPERATION MANUAL
KERR- McGEE Technical Manual TM-940035 March-1994

2.5 ACCUSPEC Installation and User's Guide
CANBERRA Program Documentation Version 03 March-1990

2.6 RADIOACTIVE DECAY DATA TABLES
D. C. Kocher

2.7 NaI(Tl) DETECTORS MODEL 802 SERIES
CANBERRA Operator's Manual

2.8 PHOTOMULTIPLIER TUBE BASE/PREAMPLIFIER MODEL 2007P
CANBERRA Operator's Manual

2.9 US-NRC Regulatory Guide 4.14

3.0 DEFINITIONS

3.1 None.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 The Accuspec system is operational

4.1.2 Samples to be analyzed by the Accuspec system must be in the 20 ml liquid scintillation vial geometry.

4.2 Tools, Material, Equipment

4.2.1 Canberra NaI(Tl) detector model 802

4.2.2 Canberra photomultiplier tube base/preamplifier model 2007P

4.2.3 Accuspec gamma spectroscopy program

4.3 Precautions, Limits

4.3.1 Use only plastic liquid scintallation vials 16.7 to 28 mm in diameter.

4.3.2 Power is to remain applied to this equipment. Should power be lost a warm up time of 24 hours may be required upon restart.

4.3.3 Ensure all samples to be analyzed are free from external contamination.

4.4 Acceptance Criteria

4.4.1 Background and Efficiency checks shall be performed daily prior to use.

Kerr-McGee's NUTRANL gamma pulse height analysis software does not employ "target energies" to identify and quantify nuclides. All gamma photopeaks over the range of interest are used. The Packard AccuSpec Gamma Counter system is adjusted to monitor the energy range from 50 to 2,000 keV, inclusive.

The Minimum Detectable activity (MDA) is as follows:

Counting Time	U-238 pCi/g	Ra-226 pCi/g	[illegible]	K-40 pCi/g
10 Minutes	4.6	1.4	1.3	32

MDA calculated in compliance with US-NRC Regulatory Guide 4.14 (at 4.65 times the standard deviation of the analysis for the instrument background).

4.4.2 All efficiency checks shall be within 2 standard deviations from the certified activity of the standard measured.

4.4.3 All samples to be analyzed shall be preceded by analysis of the Uranium, Thorium, Radium, Potassium, and Blank standards.

The calibration standards contain U-238 (in secular equilibrium through U-234), Th-232 (in secular equilibrium with progeny), Ra-226 (in Secular equilibrium through Po-214), pCi/g K-40. The density of each standard is similar to that of lightly compacted soil (1.5 g/cc). The U-238, Th-232 and Ra-226 standards are traceable to NIST. The K-40 standard is not NIST traceable. The blank is chromatographic grade alumina.

4.4.4 The Canberra system measures and records elapsed time, live time and dead time. The NUTRANL, code uses the live time. System dead time is typically 9 to 0% for samples ranging from background up to 1,000 pCi/g Ra.

5.0 PROCEDURE

5.1 INITIAL INSTRUMENTATION SETUP

5.1.1 Connect the equipment cables in accordance with the manufactures technical manual.

5.1.2 From the C:> prompt type "START" and press enter to start NUTRANL.

5.1.3 Enter "SETUP" for the category.

5.1.4 Enter "YYMMDDS1" for the sample ID.

5.1.5 Enter "SYSTEM SETUP" for the description.

5.1.6 Press the "ESC" key.

5.1.7 Open the detector shield assembly, place the 20 gram Thorium Standard in the detector, and close the detector shield assembly.

5.1.8 Select "S" to open the SETUP menu.

5.1.9 Select "V" to open the HVPS menu.

5.1.10 Select "L" to open the VOLTAGE LEVEL menu.

5.1.11 Enter "1000" to set the high voltage to 1000 volts.

5.1.12 Select "N" to turn the high voltage on.

5.1.13 Press the "ESC" key to return to the SETUP menu.

5.1.14 Select "A" to open the ADC menu.

5.1.15 Select "G" to open the CONV. GAIN menu.

5.1.16 Select "2" to set the conv. gain to 2048.

5.1.17 Press "ESC" key to return to the ADC menu.

5.1.18 Select "U" to set the ULD, normally set to 100%.

5.1.19 Set the ULD level using the left and right arrow keys and press "ENTER" to lock the setting.

5.1.20 Press "ESC" to return to the ADC menu.

5.1.21 Set the desired LLD level using the COARSE LLD and the FINE LLD menus.

5.1.22 Press "SHIFT-F2" to erase the current spectrum.

5.1.23 Press "F1" to start acquisition.

5.1.24 Collect a spectrum that will determine the channel location of the 74 kev peak from Thorium.

5.1.25 Adjust the ADC ZERO to place the 74 kev peak in channel 74.

5.1.26 Repeat steps 5.1.23 to 5.1.25 to adjust the ADC ZERO.

5.1.27 Open the detector shield assembly, remove the Thorium standard, place a Cs-137 source in the detector, and close the detector shield assembly.

5.1.28 Press "SHIFT-F2" to erase the current spectrum.

5.1.29 Press "F1" to start acquisition.

5.1.30 Collect a spectrum that will determine the channel location of the 662 kev peak from Cs-137.

5.1.31 Adjust the AMP GAIN to place the 662 kev peak in channel 662.

5.1.32 Repeat steps 5.1.27 to 5.1.30 to adjust the AMP GAIN.

5.1.33 Repeat steps 5.1.23 to 5.1.30 to until both the 74 kev and the 662 kev peaks are in the proper channels.

5.1.34 Record the ADC, AMP, and HVPS settings in the Accuspec Log Book.

5.2 NUTRANL CALIBRATION

5.2.1 From the C:> prompt type "START" and press enter to start NUTRANL.

5.2.2 Enter "CALIB URANIUM" for the Category.

5.2.3 Enter "YYMMDDC1" for the sample ID.

5.2.4 Enter "URANIUM STANDARD" for the description.

5.2.5 Enter 20.0 for the weight of the sample.

5.2.6 Press the "ESC" key.

5.2.7 Open the shield assembly, place a Cs-137 source in the detector, and close the shield assembly.

5.2.8 Press "SHIFT-F2" to erase the current spectrum.

5.2.9 Press "F1" to start acquisition.

5.2.10 Collect at least a two minute spectrum and press "F1" to stop acquisition.

5.2.11 Record the ADC, AMP, and HVPS settings in the Accuspec Log Book.

5.2.12 Adjust the AMP gain settings, if necessary, to align the Cs-137 662 kev peak in the 662 channel and record any changes in the Accuspec Log Book.

5.2.13 Open the detector shield assembly remove the Cs-137 source and place the 20 gram Uranium standard in the detector well and close the detector shield assembly.

5.2.14 Select "A" to open the acquire menu.

5.2.15 Select "P" to open the preset time menu.

5.2.16 Select "L" to open the preset live time menu.

5.2.17 Enter 16 minutes and 40 seconds, 1000 seconds, for the preset live time.

5.2.18 Press the "ESC" key until the main menu is reached.

5.2.19 Press "SHIFT-F2" to erase the current spectrum.

5.2.20 Press "F1" to start acquisition.

5.2.21 Upon completion of acquisition press "M" to open the move menu.

5.2.22 Select "D" to open the data menu

5.2.23 Press "ENTER" to use the default file to transfer the spectrum from.

5.2.24 Enter "F" to name the file to transfer the spectrum and press "enter".

5.2.25 Press "ENTER" to use the default Header.

5.2.26 Press "ENTER" to use the default Eff File.

5.2.27 Press the "ESC" key to return to the main menu.

5.2.28 Press "E" to exit the program.

5.2.29 Enter a "Y" to continue exiting.

5.2.30 When prompted to continue analysis enter a "Y" to preform NUTRANL analysis. The U-238 standard should yield approximately 127,200 counts in 1,000 sec of live time counting. The counter is being calibrated against all photopeaks in the spectrum over the energy range from approximately 50 to 2,000 keV.

5.2.31 The computer will display "U-238 IS DONE. PLEASE START THE TH-232 STANDARD. PRESS ANY KEY"

5.2.32 Press "ENTER" to continue.

5.2.33 Enter "YYMMDDC2" for the sample ID.

5.2.34 Enter "CALIB THORIUM" for the category.

5.2.35 Enter "THORIUM STANDARD" for the description.

5.2.36 Press the "ESC" key.

5.2.37 Open the detector shield assembly and place the 20 gram Thorium standard in the detector well and close the detector shield assembly.

5.2.38 Repeat steps 5.2.19 to 5.2.30. The Th-232 standard should yield approximately 1,070,600 counts in 1,000 sec of live time counting. The counter is being calibrated against all photopeaks in the spectrum over the energy range from approximately 50 to 2,000 keV.

5.2.39 The computer will display "TH-232 IS DONE. PLEASE START THE RA-226 STANDARD. PRESS ANY KEY"

5.2.40 Press "ENTER" to continue.

5.2.41 Enter "YYMMDDC3" for the sample ID.

5.2.42 Enter "CALIB RADIUM " for the category.

5.2.43 Enter "RADIUM STANDARD" for the description.

5.2.44 Press the "ESC" key.

5.2.45 Open the detector shield assembly and place the 20 gram Radium standard in the detector well and close the detector shield assembly.

5.2.46 Repeat steps 5.2.19 to 5.2.30. The Ra-226 standard should yield approximately 1,073,800 counts in 1,000 sec of live time counting. The counter is being calibrated against all photopeaks in the spectrum over the energy range from approximately 50 to 2,000 keV.

5.2.47 The computer will display "RA-226 IS DONE. PLEASE START THE K-40 STANDARD. PRESS ANY KEY"

5.2.48 Press "ENTER" to continue.

5.2.49 Enter "YYMMDDC4" for the sample ID.

5.2.50 Enter "CALIB K-40" for the category.

5.2.51 Enter "POTASSIUM STANDARD" for the description.

5.2.52 Press the "ESC" key.

5.2.53 Open the detector shield assembly and place the 20 gram Potassium standard in the detector well and close the detector shield assembly.

5.2.54 Repeat steps 5.2.19 to 5.2.30. The K-40 standard should yield approximately 14,521 counts in 1,000 sec of live time counting. The counter is being calibrated against all photopeaks in the spectrum over the energy range from approximately 50 to 2,000 keV.

5.2.55 The computer will display "K-40 IS DONE. PLEASE START THE BACKGROUND STANDARD. PRESS ANY KEY"

5.2.56 Press "ENTER" to continue.

5.2.57 Enter "YYMMDDC5" for the sample ID.

5.2.58 Enter "CALIB BACKGROUND" for the category.

5.2.59 Enter "BLANK STANDARD" for the description.

5.2.60 Press the "ESC" key.

5.2.61 Open the detector shield assembly and place the 20 gram Blank standard in the detector well and close the detector shield assembly.

5.2.62 Repeat steps 5.2.19 to 5.2.30.

5.2.63 The computer will display "IS A NEW CALIBRATION DESIRED? "Y OR N".

5.2.64 Enter "Y" to install the calibration data into the data file.

5.2.65 The computer will display "CALIBRATION IS FINISHED. PRESS ANY KEY".

5.2.66 Press "ENTER" to continue.

5.2.67 Record the data and time of the calibration in the Accuspec Log Book.

5.3 DAILY BACKGROUND and EFFICIENCY CHECKS

5.3.1 From the C:> prompt type "START" to start NUTRANL.

5.3.2 Press "ESC"

5.3.3 To Perform the Background Check:

A) Press "A" to open the Acquire Menu.

B) Press "P" to open the Preset Menu.

C) Press "L" to open the Live Time Menu.

D) Enter 3600 to set the live time to 1 hour (3600 seconds).

E) Press "ESC: until main menu is reached.

F) Place an empty vial in the detector assembly.

G) Press "SHIFT-F2" to erase current spectrum.

H) Press "F1" to start acquisition.

I) Upon completion of acquisition press "Pg Dn" until the marker/RDI Screen is Displayed.

J) Press "HOME" to set the curser at channel #1.

K) Press "CTRL-L" to set the left marker at channel #1.

L) Press "END" to set the cursor at channel #2045.

M) Press "CTRL-R" to set the right marker at channel #2048.

N) Copy the total CTS displayed onto the "Lab Instrument Check Sheet".

5.3.4 To perform the Efficiency Check:

A) Press "A" to open the Acquire Menu.

B) Press "P" to open the Preset Menu.

C) Press "L" to open the Live Time Menu.

D) Enter 60 to set the live time to 1 minute (60 seconds).

E) Open the shield assembly and place the check source in the detector and close the shield assembly.

F) Press "SHIFT-F2" to erase the current spectrum.

G) Press "F1" to start acquisition.

H) Upon Completion of Acquisition press "Pg Dn" until the markers/RDI Screen is displayed.

I) Using the arrow keys place the curser at the left start channel of the 88 Kev Peak and press "CRTL-L" to place the left marker.

J) Using the arrow keys place the curser at the right end channel of the 88 Kev Peak and press "CTRL-R" to place the right marker.

K) Copy the net CTS displayed onto the "Lab Instrument Check Sheet".

5.3.5 Forward the "Lab Instrument Check Sheet" for input into the computer.

5.3.6 The computer tracks the background and efficiency check using a 30 Day average and will report when either is outside of ±2 standard deviation.

5.3.7 If the background and efficiency check meet the acceptance criteria, place the instrument in service.

5.3.8 If the efficiency check fails to meet the acceptance criteria then repeat step 5.3.4.

5.3.9 If the Accuspec fails a second efficiency check, place the instrument out of service and notify the Lab Supervisor.

5.3.10 If the data from the Blank Standard indicates a contaminated detector, place the instrument out of service and notify the Lab Supervisor.

5.4 ROUTINE SAMPLE ANALYSIS

5.4.1 At the C:> prompt type "START" and press "ENTER" to start NUTRANL.

5.4.2 If the sources, U-238, Th-232, RA-226, K-40, and the blank, have been run for the day you may skip to step 5.4.54.

5.4.3 Enter "Source Count" for the category.

5.4.4 Enter "YYMMDDXX" for the identification tag whereYY = year, MM = month, DD = day.

5.4.5 Enter "Radium STD" for the description.

5.4.6 Enter "20" for the weight.

5.4.7 Enter "y" for the dry weight.

5.4.8 Press "ESC" to go to the MCA Screen.

5.4.9 Press "A" to open the Acquire Menu.

5.4.10 Press "P" to open the preset menu.

5.4.11 Press "L" to open the Live Time menu.

5.4.12 Press the "300" to set live time to 5 minutes (300 seconds).

5.4.13 Press "ESC" until the main menu is displayed.

5.4.14 Open the shield assembly, insert the EPA tailing *or NBL-75* standard, and close the shield assembly.

5.4.15 Press "SHIFT-F2" to erase the current spectrum..

5.4.16 Press "F1" to start Acquisition.

5.4.17 Upon completion of Acquisition press "M" to select transfer data.

5.4.18 Press "D" to select data.

5.4.19 Press "ENTER" to select the default file to move data from the default file.

5.4.20 Enter "F" to select the destination file.

5.4.21 Enter a "ENTER" to select the default header file.

5.4.22 Press "ENTER" to select the default efficiency file.

5.4.23 Press "ESC" to return to the main menu.

5.4.24 Press "E" to exit.

5.4.25 Enter "Y" to confirm the exit.

5.4.26 At the "Continue with Analysis (Y or N)" prompt enter "y" to perform NUTRANL Analysis.

5.4.27 Upon Completion of the analysis enter "CTRL-E" to exit.

5.4.28 Type "PRINTOUT" and press "ENTER" to print the result.

5.4.29 Collect the printout and review the RA-226 result.

5.4.30 ***For the EPA tailing standard,*** if the value is 309.6 pCi/g to 378.4 pCi/g, (±10% of 344 pCi/g) the result is acceptable. ***For the NBL-75 standard, if the value is 149.4 pCi/g to 182.6 pCi/g, (±10% of 166 pCi/g) the result is acceptable.***

5.4.31 Type "START" and press "ENTER" to enter NUTRANL.

5.4.32 If the RA-226 result was not acceptable:

A) Press "ESC" to go to the MCA Screen.

B) Press "S" to open the Setup Menu.

C) Press "P" to open the AMP Menu.

D) Press "G" to open the Gain Menu.

E) Enter the Gain value determined from the Radium Analysis.

NOTE: Log the "As Found" ADC an AMP Settings in the "Accu-Spec Log Book prior to adjust the gain.

F) Press "ESC" to return to the main menu.

G) Repeat steps 5.4.15 to 5.4.30

H) Continue step 5.4.31 until RA-226 analysis is acceptable.

I) If unable to adjust gain to bring the RA-226 Value into the specifications of step 5.4-30 notify the lab supervisor and place the Accuspec out of service.

5.4.33 If the RA-226 result is acceptable enter "Thorium STD" for the Description.

5.4.34 Press "ESC" to go to the MCA Screen.

5.4.35 Open the shield assembly, place the EPA Dilute Monazite ***or DH-1 STD*** in the Detector, and close the shield assembly.

5.4.36 Repeat steps 5.4.15 to 5.4.28

5.4.37 Collect the printout and review the Th-232 result.

5.4.38 ***For the EPA Dilute Monazite standard,*** if the value is 135 pCi/g to 165 pCi/g, (±10% of 150 pCi/g) the result is acceptable. ***For the DH-1 standard, if the value is 102.6 pCi/g to 125.4 pCi/g, (±10% of 114 pCi/g) the result is acceptable.***

5.4.39 Type "START" and press "ENTER" to start NUTRANL.

5.4.40 If the Th-232 value was not acceptable:

A) Repeat Steps 5.4.32 A to 5.4.31 D

B) Enter the gain value determined from the Th-232 analysis.

C) Continue at step 5.4.14

5.4.41 If the Th-232 Value was acceptable enter "URANIUM STD" for the description.

5.4.42 Press "ESC" to go to the MCA Screen.

5.4.43 Open the shield assembly, place the EPA Pitchblende ***or DH-1*** STD in the detector and close the shield assembly.

5.4.44 Repeat steps 5.4.15 to 5.4.28.

5.4.45 Collect the printout and review the U-238 result.

5.4.46 ***For the EPA Pitchblende standard,*** if the value is 2457 pCi/g to 3003 pCi/g, (±10% of 2730 pCi/g) the result is acceptable. ***For the DH-1 standard, if the value is 529.2 pCi/g to 646.8 pCi/g, (±10% of 588 pCi/g) the result is acceptable.***

5.4.47 If the U-238 result is not acceptable:

A) Repeat steps 5.4.31. A to 5.4.31 D

B) Enter the gain value determined from the U-238 analysis.

C) Continue at step 5.4.14

5.4.48 If the U-238 result is acceptable enter "Potassium STD" for the description.

5.4.49 Press "ESC" to go to the MCA Screen.

5.4.50 Open the shield assembly, place the Potassium STD in the detector, and close the shield assembly.

5.4.51 Repeat steps 5.4.15 to 5.4.26.

5.4.52 Enter "BLANK" for the description.

5.4.54 Press "ESC" to go to the MCA Screen.

5.4.55 Repeat steps 5.4.15 to 5.4.26

5.4.56 Enter a description to the type of sample i.e. Lot #x, off site soils, etc. for the category.

5.4.57 Enter a sample description i.e. Sample number.

5.4.58 Enter the sample weight.

5.4.59 Enter a "y" or "n" for dry weight.

5.4.60 Press "ESC" to go to the MCA Screen.

5.4.61 Repeat steps 5.4.9 to 5.4.11 to set count time.

5.4.62 Repeat steps 5.4.15 to 5.4.26.

5.4.63 Repeat steps 5.4.52 to 5.4.57 for each sample to be analysis.

5.4.64 Upon completion of sample analysis press "CTRL E" to exit.

5.4.65 Type "PRINTOUT" and press "ENTER" to printout a sample report.

5.4.66 Submit the data printout (see example in Attachment #1) to the Lab Supervisor and *H. P.* Supervisor for review.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Records

6.1.1 Accuspec Log Book

6.1.2 Accuspec Sample Log Book

6.1.3 Data Printout

6.2 Reports

6.2.1 None

6.3 Notifications

6.3.1 None

6.4 Retention

6.4.1 All the records generated in performance of this procedure shall be retained for the duration of the project.

7.0 ATTACHMENTS

7. 1 Attachment #1 Example - Analysis Results Printout

Attachment #1
(Example)

GAMMA-SPEC ANALYSIS RESULTS

Page: 4

Analyzed by West Chicago site procedure #3, Rev. 2

Date Analyzed: 06/15/95 Time Analyzed: 1:25 Category: Source Count Analyzed by:____
Sample ID: 950615XX Description: Radium Std

Activity is reported on AS RECEIVED basis

Weight grams	U-238 pCi/g	Th-232 pCi/g	Ra-226 pCi/g	K-40 pCi/g	Total Gamma * pCi/g
20.0	2.1 +- 22.2	-0.0 +- 5.8	1740.6 +- 12.9	-66.0 +- 112.2	1676.67 +- 115.2

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* Sum of U-238, Th-232, Ra-226, and K-40. Negative values are not part of total gamma.

TEACHERS' RETIREMENT SYSTEM - GMO SITE

STANDARD OPERATING PROCEDURE

Title: Operation of the Ludlum Model 2000 Alpha system

Document SOP-LLII372

Revision Number: 0

Date:

Replaces: New

OPERATION OF THE LUDLUM MODEL 2000 ALPHA SYSTEM

1.0 SCOPE

1.1 Purpose

The Ludlum Model 2000 (LM 2000) Alpha System is utilized at the control line area or in the counting laboratory for measurement of gross alpha radioactivity of various types of samples. The system normally consists of an Ludlum Model 43-10 alpha scintillation detector coupled to an Ludlum Model 2000 Scaler. This procedure describes the steps for operating the system.

1.2 Applicability

The LM 2000 system is used primarily for measuring smear samples and radon\thoron working level air samples for gross alpha radioactivity. If necessary, it may be used for the measurement of gross alpha radioactivity of air particulate and water samples in the event that the Gamma Products Model G5000 Gas Proportional Counting System is not available.

2.0 REFERENCES

2.1 32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection Against Radiation

2.2 32 Illinois Administrative Code, Part 400, Notices, Instructions and Reports to Workers; Inspections

2.3 West Chicago Project, Health and Safety Plan for Decommissioning Activities at the Kerr-McGee Chemical Corporation Rare Earths Facility, West Chicago, Illinois

2.4 State of Illinois Department of Nuclear Safety Radioactive Material License Number STA-583

2.5 Ludlum Technical Manual for Ludlum Model 43-10 Alpha Sample Counter.

2.6 Ludlum Technical Manual for Scaler Model LM 2000.

3.0 DEFINITIONS

None.

4.0 REQUIREMENTS

4.1 Prerequisites

None.

4.2 Tools, Material, Equipment

4.2.1 Ludlum Model 43-10 Alpha Scintillation Detector

4.2.2 Ludlum Model LM 2000 Scaler

4.2.3 Appropriate calibration standard which is traceable to the National Institute of Standards and Technology (NIST):

a. Eberline electroplated Pu-239 standard (serial number S-4100) or equivalent

4.3 Precautions, Limits

4.3.1 Do not exceed 1500 volts using the H.V. ADJUST ten-turn potentiometer on the front panel of the mini scaler. Photomultiplier (PM) tube damage may result.

4.3.2 Considerable time may be lost waiting for the PM tube and crystal to dark adapt. Always keep the sample drawer in the closed position when not in use to avoid possible contamination.

4.3.3 Operate the LM 2000 only in the LINE Mode as indicated on the operating knob on the front panel. Batteries are not normally installed in the LM 2000.

4.3.4 Before counting any samples, ensure that the daily background and daily efficiency determinations have been performed.

4.3.3 Any adjustments to the high voltage, window threshold, window setting, scaler or detector change out requires a recalibration of the instrument.

4.3.4 In the event of a power failure, a background check and efficiency check is required prior to placing the instrument back in service.

4.4 Acceptance Criteria

4.4.1 The daily background determination passes if the number of counts lies between the ± 2 standard deviation range established by the background control chart.

4.4.2 The daily efficiency determination passes if the number of counts lies between the ± 2 standard deviation range established by the instrument control chart.

5.0 PROCEDURE

5.1 Initial Setup

5.1.1 Apply power to the instrument by turning the operating knob located on the front panel of the scaler to the LINE position.

5.1.2 With the sample drawer in the closed position, ensure that the high voltage is adjusted to the value determined by the most recent plateau curves. If necessary, adjust the high voltage using the H.V. ADJUST ten-turn potentiometer on the front panel of the scaler.

5.2 Plateau Curves

5.2.1 High voltage source and background plateau curves must be generated initially. If, for any reason, either the counting instrument, detector assembly or PM tube is changed, a set of new curves must be run.

5.2.2 On a VOLTAGE PLATEAU form (Attachment 2), record the instrument, observer, date, time, source serial number, and any other pertinent information.

5.2.3 Turn the high voltage to a minimum using the H.V. ADJUST ten-turn potentiometer on the front panel of the scaler.

5.2.4 Apply power to the instrument by turning the power knob located on the front panel of the scaler to the LINE position.

5.2.5 Set an appropriate count time (1 minute suggested) using the timer adjustment switches on the front panel of the scaler.

5.2.6 Place the Pu-239 check source in the sample tray and close the tray, locking

it closed with the unlocking knob.

5.2.7 Adjust the ten-turn potentiometer in definitive increments (50 volts suggested), recording the counts and voltage on the "VOLTAGE PLATEAU" form.

NOTE:	Do not exceed 1500 volts. If 1500 volts are exceeded the photomultiplier tube may be damaged. If using the RD-14, do not exceed 1800 volts.

5.2.8 Plot the reading versus high voltage settings on a sheet of rectangular coordinate paper.

5.2.9 Remove the check source from the detector and close the sample drawer.

5.2.10 Repeat steps 5.2.7 and 5.2.8 without the source, for a background

5.2.11 Plot the results of the high voltage background plateau curve on the same plot as the high voltage source plateau curve.

5.2.12 From the graph, choose the high voltage setting which is on the flat portion of the curve with a minimum background count. Set the high voltage to this value.

5.3 Chi-square Test

5.3.1 A Chi-square test must be generated upon initial setup, equipment change out or repair, high voltage adjustment, and monthly.

5.3.2 Obtain the "COUNTER TEST-CHI SQUARED" data sheet (Attachment 1).

5.3.3 Record:

a. Your name

b. The date

c. Time

d. The high voltage setting

e. The source used

5.3.4 Open the sample tray, place the Pu-239 source into the planchet, and close the sample tray.

5.3.5 Set the timer for 1 minute and depress the count button.

5.3.6 Upon completion of the count, record the results on the "COUNTER TEST-CHI SQUARED DATA SHEET," Attachment 1.

5.3.7 Repeat steps 5.3.5 to 5.3.6 until 21 data points have been recorded. Remove the source from the detector. Record this data on Attachment 1.

5.3.8 When all the above data has been entered on Attachment 1, perform the calculations on Attachment 1.

5.3.9 Using the table on Attachment 1, find the value of "P" and record the value on Attachment 1. If the value of "P" falls between 0.98 and 0.10, the counter passes the test. If the value of "P" falls outside of these values, the counter fails the test.

5.3.10 If the counter fails the test, rerun the test. If the counter fails a second time, tag the detector out of service and notify the lab supervisor.

5.4 Background Determination

5.4.1 Perform a 50 minute instrument background check daily.

a. Verify that the LM 2000 is not in a count sequence by insuring that the "count" light is not lit.

b. Open the sample tray by operating the unlocking knob and sliding the tray out of the detector.

NOTE:	The 43-10 is a scintillation detector and is light sensitive. Care must be used not to force or pull sideways when opening the sample tray.

c. Remove any sample that may have been left in the detector and clean the sample tray with a clean cloth.

d. Insert the Pu-239 alpha standard and shut the sample tray by gently sliding the tray into the detector and operating the unlocking knob.

e. Press the count button and verify that the count light is on, indicating that the LM 2000 is in a counting sequence.

f. Counting is complete when the count light is extinguished.

5.4.2 Record the results of the background measurement onto the LM 2000 log and the daily LAB INSTRUMENT CHECK SHEET.

5.4.3 If the 2 sigma error from the daily background does not overlap the 2 sigma error of the previous 30 days background, then the sample tray should be decontaminated and the background should be recounted.

5.5 Efficiency Determination

5.5.1 Following the background measurement, perform an efficiency determination with the Pu-239 alpha standard designated for this purpose using a count time of 5 minutes. The efficiency determination must be performed daily, or if not used daily, prior to each use.

a. Verify that the LM 2000 is not in a count sequence by insuring that the "count" light is not lit.

b. Open the sample tray by operating the unlocking knob and sliding the tray out of the detector.

NOTE:	The 43-10 is a scintillation detector and is light sensitive. Care must be used not to force or pull sideways when opening the sample tray.

c. Remove any sample that may have been left in the detector.

d. Shut the sample tray by gently sliding the tray into the detector and operating the unlocking knob.

e. Press the count button and verify that the count light is on, indicating that the LM 2000 is in a count sequence.

f. Counting is complete when the count light is extinguished.

5.5.2 Log the results of the efficiency determination onto the daily LAB INSTRUMENT CHECK SHEET.

5.5.3 The daily efficiency determination is acceptable if the number of counts lies between the ± 2 standard deviation range established by the instrument control chart.

5.5.4 If the instrument fails the daily efficiency determination the first time, it must subsequently pass two consecutive times before the instrument is considered acceptable for operation.

5.5.5 If the daily efficiency fails two consecutive times, the instrument is placed out of operation until the cause of the failures is investigated. The system is placed back into operation only after:

a. The cause of the failures has been identified and recorded in the instrument log.

b. Efficiencies have been verified or system recalibration has taken place.

5.6 Lower Limit of Detection (LLD) Determination

5.6.1 Use the equation shown on Attachment 3, the Smear Counting Data sheet, to determine the LLD.

5.6.2 Record the LLD on each SMEAR COUNTING DATA SHEET, or printout when available.

5.7 Routine Sample Analysis

5.7.1 Set the desired count time using the timer adjustment switches on the front panel of the mini scaler.

5.7.2 Using forceps, remove the smear or air particulate sample to be counted from the glassine envelope and load it into a sample planchet. For evaporated samples (i.e., liquids), proceed to the next step.

5.7.3 Open the sample drawer.

5.7.4 Position the sample planchet in the center of the sample drawer.

5.7.5 Slide the sample drawer to the fully closed position and lock closed by operating the unlocking knob.

5.7.6 Start the count by pressing the COUNT button on the front panel of the scaler.

5.7.7 At the conclusion of the count, open the sample drawer, remove the sample planchet, and return the sample drawer to the closed position.

5.7.8 Remove the sample from the planchet, return it to the glassine envelope, and store the sample in the designated location.

5.7.9 Attach the printout, if available, to the survey, recording the survey number, instrument background, efficiency, and lower limit of detection on the printout. If no printout is available, record the counts accumulated on the scaler onto the SMEAR COUNTING DATA SHEET (Attachment 3).

5.8 INSTRUMENT OUT OF CALIBRATION

5.8.1 When a instrument is found to be "out of calibration" or fails a daily response check immediately notify the HP Supervisor.

5.8.2 The HP Supervisor shall determine the last date that the instrument passed a daily source response check, or the last calibration date, whichever is later.

5.8.3 Based on the last acceptable source response check or good calibration date, the HP Supervisor shall determine what radiological surveys were performed with the defective instrument.

5.8.4 The HP Supervisor shall determine whether regulatory or general information surveys were performed with the defective instrument.

5.8.5 Using previous surveys or previous knowledge of the survey data, the HP Supervisor shall determine whether the surveys taken with the defective meter are acceptable or the surveys must be reperformed. In the case of regulatory surveys the survey shall be retaken, if possible, if resurveying is not possible the HP Supervisor will make a written assessment of the quality of the data.

5.8.6 Source check failures/ "out of calibration" are to be recorded in the instrument log book and a nonconformance report (NCR) shall be initiated per QPM-DOC #9, in order to assess trends.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Lab Instrument Check Sheet

6.1.1 The LAB INSTRUMENT CHECK SHEET is utilized to record the results of the daily background measurement and daily efficiency determination. The information from the sheet is entered into the Health Physics data base.

6.2 Voltage Plateau Form

6.2.1 The VOLTAGE PLATEAU form is utilized to record the data used to generate the high voltage and background plateau curves.

6.3 Smear counting Data Sheet

6.3.1 The Smear Counting Data sheet is utilized to record all pertinent data from smear counting where no printing device is available.

7.0 ATTACHMENTS

7.1	Attachment 1	Counter Test-Chi Squared
7.2	Attachment 2	Voltage Plateau Form
7.3	Attachment 3	Smear Counting Data Sheet

Attachment 1

COUNTER TEST - CHI SQUARED (χ^2)

OBSERVER	DATE	TIME	VOLTAGE SETTING	STANDAR

COUNT TIME - ONE MINUTE

COUNT	NET COUNT	AVERAGE		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
TOTAL OF 20		[redacted]	TOTAL	

P	X^2
0.98	8.5
0.95	10.1
0.90	11.6
0.80	13.7
0.50	18.4
0.20	23.8
0.10	27.3

IF P FALLS BETWEEN 0.98 AND 0.10, THE COUNTER IS FUNCTIONING PROPERLY

*DISCARD ONE UNUSUALLY HIGH OR LOW COUNT IN CALCULATING $\bar{n}$.

$\ddagger\ \bar{n}\ \frac{\Sigma n}{20} \cdot \frac{\quad}{20} \cdot$ [ ] ENTER THIS VALUE IN n COLUMN FOR EACH COUNT NUMBER.

$X^2 \cdot \frac{\Sigma(n-\bar{n})^2}{\bar{n}} \cdot __ \cdot$ [ ] . P = [ ] .

STANDARD DEVIATION FOR A 95% CONFIDENCE LEVEL = (1.96) $\left(\frac{\sqrt{\Sigma(n-\bar{n})^2}}{20}\right)$.

Attachment 2

VOLTAGE PLATEAU FORM

RD-14/LM-2000

Instrument Serial Number _____ Source Serial Number _____ Date _____

Pulser Serial Number _____ Scaler Model Number _____ Serial Number ____

Technician Name _____ Technician Signature _____

Counts per Minute

	700	800	900	1000	1100	1250	1300	1400	1500	1600	1700	1800
4500												
4000												
3500												
3000												
2500												
2000												
1500												
1000												
500												
0												

DETECTOR VOLTAGE

Attachment 3

SMEAR COUNTING DATA SHEET

TO BE USED WHEN NO PRINTOUT IS AVAILABLE

Instrument Number_____ Background_____
Efficiency_____ LLD_____ Date_____
Survey Performed By_____ Survey Number_____

Smear Number	Gross Counts per Minute	dpm/100cm2		Smear Number	Gross Counts per Minute	dpm/100cm2

LLD CALCULATION:

$$LLD = \frac{2.71}{T_s} + 3.29\sqrt{\frac{C_B}{T_B} \times [1 + (\frac{T_B}{T_s})]}$$

Where
C_B = Background counts per minute
T_s = Sample count time in minutes
T_B = Background count time in minutes

SMEAR ACTIVITY CALCULATION:

$$A = \frac{(C_G/T) - B}{EFF}$$

Where
C_G = Gross counts
T = Count time in minutes
B = Background counts per minute
EFF = Efficiency

341 EAST OHIO STREET SITE

FIELD SAMPLING PLAN

APPENDIX C

Title: Field Sampling Plan

Revision Number: 1

Date: September 13, 2001

Replaces: New

FIELD SAMPLING PLAN

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1.0 INTRODUCTION

This Field Sampling Plan (FSP) describes the quality-related sampling activities that will be implemented during the excavation activities at 341 East Ohio Street site (Site), located in Chicago, Illinois.

Samples will be collected under the Quality Assurance Project Plan (QAPP) for the following limited aspects of the work:

1. Air monitoring.
2. Sampling excavated backfill soil material to ensure that the material returned into excavations is clean, that is, that the radiological composition of the backfill material is statistically demonstrated to be below the cleanup criteria.
3. Confirmation that material proposed for loading has total radium concentrations greater than 7.1 pCi/g.
4. Local background has been established for total radium (Ra-226 and Ra- 228) at 2.1 pCi/g.
5. Verification sampling to ensure that contaminants which were present above the cleanup criteria have been removed.
6. Material to be shipped for disposal as radiologically-impacted soil does not exhibit hazardous waste characteristics per RCRA.
7. Groundwater removed from the Site for excavation dewatering meets pre-treatment standards for the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC).

The USEPA identified the constituents of concern as the entire thorium 232 and uranium 238 decay chains, including radium-226 and radium-228. This sampling program includes monitoring only for total radium (Ra-226 and Ra-228) in accordance with the Unilateral Administrative Order (UAO).

The characteristic hazardous waste classification analysis per 40 CFR 261.4 will include:

Ignitability	Flash Point
Corrosivity	pH
Reactivity	unstable, reacts violently with water, is sufficiently cyanide or sulfide bearing the produce toxic gas, or is capable of detonation.
Toxicity	TCLP analysis for regulated contaminants

The groundwater analysis will include the parameters specified in Appendix A of the MWRDGC Environmental Remediation Wastewater Ordinance (May 9, 1996).

Waste or Chemical	Concentration (mg/L)
Cadmium	0.11
Chromium (total)	2.77
Copper	2.07
Cyanide (total)	1.20
Fats, Oils and Greases (FOG) (total)	250.0
Iron	250.0
Lead	0.5
Mercury	0.0005
Nickel	3.98
Zinc	2.61
Dichloromethane	0.294
Chloroform	0.309
1,1,1-Trichloroethane	0.193
Trichloroethylene	0.242
Benzene	0.278
Tetrachloroethene	0.225
Toluene	0.247
Ethylbenzene	0.329
Volatile Organic Compounds (total)*	0.567
Total Toxic Organics**	2.13

pH Range - Not lower than 5.0 or greater than 10.0

Temperatures of liquids or vapors at point of entrance to the sewerage system shall not exceed 150°F.

* Total Volatile Organic Compounds shall be the arithmetic sum of the concentrations of:

dichloromethane
chloroform

1,1,1-trichloroethane
trichloroethylene
benzene
tetrachloroethene
toluene
ethylbenzene
acrolein
acrylonitrile
1,3-butadiene
carbon tetrachloride
chlorobenzene
dichloroethane
dichlorobenzene
1-ethyl 2-methylbenzene
napthalene
styrene
1,3,5-trimethylbenzene
vinyl chloride
xylenes
1,4-dioxane
ethylene dibromide
methyl ethyl ketone

** Total Toxic Organics shall be the arithmetic sum of the concentrations of those pollutants found under Title 40 Part 413.02(i) of the Code of Federal Regulations.

This FSP describes the basis for the backfill, air monitoring, verification, and waste characterization sampling programs. It describes sample locations, field sampling and surveying, field instruments, decontamination, and sample management that will comprise the quality-related excavation sampling.

Field sampling activities described in this plan include the following:

- Soil sampling for laboratory analysis of radioactive constituents of concern to document contaminant levels present and confirm excavated spoil soil are below cleanup criteria.

- Air sampling (filter paper) for laboratory analysis of radiological constituents of concern;

- Verification sampling to ensure removal of contamination above the cleanup criteria.

- Onsite management of samples;
- Decontamination; and
- Analytical programs.

The FSP specifies techniques, equipment, and procedures for each activity, number and type of sample, and contingencies that may be implemented during the excavation activities. Standard Operating Procedures (SOPs) that will be followed in the sampling and analyses are included in the QAPP.

2.0 SAMPLE NETWORK AND RATIONALE

This section describes the sampling collection programs and the bases upon which the programs have been developed.

2.1 SAMPLING OBJECTIVES

The objectives of the air sampling program described in this plan are to collect sufficient air samples during soil excavation to assure that excessive airborne contaminated dust is not being released. Air monitoring activities will be conducted within excavated areas to monitor personnel exposures, and at the perimeter of the site to monitor releases to the uncontrolled environment.

The objectives of the soil sampling program described in this plan are to assure that soil used as backfill is clean.

The objectives of the verification sampling program are to ensure that all contamination in excess of the cleanup criteria has been removed. Gamma screening and specific soil testing will be conducted, and the results reported to the U.S. EPA. A complete description of the verification sampling program is included in the specifications attached to the Construction Quality Assurance Plan (CQAP).

The following types of samples will be collected at the Site:

Air Samples

The following air samples will be taken during excavation activities:

- High-volume particulate air samples (for radioactivity) from site perimeter monitoring stations; and
- Samples from personal samplers (for radioactivity).

Backfill Soil Samples

Samples of excavated soil under consideration for use as backfill will be collected in accordance with soil sampling procedure (SOP-214). Statistical analysis will be conducted to document the soil is suitable as backfill.

Sampling will be from lifts, 18 inches or less thick, or from stockpiles, samples in accordance with SOP-214.

Verification Samples

The samples will be collected in accordance with the Soil Sampling Procedure (SOP-214) and the Verification Sampling Plan (Appendix 5 of the Work Plan). One set of 6 subsamples will be analyzed for each 100 m^2 , or less, of excavated area. The subsample set will be prepared from five samples, about 15 centimeters deep (six inches), obtained at the center (one sample) and half way between the center and each corner (four samples).

Waste Characterization Samples

The samples will be collected at locations where previous investigations (May 2000 Koh report) have shown elevated gamma readings. The sampling objective is to evaluate whether these soils exhibit characteristics of hazardous waste that would constrain disposal at the proposed low-level radioactive materials disposal facility.

Samples will consist of ten individual samples from the ten borings distributed across the seven identified locations with elevated gamma readings. Each sample will consist of the fill material above the native sand soil. Samples will be collected in 3-inch diameter split spoons through either hollow stem augers, or if the fill contains sufficient obstructions to constrain hollow stem augers, through borings drilled with solid flight augers.

Dewatering Groundwater Samples

A representative sample of site groundwater will be obtained to document the water quality of water which would be discharged to the Chicago city sewer as part of site dewatering. The objective of this sampling is to evaluate whether the water meets the City's Environmental Remediation Discharge Standards.

The groundwater sample will be from a well located where the excavation will extend to beneath the groundwater table, at the east end of the Site. The well will be a 2-inch diameter PVC well casing and screen with a natural sand sand-pack. The well will be developed by pumping or bailing until pH, temperature and specific conductance are stable (less than 15% variation between successive measurements). The samples will be preserved in accordance with SW-846 methods, stored on ice and shipped under chain-of-custody. The sample will be unfiltered prior to preservation.

2.2 SAMPLE TYPE, LOCATION AND QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

2.2.1 Air Monitoring

The air monitoring program is described in detail in the Air Monitoring Plan, Appendix 8 to the Work Plan.

High-volume air samples will be obtained from perimeter monitoring stations located at four points (north, south, east, and west) around the site.

Air samples will be collected during excavation activities to determine the presence of airborne radioactivity particulates. The air sampling procedure is included as SOP-212 in the QAPP.

Four air monitoring stations will be established at the Site before the excavation begins. Air monitoring locations will be located along the margins of each quarter of the Site at points

on the north, south, east, and west sides of the site. Air samplers will be used to collect ambient air particulates on filters for subsequent counting.

2.2.2 Verification Sampling

The verification sampling program is described in detail in the Verification Survey Procedure (SOP 223).

Verification sampling is intended to be confirmatory to the verification gamma scan. Laboratory analyses of sets of 6 subsamples, each consisting of a set of 6 subsamples representing an excavated area of 100 ^{m2}, shall be used to confirm that the cleanup criteria were achieved.

2.2.3 Waste Characterization Sampling

The waste characterization samples will consist of soil and debris encountered above the native sand soil. Samples will be recovered in 3-inch diameter split spoon samples. Samples will be placed in one 1-liter bottle and one 4-ounce jar with teflon sealed lids. Containers will be packed to minimize headspace.

Preservation will be limited to storing on ice. Holding times will be in accordance with SW-846 with extractions before seven days. QA/QC procedures will be in accordance with the laboratory (STL) QAPP, included in the QAPP.

3.0 SAMPLE MANAGEMENT PROCEDURES

3.1 FIELD ACTIVITY DOCUMENTATION

Field logbooks will be used to document daily field activities in accordance to Section 5 of the QAPP. Field logbook documentation procedures are in SOP-215 in this QAPP.

3.2 SAMPLE IDENTIFICATION

All samples collected at the Site will be identified according to the Soil Sampling Procedure (SOP-214).

3.3 SAMPLE CONTAINERS

Sample containers have been selected based on the sample matrix and requirements of the analytical methods. Suitable containers used during the excavation and restoration activities include:

Air Monitoring Station Sampling

- Envelopes of suitable size for glass fiber filters.

Soil Sampling

- Plastic bottles or plastic bags of suitable size for soil samples.

3.4 SAMPLE PRESERVATION

Soil samples to be tested for radioactivity do not require preservation.

Waste characterization samples will be stored on ice and shipped in a cooler, under chain-of-custody, by overnight courier.

3.5 SAMPLE HOLDING TIME

All initial radiological analysis will be performed within six months from the date the sample was collected.

All waste characterization analysis will be extracted within seven days of sampling.

3.6 SAMPLE LABELS

Each container will be labeled with the following minimum information:

- Date and time of sample;
- Unique sample number, including geographic (grid) location;
- Sample volume (air samples);
- Project identification; and
- Name of sampler.

Other information such as weather conditions, sample analysis, and sample preservation may be included on the sample label, as appropriate.

4.0 DECONTAMINATION

All discarded materials, waste materials, and other field equipment and supplies will be handled in such a way to prevent the potential spread of contamination during excavation activities. Discarded items that have contacted contaminated materials will be containerized and transported to the approved disposal facility. Non-contaminated discarded items will collected, bagged, and placed in dumpsters for disposal at an approved landfill.

4.1 PERSONNEL DECONTAMINATION

The following procedure will be implemented for personnel decontamination when work activities are conducted in contaminated areas. This procedure is based on USEPA's Standard Operating Safety Guides, Publication 9285.1-03, PB92-963414 (June 1992).

1. Equipment Drop: Deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, clipboards, etc.) on plastic drop cloths.

2. Outer Boot and Glove Removal Remove outer boot covers and gloves and deposit in appropriate container.

3. If Respirator Worn - Canister or Mask Change When a worker leaves the Exclusion Zone to change canister or mask, this is the last step in the decontamination procedure. The worker's canister is exchanged, new or clean outer gloves and boot donned, and the worker returns to duty.

4. Boots Gloves, and Outer Garment Removal Boots and outer garment (coveralls) and inner gloves are removed and deposited in appropriate containers.

5. Personal Radiation Survey Perform radiation survey of personnel.

6. Face Piece Removal: If applicable, face piece is removed. Avoid touching face with fingers. The face piece is deposited on plastic sheet.

7. Field Wash: Wash face and hands thoroughly. Shower as soon as possible.

4.2 EQUIPMENT DECONTAMINATION

All sampling equipment will be wiped clean of soil and dust between each use when work activities are conducted in contaminated areas:

4.3 CONTAINER AND SHIPPING CONTAINER DECONTAMINATION

The following general procedure for decontamination of sample containers and shipment packages will be followed:

1. Seal container or shipping package;
2. Wipe container or shipping package with paper and tap water;
3. Allow to air dry; and
4. Perform radiation release survey.

TEACHERS' RETIREMENT SYSTEM - GMO SITE

MEASUREMENT PERFORMANCE CRITERIA

APPENDIX D

Title: Measurement Performance Criteria

Revision Number: 0

Date: Replaces: New

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Acidity	Method Blank	305.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	305.1	Not Applicable	—	Not Applicable
	Matrix Spike	305.1	Not Applicable	—	Not Applicable
	Matrix Spike Duplicate	305.1	Not Applicable	—	Not Applicable
	Duplicate	305.1	Frequency: 1 per batch of 10 samples Criteria: ≤ 20 % RPD[3] Corrective Action: Flag data outside of limit.	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Alkalinity	Method Blank	310.1 2320B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	310.1 2320B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	310.1 2320B	Not Applicable	—	Not Applicable
	Matrix Spike Duplicate	310.1 2320B	Not Applicable	—	Not Applicable
	Duplicate	310.1 2320B	Frequency: 1 per batch of 10 samples Criteria 310.1: ≤ 20 % RPD[3] Criteria 2320B: ≤ 25 % RPD[3] Corrective Action: Flag data outside of limit.	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Ammonia	Method Blank	350.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	350.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	350.1	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	350.1	Not Applicable	—	Not Applicable
	Duplicate	350.1	Not Applicable	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Ammonia (TKN)	Method Blank	351.2 351.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	351.2 351.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	351.2 351.3	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	351.2 351.3	Not Applicable	—	Not Applicable
	Duplicate	351.2 351.3	Not Applicable	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
BOD	Method Blank	405.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	405.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	405.1	Not Applicable	—	Not Applicable
	Matrix Spike Duplicate	405.1	Not Applicable	—	Not Applicable
	Duplicate	405.1	Not Applicable	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Bromide	Method Blank	300.0[5] 320.1 D1246	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	300.0[5] 320.1 D1246	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within control limits, rerun all associated samples	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within control limits, rerun all associated samples
	Matrix Spike	300.0[5] 320.1 D1246	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data associated with MS outside of limit
	Matrix Spike Duplicate	300.0[5] 320.1 D1246	Not Applicable	9056	Not Applicable
	Duplicate	300.0[5] 320.1 D1246	Methods 300.0, 320.1: Not Applicable Frequency: Method D1246: 1 with each batch of samples processed not to exceed 20 samples	9056	Frequency: 1 with each batch of samples processed Criteria: RPD[3] must be within laboratory control limits Corrective Action: Flag data associated with duplicates outside of laboratory RPD[3] limits

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Chemical Oxygen Demand (COD)	Method Blank	410.1 410.2 410.4	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	410.1 410.2 410.4	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	410.1 410.2 410.4	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	410.1 410.2 410.4	Not Applicable	—	Not Applicable
	Duplicate	410.1 410.2 410.4	Not Applicable	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Chloride	Method Blank	300.0[5] 325.1 325.2 325.3 4500-Cl E	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9056 9251 9253	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	300.0[5] 325.1 325.2 325.3 4500-Cl E	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within control limits, rerun all associated samples	9056 9251 9253	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples
	Matrix Spike	300.0[5] 325.1 325.2 325.3 4500-Cl E	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	9056 9251 9253	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Methods 9251 Corrective Action: If not within laboratory control limits, rerun all associated samples Method 9056/9253 Corrective Action: Flag data associated with MS outside of limits

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Chloride (continued)	Matrix Spike Duplicate	300.0[5] 325.1 325.2 325.3 4500-Cl E	Not Applicable	9056 9251 9253	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits/< 20 % RPD[3] Corrective Action: Flag data outside of limit Method 9056: MSD is not applicable
	Duplicate	300.0[5] 325.1 325.2 325.3 4500-Cl E	Methods 300.0, 325.1, 325.2, 325.3: Not Applicable Method 4500-Cl E: Frequency: 1 with each batch of samples processed not to exceed 20 samples	9056 9251 9253	Method 9056/9253: Frequency: 1 with each batch of samples processed Criteria: RPD[3] must be within laboratory control limits Corrective Action: Flag data associated with duplicates outside of laboratory RPD[3] limits
Chlorine, Residual	Method Blank	330.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Chlorine, Residual (continued)	Laboratory Control Sample	330.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	330.1 330.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	330.1 330.3	Not Applicable	—	Not Applicable
	Duplicate	330.1 330.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] Corrective Action: Flag data outside of limit.	—	Water

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Chromium (Cr^{+6})	Method Blank	218.4 3500 Cr-D	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	3060A 7196A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	218.4 3500 Cr-D	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	3060A 7196A	Frequency: 1 with each batch of samples processed not to exceed 20 samples prepped Criteria: percent recovery for water must be within ± 15 % and for solids must be within ± 20% Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	218.4 3500 Cr-D	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Must be within laboratory QC limits Corrective Action: Flag data outside of limit	3060A 7196A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Advisory limits are 75% - 125% recovery Corrective Action: Flag data associated with unacceptable Matrix Spike
	Matrix Spike Duplicate	218.4 3500 Cr-D	Not Applicable	3060A 7196A	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Chromium (Cr^{+6}) (continued)	Duplicate	218.4 3500 Cr-D	Not Applicable	3060A 7196A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] limit Corrective Action: Flag data outside of limit.
Color	Method Blank	110.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	110.2	Not Applicable	—	Not Applicable
	Matrix Spike	110.2	Not Applicable	—	Not Applicable
	Matrix Spike Duplicate	110.2	Not Applicable	—	Not Applicable
	Duplicate	110.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] Corrective Action: Flag data outside of limit.	—	Not Applicable
Conductivity	Method Blank	120.1	Not Applicable	9050A	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846) [2]
Conductivity (continued)	Laboratory Control Sample	120.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9050A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples
	Matrix Spike	120.1	Not Applicable	9050A	Not Applicable
	Matrix Spike Duplicate	120.1	Not Applicable	9050A	Not Applicable
	Duplicate	120.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] Corrective Action: Flag data outside of limit.	9050A	Frequency: 1 with each batch of samples processed not to exceed 10 samples
Cyanide (Amenable)	Method Blank	335.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9010B 9012A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Cyanide (Amenable) (continued)	Laboratory Control Sample	335.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9010B 9012A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action Rerun all samples associated with unacceptable LCS
	Matrix Spike	335.1	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	9010B 9012A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Advisory limits are 75% - 125% recovery Corrective Action Flag data associated with unacceptable Matrix Spike
	Matrix Spike Duplicate	335.1	Not Applicable	9010B 9012A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Advisory limits are 75% - 125% recovery Corrective Action Flag data associated with unacceptable Matrix Spike
	Duplicate	335.1	Not Applicable	9010B 9012A	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Cyanide (Total)	Method Blank	335.2 335.3 4500-CN E	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9010B 9012A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	335.2 335.3 4500-CN E	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9010B 9012A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	335.2 335.3 4500-CN E	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	9010B 9012A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Advisory limit is 75% - 125% recovery Corrective Action: Flag data associated with unacceptable Matrix Spike

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Cyanide (Total) (continued)	Matrix Spike Duplicate	335.2 335.3 4500-CN E	Not Applicable	9010B 9012A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Limit is 75% - 125% recovery Corrective Action: Flag data associated with unacceptable Matrix Spike
	Duplicate	335.2 335.3	Methods 335.2, 335.3: Not Applicable Method 4500-CN E: Frequecny: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] Corrective Action: Flag data outside of limit.	9010B 9012A	Not Applicable
Flashpoint	Method Blank	—	Not Applicable	1010 1020A	Not Applicable
	Laboratory Control Sample	—	Not Applicable	1010 1020A	Not Applicable
	Matrix Spike	—	Not Applicable	1010 1020A	Not Applicable
	Matrix Spike Duplicate	—	Not Applicable	1010 1020A	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Flashpoint (continued)	Duplicate	—	Not Applicable	1010 1020A	Frequency: 1 per batch of ≤20 samples Criteria: RPD[3] must be ≤ 20% Corrective Action: Flag data associated with unacceptable Duplicate
Fluoride	Method Blank	300.0[5] 340.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable
	Laboratory Control Sample	300.0[5] 340.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within control limits, rerun all associated samples

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Fluoride (continued)	Matrix Spike	300.0[5] 340.2	Frequency: 1 per 10 samples by IC Criteria: Must be within laboratory QC limits Corrective Action: Flag data outside of limit	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data associated with outside of limit
	Matrix Spike Duplicate	300.0[5] 340.2	Not Applicable	9056	Not Applicable
	Duplicate	300.0[5] 340.2	Not Applicable	9056	Frequency: 1 with each batch of samples processed Criteria: RPD[3] must be within laboratory control limits Corrective Action: Flag data associated with duplicates outside of laboratory RPD[3] limits
Hardness	Method Blank	130.2 2340B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Hardness (continued)	Laboratory Control Sample	130.2 2340B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	130.2 2340B	Method 130.2, Not Applicable Method 2340B: Frequency, Criteria, and Corrective Action: See ICP Metals Method 200.7 Requirements	—	Not Applicable
	Matrix Spike Duplicate	130.2 2340B	Method 130.2, Not Applicable Method 2340B: Frequency, Criteria, and Corrective Action: See ICP Metals Method 200.7 Requirements	—	Not Applicable
	Duplicate	130.2 2340B	Frequency: 1 per 20 samples, minimum of one per batch of samples processed Criteria: RPD[3] must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Iodide	Method Blank	345.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	345.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	345.1	Frequency: 1 per batch of 20 samples Criteria: Must be within laboratory QC limits Corrective Action: Flag associated data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	345.1	Not Applicable	—	Not Applicable
	Duplicate	345.1	Not Applicable	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Iron	Method Blank	3500-Fe D	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	3500-Fe D	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	3500-Fe D	Frequency: 1 every 10 samples Criteria: Must be within laboratory QC limits Corrective Action: Flag associated data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	3500-Fe D	Not Applicable	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Iron (continued)	Duplicate	3500-Fe D	Frequency: 1 per batch of 20 samples Criteria: Must be within laboratory QC limits Corrective Action: Flag associated data outside of limit	—	Not Applicable
Methylene Blue Active Substances (MBAS)	Method Blank	425.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	425.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Methylene Blue Active Substances (MBAS) (continued)	Matrix Spike	425.1	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	425.1	Not Applicable	—	Not Applicable
	Duplicate	425.1	Not Applicable	—	Not Applicable
Nitrate	Method Blank	300.0[5] 352.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9056 9210	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Criteria 9210: Concentration must be < 1 mg/L of Nitrate Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	300.0[5] 352.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9056 9210	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Criteria 9210: 90-110% Corrective Action: If not within laboratory control limits, rerun all associated samples

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Nitrate (continued)	Matrix Spike	300.0[5] 352.1	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Must be within laboratory control limits Corrective Action: Flag data outside of limit	9056 9210	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Criteria 9210: 75-125% Corrective Action: If not within laboratory control limits, flag all associated samples
	Matrix Spike Duplicate	300.0[5] 352.1	Not Applicable	9056 9210	Not applicable
	Duplicate	300.0[5] 352.1	Not Applicable	9056 9210	Method 9056: Frequency: 1 per 10 samples Criteria: RPD[3] must be within laboratory control limits Corrective Action: If not within laboratory control limits, flag all associated samples Method 9210: Not applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Nitrite	Method Blank	300.0[5] 354.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	300.0[5] 354.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples
	Matrix Spike	300.0[5] 354.1	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Must be within laboratory control limits Corrective Action: Flag data outside of limit	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, flag all associated samples
	Matrix Spike Duplicate	300.0[5] 354.1	Not Applicable	9056	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Nitrite (continued)	Duplicate	300.0[5] 354.1	Not Applicable	9056	Frequency: 1 per 10 samples Criteria: RPD[3] must be within laboratory control limits Corrective Action: If not within laboratory control limits, flag all associated samples
Nitrate-Nitrite	Method Blank	353.1 353.2 353.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	353.1 353.2 353.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Nitrate-Nitrite (continued)	Matrix Spike	353.1 353.2 353.3	Frequency: 1 per 20 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	353.1 353.2 353.3	Not Applicable	—	Not Applicable
	Duplicate	353.1 353.2 353.3	Not Applicable	—	Not Applicable
Odor	Method Blank	140.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable
	Laboratory Control Sample	140.1	Not Applicable	—	Not Applicable
	Matrix Spike	140.1	Not Applicable	—	Not Applicable
	Matrix Spike Duplicate	140.1	Not Applicable	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Odor (continued)	Duplicate	140.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] Corrective Action: Flag data outside of limit.	—	Not Applicable
pH	Method Blank	150.1 4500-H^+ B	Not Applicable	9040B 9045C	Not Applicable
	Laboratory Control Sample	150.1 4500-H^+ B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Sample provided by external source, must be within ± 0.05 pH units Corrective Action: If not within laboratory control limits, rerun all associated samples	9040B 9045C	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Sample provided by external source, must be within ± 0.05 pH units Corrective Action: If not within laboratory control limits, rerun all associated samples
	Matrix Spike	150.1 4500-H^+ B	Not Applicable	9040B 9045C	Not Applicable
	Matrix Spike Duplicate	150.1 4500-H^+ B	Not Applicable	9040B 9045C	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
pH (continued)	Duplicate	150.1 4500-H^+ B	Method 150.1 Frequency: 1 with each batch of samples processed not to exceed 20 samples Method 4500-H^+ B Frequency: 1 with each batch of 10 samples Method 150.1 Criteria: ≤ 20 % RPD[3] limit Method 4500-H^+ B Criteria: ≤ 25 % RPD[3] limit Corrective Action: Flag data outside of limit.	9040B 9045C	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Advisory limits are ≤ 20% RPD[3] Corrective Action: Flag data associated with unacceptable Duplicate
Phenolics	Method Blank	420.1 420.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9065 9066	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	420.1 420.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9065 9066	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Phenolics (continued)	Matrix Spike	420.1 420.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data associated with unacceptable Matrix Spike	9065 9066	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated data
	Matrix Spike Duplicate	420.1 420.2	Not Applicable	9065 9066	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated data
	Duplicate	420.1 420.2	Not Applicable	9065 9066	Not Applicable
Phosphate	Method Blank	---	Not Applicable	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	---	Not Applicable	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Phosphate (continued)	Matrix Spike	---	Not Applicable	9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated data associated with MS outside of limits
	Matrix Spike Duplicate	---	Not Applicable	9056	Not Applicable
	Duplicate	---	Not Applicable	9056	Frequency: 1 with each batch of samples processed Criteria: RPD[3] must be within laboratory control limits Corrective Action: Flag data associated with duplicates outside of laboratory RPD[3] limits
Phosphorus (Total and Ortho-phosphate)	Method Blank	300.0[4,5] 365.1 365.2 365.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Phosphorus (Total and Ortho-phosphate) (continued)	Laboratory Control Sample	300.0[4,5] 365.1 365.2 365.3	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	300.0[4,5] 365.1 365.2 365.3	Frequency: 1 per 10 samples Criteria: Must be within laboratory QC limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	300.0[4,5] 365.1 365.2 365.3	Not Applicable	—	Not Applicable
	Duplicate	300.0[4,5] 365.1 365.2 365.3	Not Applicable	—	Not Applicable
Reactivity (Cyanide and Sulfide)	Method Blank	---	Not Applicable	Chapter 7[6] Sections 7.3.3.2 and 7.3.4.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Reactivity (Cyanide and Sulfide) (continued)	Laboratory Control Sample	---	Not Applicable	Chapter 7[6] Sections 7.3.3.2 and 7.3.4.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	---	Not Applicable	Chapter 7[6] Sections 7.3.3.2 and 7.3.4.2	Follow QC sample requirements of determinative method
	Matrix Spike Duplicate	---	Not Applicable	Chapter 7[6] Sections 7.3.3.2 and 7.3.4.2	Follow QC sample requirements of determinative method
	Duplicate	---	Not Applicable	Chapter 7[6] Sections 7.3.3.2 and 7.3.4.2	Not Applicable
Silica, Dissolved	Method Blank	370.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Silica, Dissolved (continued)	Laboratory Control Sample	370.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	370.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	370.1	Not Applicable	—	Not Applicable
	Duplicate	370.1	Not Applicable	—	Not Applicable
Solids	Method Blank	160.1 160.2 160.3 160.4	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: If analyte level in method blank is≥ RL for the analyte of interest in the sample, all associated samples with reportable levels ofanalyte are reprepared and reanalyzed. SOP No. CORP-WC-0002.	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Solids (continued)	Laboratory Control Sample	160.1 160.2 160.3 160.4	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, reprepare and rerun all associated samples	—	Not Applicable
	Matrix Spike	160.1 160.2 160.3 160.4	Not Applicable	—	Not Applicable
	Matrix Spike Duplicate	160.1 160.2 160.3 160.4	Not Applicable	—	Not Applicable
	Duplicate	160.1 160.2 160.3 160.4 160.5	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Sample results should agree within 20% if both the sample and sample duplicate results are > 5 X RL Corrective Action: Flag data outside of limit- Address in the project narrative	—	Not Applicable
Specific Conductance	Method Blank	120.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9050A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Specific Conductance (continued)	Laboratory Control Sample	120.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9050A	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples
	Matrix Spike	120.1	Not Applicable	9050A	Not Applicable
	Matrix Spike Duplicate	120.1	Not Applicable	9050A	Not Applicable
	Duplicate	120.1	Frequency: 1 with each batch of 20 samples processed Criteria: RPD[3] must be within laboratory QC limits Corrective Action: Flag associated data if outside of limits	9050	Frequency: 1 with each batch of 20 samples processed Criteria: RPD[3] must be within laboratory QC limits Corrective Action: Flag associated data if outside of limits
Sulfate	Method Blank	300.0[5] 375.1 375.4	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9038 9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Sulfate (continued)	Laboratory Control Sample	300.0[5] 375.1 375.4	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9038 9056	Frequency: 1 with each batch of samples processed not to exceed 20 samples Method 9038 Criteria: Percent recovery must be within ± 15 % Method 9056 Criteria: Percent recovery must be within laboratory control limits Corrective Action: Rerun all samples associated with unacceptable LCS (ICV)
	Matrix Spike	300.0[5] 375.1 375.4	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	9038 9056	Frequency: 1 with each batch of samples processed not to exceed 10 samples (Method 9038) or 20 samples (Method 9056) Method 9038 Criteria: Limits are 75% - 125% recovery Method 9056 Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data associated with unacceptable Matrix Spike
	Matrix Spike Duplicate	300.0[5] 375.1 375.4	Not Applicable	9038 9056	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Sulfate (continued)	Duplicate	300.0[5] 375.1 375.4	Not Applicable	9038 9056	Frequency: 1 with each batch of samples processed Criteria: RPD[3] must be within laboratory control limits Corrective Action: Flag data associated with duplicates outside of laboratory RPD[3] limits
Sulfide	Method Blank	376.1 376.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9030B 9034	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	376.1 376.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9030B 9034	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated data

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Sulfide (continued)	Matrix Spike	376.1 376.2	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	9030B 9034	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated data
	Matrix Spike Duplicate	376.1 376.2	Not Applicable	9030B 9034	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated data Method 9034: Not Applicable
	Duplicate	376.1 376.2	Not Applicable	9030B 9034	Not Applicable
Sulfite	Method Blank	377.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Sulfite (continued)	Laboratory Control Sample	377.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	377.1	Frequency: 1 per 20 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	—	Not Applicable
	Matrix Spike Duplicate	377.1	Not Applicable	—	Not Applicable
	Duplicate	377.1	Not Applicable	—	Not Applicable
Temperature	Method Blank	170.1	Not Applicable	---	Not Applicable
	Laboratory Control Sample	170.1	Not Applicable	---	Not Applicable
	Matrix Spike	170.1	Not Applicable	---	Not Applicable
	Matrix Spike Duplicate	170.1	Not Applicable	---	Not Applicable
	Duplicate	170.1	Not Applicable	---	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Total Organic Carbon (TOC)	Method Blank	415.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	9060	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	415.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	9060	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery must be within laboratory control limits Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	415.1	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag data outside of limit	9060	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable Matrix Spike

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Total Organic Carbon (TOC) (continued)	Matrix Spike Duplicate	415.1	Not Applicable	9060	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action Reanalyze if sample remaining. If not, flag data associated with unacceptable Matrix Spike Duplicate
	Duplicate	415.1	Not Applicable	9060	Not Applicable
Total Organic Halides (TOX)	Method Blank	SM 5320B [5] 450.1 [5]	Frequency: 1 with each set of 8 samples Criteria: Concentration less than reporting limit Corrective Action Rerun all samples associated with unacceptable blank	9020B	Frequency: Run in duplicate between each group of 8 analytical determinations Criteria: Concentration less than reporting limit or less than 2 X MDL or RL whichever is lower Corrective Action Rerun all samples associated with unacceptable blank SOP NO. CORP-WC-0001
	Laboratory Control Sample	SM 5320B [5] 450.1 [5]	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery of analyte must be within laboratory control limits Corrective Action Rerun all samples associated with unacceptable LCS (ICV)	9020B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery of analyte must be within 90-110% Corrective Action Rerun all samples associated with unacceptable LCS (ICV) SOP NO. CORP-WC-0001

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846) [2]
Total Organic Halides (TOX) (continued)	Matrix Spike	SM 5320B [5] 450.1 [5]	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Must be within laboratory control limits Corrective Action: Reanalyze if sample remaining. If not, flag data with unacceptable Matrix Spike	9020B	Frequency: 1 per batch of 10 samples Criteria: Must be within laboratory control limits Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-WC-0001
	Matrix Spike Duplicate	SM 5320B [5] 450.1 [5]	Not Applicable	9020B	Not Applicable
	Duplicate	SM 5320B [5] 450.1 [5]	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] limit Corrective Action: Flag data outside of limit.	9020B	Frequency: All samples will be analyzed in duplicate Criteria: ≤ 20 % RPD[3] limit if both the sample and sample duplicate results are > 10 X MDL. Corrective Action: Flag data outside of limit. SOP NO. CORP-WC-0001
Turbidity	Method Blank	180.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Turbidity (continued)	Laboratory Control Sample	180.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples	—	Not Applicable
	Matrix Spike	180.1	Not applicable	—	Not Applicable
	Matrix Spike Duplicate	180.1	Not Applicable	—	Not Applicable
	Duplicate	180.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Must be within laboratory QC limits Corrective Action: Flag data outside of limit Not Applicable.	—	Not Applicable
Water Content	Method Blank	—	Not Applicable	—	Not Applicable
	Laboratory Control Sample	—	Not Applicable	—	Not Applicable
	Matrix Spike	—	Not Applicable	—	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Water Content (continued)	Matrix Spike Duplicate	—	Not Applicable	—	Not Applicable
	Duplicate	—	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] Corrective Action: Flag data outside of limit.	—	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: ≤ 20 % RPD[3] limit Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.
GFAA and Flame AA Metals, Mercury by CVAA	Method Blank	200 series	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank SOP NO. CORP-MT-0003	7000A series	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank SOP NO. CORP-MT-0003
	Laboratory Control Sample	200 series	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS SOP NO. CORP-MT-0003	7000A series	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS SOP NO. CORP-MT-0003

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
GFAA and Flame AA Metals, Mercury by CVAA (continued)	Matrix Spike	200 series	Frequency: with each batch of samples processed not to exceed 20 samples Criteria: Recovery must be within 75-125 % Corrective Action Flag data associated with unacceptable MS. (See SOP NO. CORP-MT-0003 for detailed corrective action procedure and for other QC procedures.)	7000A series	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Recovery must be within 75-125 % Corrective Action Flag data associated with unacceptable MS. (See SOP NO. CORP-MT-0003 for detailed corrective action procedure and for other QC procedures.)
	Matrix Spike Duplicate	200 series	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Recovery must be within 75-125 % , RPD[3] must be within 20 % Corrective Action Flag data associated with unacceptable MSD SOP NO. CORP-MT-0003	7000A series	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Recovery must be within 75-125 % , RPD[3] must be within 20 % Corrective Action Flag data associated with unacceptable MSD SOP NO. CORP-MT-0003
	Duplicate	200 series	Not Applicable	7000A series	Not Applicable
	Post Digestion Spikes	200 series	Post Digestion Spike is conducted on all samples	7000A series	Post Digestion Spike is conducted on all samples
ICP Metals	Method Blank	200.7	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action Rerun all samples associated with unacceptable blank SOP NO. CORP-MT-0001	6010B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action Rerun all samples associated with unacceptable blank SOP NO. CORP-MT-0001

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
ICP Metals (continued)	Laboratory Control Sample	200.7	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery of analyte must be ± 85-115% Corrective Action: Rerun all samples associated with unacceptable LCS SOP NO. CORP-MT-0001	6010B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery of analyte must be ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS SOP NO. CORP-MT-0001
	Matrix Spike	200.7	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Limits for percent recovery are 75-125% Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-MT-0001	6010B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Limits for percent recovery are 75-125% Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-MT-0001
	Matrix Spike Duplicate	200.7	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Limits for percent recovery are 75-125%, RPD[3] must be within 20 % Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-MT-0001	6010B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Limits for percent recovery are 75-125%, RPD[3] must be within 20 % Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-MT-0001

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
ICP Metals (continued)	Duplicate	200.7	Not Applicable	6010B	Not Applicable
	Serial Dilution	200.7	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: 10 % Difference Corrective Action: Flag data associated with unacceptable Serial Dilution SOP NO. CORP-MT-0001	6010B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: 10 % Difference Corrective Action: Flag data associated with unacceptable Serial Dilution SOP NO. CORP-MT-0001
ICP/MS Metals	Method Blank	200.8	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	6020	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	200.8	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Recovery within laboratory control limits Corrective Action: Rerun all samples associated with unacceptable LCS	6020	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Recovery within laboratory control limits Corrective Action: Rerun all samples associated with unacceptable blank
	Matrix Spike	200.8	Frequency: 1 per 10 samples, minimum of one per batch of samples processed Criteria: Recovery within laboratory control limits Corrective Action: Qualify data "suspect/matrix"	6020	Not Applicable

TABLE 8.4-5
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
ICP/MS Metals (continued)	Matrix Spike Duplicate	200.8	Not Applicable	6020	Not Applicable
	Duplicate	200.8	Not Applicable	6020	Frequency: 1 per 20 samples, minimum of one per batch of samples processed Criteria: 20% RPD[3] Corrective Action: Re-analyze samples associated with unacceptable duplicate
	Post Duplicate Spike	200.8	Not Applicable	6020	Frequency: 1 per 20 samples Criteria: 75-125% Corrective Action: Dilute and reanalyze
	Serial 5x Dilution	200.8	Not Applicable	6020	Frequency: 1 per 20 samples Criteria: ± 10% D Corrective Action: Use alternate isotope or quality data "suspect/matrix"

Footnotes

(1) National Pollutant Discharge Elimination System

(2) Resource Conservation and Recovery Act,Test Methods for Evaluating Solid Waste, Physical/ChemicaMethods, (SW-846), Third Edition, September 1986. Contains Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996).

(3) RPD-Relative Percent Difference

(4) Orthophosphate only

(5) Method not listed in 40 CFR Part 136.

(6) Current promulgated method is a Guidance Method Only, SW-846, Final Update III, Rev.3, 12/96.

TABLE 8.4-6
Organic Laboratory Quality Control Samples

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Aromatic Volatiles by GC	Method Blank	602	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	8021B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank SOP NO. CORP-GC-0001
	Laboratory Control Sample	602	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS	8021B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS SOP NO. CORP-GC-0001
	Matrix Spike	602	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8021B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-GC-0001

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Aromatic Volatiles by GC (continued)	Matrix Spike Duplicate	602	Not Applicable	8021B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-GC-0001
	Duplicate	602	Not Applicable	8021B	Not Applicable
	Surrogates	602	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Re-extract samples or flag sample data not meeting surrogate criteria	8021B	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Reprepare and reanlayze samples or flag sample data not meeting surrogate criteria SOP NO. CORP-GC-0001
	Internal Standards	602	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.	8021B	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate. SOP NO. CORP-GC-0001

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Acrolein &Acrylonitrile by GC	Method Blank	603	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	8031 (Acrylo-nitrile only)	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	603	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS	8031 (Acrylo-nitrile only)	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	603	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8031 (Acrylo-nitrile only)	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Acrolein & Acrylonitrile by GC (continued)	Matrix Spike Duplicate	603	Not Applicable	8031 (Acrylo-nitrile only)	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike
	Duplicate	603	Not Applicable	8031 (Acrylo-nitrile only)	Not Applicable
	Surrogates	603	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Re-extract samples or flag sample data not meeting surrogate criteria	8031 (Acrylo-nitrile only)	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria
	Internal Standards	603	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.	8031 (Acrylo-nitrile only)	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Dioxins/ Dibenzo-furans (LRMS)	Method Blank	613	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: Concentration less than reporting limit Corrective Action: Rerun all positive samples associated with unacceptable blank	8280A	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: Concentration less than reporting limit Corrective Action: Rerun all positive samples associated with unacceptable blank
	Laboratory Control Sample	613	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS	8280A	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	613	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8280A	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike
	Matrix Spike Duplicate	613	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike Duplicate	8280A	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable matrix spike duplicate

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Dioxins/ Dibenzo-furans (LRMS) (continued)	Duplicate	613	Not Applicable	8280A	Not Applicable
	Surrogates	613	Not Applicable	8280A	Not Applicable
	Internal Standards	613	Internal standards are added to all samples (QC samples included). Internal standard recovery should be between 40 % to 120 %.	8280A	Internal standards are added to all samples (QC samples included). Internal standard recovery should be between 40 % - 120 % for Method 8280A. Use limits in laboratory SOP.
Dioxins/ Dibenzo-furans (HRGC/HR MS)	Method Blank	1613B[5]	Frequency: 1 per batch ≤ 20 samples extracted Criteria: Concentration less than reporting level or one third regulatory level whichever is greater Corrective Action: Rerun all positive samples associated with unacceptable blank	8290	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: Concentration less than reporting limit Corrective Action: Rerun all positive samples associated with unacceptable blank
	Laboratory Control Sample (Ongoing Precision and Recovery - OPR)	1613B[5]	Frequency: 1 per batch ≤ 20 samples extracted Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS (OPR)	8290	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Dioxins/ Dibenzo-furans (HRGC/HR MS) (continued)	Matrix Spike	1613B[5]	Not Applicable	8290	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike
	Matrix Spike Duplicate	1613B[5]	Not Applicable	8290	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable matrix spike duplicate
	Duplicate	1613B[5]	Not Applicable	8290	Not Applicable
	Surrogates	1613B[5]	Not Applicable	8290	Not Applicable
	Internal Standards (Labeled Compounds and Cleanup Standards)	1613B[5]	Labeled internal standards and cleanup standards are added to all samples (QC samples included). Recovery of each labeled standard should be within the method limits.	8290	Internal standards are added to all samples (QC samples included). Internal standard recovery should be between 40 % - 135 % for Method 8290. Use limits in laboratory SOP.

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
PCBs (HRGC/HR MS)	Method Blank	1668[5]	Frequency: 1 per batch ≤ 20 samples extracted Criteria: Concentration less than reporting level or one third regulatory level whichever is greater Corrective Action: Rerun all positive samples associated with unacceptable blank	--	Not Applicable
	Laboratory Control Sample (Ongoing Precision and Recovery - OPR)	1668[5]	Frequency: 1 per batch ≤ 20 samples extracted Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS (OPR)	--	Not Applicable
	Matrix Spike	1668[5]	Not Applicable	--	Not Applicable
	Matrix Spike Duplicate	1668[5]	Not Applicable		Not Applicable
	Duplicate	1668[5]	Not Applicable	--	Not Applicable
	Surrogates	1668[5]	Not Applicable	--	Not Applicable

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
PCBs (HRGC/HR MS) (continued)	Internal Standards (Labeled Compounds and Cleanup Standards)	1668[5]	Labeled internal standards and cleanup standards are added to all samples (QC samples included). Recovery of each labeled standard should be within the method limits.	--	Not Applicable
Halogenated Volatiles Volatiles by GC	Method Blank	--	Not Applicable	8021B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank SOP NO. CORP-GC-0001
	Laboratory Control Sample	--	Not Applicable	8021B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS SOP NO. CORP-GC-0001

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Halogenated Volatiles by GC (continued)	Matrix Spike	--	Not Applicable	8021B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-GC-0001
	Matrix Spike Duplicate	--	Not Applicable	8021B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-GC-0001
	Duplicate	--	Not Applicable	8021B	Not Applicable
	Surrogates	--	Not Applicable	8021B	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Reprepare and reanalyze samples or flag sample data not meeting surrogate criteria.

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846) [2]
					SOP NO. CORP-GC-0001

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Halogenated Volatiles by GC (continued)	Internal Standards	--	Not Applicable	8021B	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate. SOP NO. CORP-GC-0001
Herbicides	Method Blank	615 [3]	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Re-extract all samples associated with unacceptable blank	8151A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Re-extract all samples associated with unacceptable blank SOP NO. CORP-GC-0001
	Laboratory Control Sample	615 [3]	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract all samples associated with unacceptable LCS	8151A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS SOP NO. CORP-GC-0001
	Matrix Spike	615 [3]	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: Percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8151A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike SOP NO. CORP-GC-0001

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846) [2]
Herbicides (continued)	Matrix Spike Duplicate	615 [3]	Not Applicable	8151A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory control limits Corrective Action: Flag data associated with unacceptable matrix spike sample SOP NO. CORP-GC-0001
	Duplicate	615 [3]	Not Applicable	8151A	Not Applicable
	Surrogates	615 [3]	Not Applicable	8151A	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must fall within laboratory established control limits before sample analysis may proceed. Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria SOP NO. CORP-GC-0001
	Internal Standards	615 [3]	Not Applicable	8151A	Optional
Nitro-aromatics by HPLC	Method Blank	--	Not Applicable	8330	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Nitro-aromatics by HPLC (continued)	Laboratory Control Sample	--	Not Applicable	8330	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	--	Not Applicable	8330	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike
	Matrix Spike Duplicate	--	Not Applicable	8330	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike
	Duplicate	--	Not Applicable	8330	Not Applicable
	Surrogates	--	Not Applicable	8330	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must fall within laboratory established control limits before sample analysis may proceed. Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846) [2]
	Internal Standards	--	Not Applicable	8330	Not Applicable

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Organo-phosphorus Pesticides	Method Blank	--	Not Applicable	8141A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	--	Not Applicable	8141A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	--	Not Applicable	8141A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable MS
	Matrix Spike Duplicate	--	Not Applicable	8141A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable MS

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
	Duplicate	--	Not Applicable	8141A	Not Applicable

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Organo-phosphorus Pesticides (continued)	Surrogates	--	Not Applicable	8141A	Surrogates spiked into method blank and all samples (QC included) Method Blank and LCS Criteria: Results must fall within laboratory-established control limits Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria
PAHs by GC and HPLC	Method Blank	610	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	8100 8310	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	610	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS	8100 8310	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
PAHs by GC and HPLC (continued)	Matrix Spike	610	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8100 8310	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike
	Matrix Spike Duplicate	610	Not Applicable	8100 8310	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike
	Duplicate	610	Not Applicable	8100 8310	Not Applicable
	Surrogates	610	Not specified in method	8100 8310	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: Results must fall within laboratory established control limits Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria
	Internal Standards	610	Optional	8100 8310	Optional

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Pesticides/ PCBs	Method Blank	608	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	8081A 8082	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Reprepare and reanalyze all samples associated with unacceptable blank, see SOP CORP-GC-0001
	Laboratory Control Sample	608	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS	8081A 8082	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS SOP NO. CORP-GC-0001
	Matrix Spike	608	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8081A 8082	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike, see SOP CORP-GC-0001

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846) [2]
Pesticides/ PCBs (continued)	Matrix Spike Duplicate	608	Not Applicable	8081A 80882	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike, see SOP CORP-GC-0001
	Duplicate	608	Not Applicable	8081A 8082	Not Applicable
	Surrogates	608	Not specified in method	8081A 8082	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: Results must fall within laboratory established control limits Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria, see SOP CORP-GC-0001
	Internal Standards	608	Optional	8081A 8082	Optional

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Petroleum Hydro-carbons/Oil and Grease	Method Blank	413.1 413.2 418.1	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank Method 413.1: Not Applicable	9070 9071A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Petroleum Hydro-carbons/Oil and Grease (continued)	Laboratory Control Sample	413.1 413.2 418.1	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: If not within laboratory control limits, rerun all associated samples Method 413.1: Not Applicable	9070 9071A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery must be within ± 20% Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike	413.1 413.2 418.1	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated data Method 413.1: Not Applicable	9070 9071A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated data
	Matrix Spike Duplicate	413.1 413.2 418.1	Not Applicable	9070 9071A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated Method 9071: Not Applicable

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Petroleum Hydro-carbons/Oil and Grease (continued)	Duplicate	413.1 413.2 418.1	Not Applicable	9070 9071A	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Percent recovery must be within laboratory control limits Corrective Action: Flag associated Method 9070: Not Applicable
	Surrogates	413.1 413.2 418.1	Not Applicable	9070 9071A	Not Applicable
	Internal Standards	413.1 413.2 418.1	Not Applicable	9070 9071A	Not Applicable
Petroleum Hydro-carbons	Method Blank	1664[4]	Frequency: 1 with each preparation batch Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank SOP NO. CORP-WC-0003	---	---

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Petroleum Hydro-carbons (continued)	Laboratory Control Sample	1664[4]	Frequency: 1 with each analytical batch Criteria: Waters - See limits in Table 2 of SOP No.: CORP-WC-0003 Soils - Percent recovery must be within laboratory control limits Corrective Action: Rerun all samples associated with unacceptable LCS SOP NO. CORP-WC-0003	---	---
	Matrix Spike	1664[4]	Frequency: 1 with every 10 samples per site Criteria: See percent recovery limits in Table 2 of SOP No. CORP-WC-0003 Corrective Action: See Section 9.6.1 of SOP No. CORP-WC-0003	---	---
	Matrix Spike Duplicate	1664[4]	Frequency: 1 with every 10 samples per site Criteria: See percent recovery and RPD limits in Table 2 of SOP No. CORP-WC-0003 Corrective Action: See Section 9.6.1 of SOP No. CORP-WC-0003	---	---
	Duplicate	1664[4]	Not Applicable	---	---

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Purgeable Halocarbons by GC	Method Blank	601	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	8021B	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank SOP NO. CORP-GC-0001
	Laboratory Control Sample	601	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS	8021B	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS, see Section 9.7, SOP No. CORP-GC-0001
	Matrix Spike	601	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8021B	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike, see Section 9.8, SOP No. CORP-GC-0001

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Purgeable Halocarbons by GC (continued)	Matrix Spike Duplicate	601	Not Applicable	8021B	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike, see Section 9.7, SOP No. CORP-GC-0001
	Duplicate	601	Not Applicable	8021B	Not Applicable
	Surrogates	601	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Re-extract samples or flag sample data not meeting surrogate criteria	8021B	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria, see Section 9.4, SOP No. CORP-GC-0001
	Internal Standards	601	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.	8021B	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Semivolatiles	Method Blank	625	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	8270C	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Reextract and reanalyze all samples associated with unacceptable blank, see Section 9.3, SOP No. CORP-MS-0001
	Laboratory Control Sample	625	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS	8270C	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Reextract and reanalyze all samples associated with unacceptable LCS, see Section 9.5.2, SOP No. CORP-MS-0001
	Matrix Spike	625	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8270C	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike, see Section 9.6, SOP No. CORP-MS-0001

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Semivolatiles (continued)	Matrix Spike Duplicate	625	Not Applicable	8270C	Frequency: 1 with each extraction batch of samples not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike, see Section 9.6, SOP No. CORP-MS-0001
	Duplicate	625	Not Applicable	8270C	Not Applicable
	Surrogates	625	Surrogates spiked into method blank and all samples (QC included) Method Blank and LCS Criteria: All surrogates must be in control before sample analysis may proceed Sample Criteria: Re-extract samples or flag sample data not meeting surrogate criteria	8270C	Surrogates spiked into method blank and all samples (QC included) Method Blank and LCS Criteria: All surrogates must be in control before sample analysis may proceed Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria, see Section 9.7.2, SOP No. CORP-MS-0001
	Internal Standards	625	Frequency: Internal standards spiked into method blank and all samples (QC included) Criteria: All internal standard recoveries must be within laboratory control limits Corrective Action: Flag sample data not meeting internal standard recovery	8270C	Internal Standards are added to all samples (QC samples included). Internal standard area of daily standard must be within 50% to 200% of the response in the mid level of the initial calibration standard. The retention time (RT) for any internal standard (IS) in the continuing calibration must not exceed ± 0.5 minutes from mid level initial calibration standard IS RT.

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
			requirements		

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Volatiles by GC/MS	Method Blank	624	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	8260B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank, see Section 9.4, SOP No. CORP-MS-0002
	Laboratory Control Sample	624	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8260B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte must be within laboratory acceptance limits Corrective Action: Rerun all samples associated with unacceptable LCS, see Section 9.5, SOP No. CORP-MS-0002
	Matrix Spike	624	Frequency: 1 per ≤ 20 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable Matrix Spike	8260B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike, see Section 9.6, SOP No. CORP-MS-0002

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	Method	NPDES[1]	Method	RCRA (SW846)[2]
Volatiles by GC/MS (continued)	Matrix Spike Duplicate	624	Not Applicable	8260B	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: percent recovery for each analyte should be within laboratory acceptance limits Corrective Action: Flag data associated with unacceptable Matrix Spike, see Section 9.6, SOP No. CORP-MS-0002
	Duplicate	624	Not Applicable	8260B	Not Applicable
	Surrogates	624	Surrogates spiked into Method Blank and all samples (QC included) Method Blank Criteria: All surrogates must be in control before sample analysis may proceed. Sample Criteria: Re-extract samples or flag sample data not meeting surrogate criteria	8260B	Surrogates spiked into Method Blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be in control before sample analysis may proceed. Sample Criteria: Re-extract and reanalyze samples or flag sample data not meeting surrogate criteria, see Section 9.3, SOP No. CORP-MS-0002
	Internal Standards	624	Frequency: Internal standards spiked into method blank and all samples (QC included) Criteria: All internal standard recoveries must be within laboratory control limits Corrective Action: Flag sample data not meeting internal standard recovery requirements	8260B	Internal Standards are added to all samples (QC samples included). Internal standard area of daily standard must be within 50% to 200% of the response in the mid level of the initial calibration standard. The retention time (RT) for any internal standard (IS) in the continuing calibration must not exceed ± 0.5 minutes from mid level initial calibration standard IS RT.

TABLE 8.4-6
Organic Laboratory Quality Control Samples
(Continued)

Footnotes

(1) National Pollutant Discharge Elimination System

(2) Resource Conservation and Recovery Act,Test Methods for Evaluating Solid Waste, Physical/ChemicaMethods, (SW-846), Third Edition, September 1986. Contains Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996).

(3) Method not listed in 40 CFR Part 136.

(4) Method 1664 is a proposed method only, and has not been promulgated by the EPA. These requirements afrom Quanterra® SOP Number CORP-WC-0003, "HEM/SGT-HEM by Method 1664".

(5) Method 1613, Rev B, October 1994, EPA 821-B-94-005, "Tetra-Through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS". Method 1668, Draft, October 4, 1995, "Toxic PCBs by Isotope Dilution HRGC/HRMS".

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples

Analysis	QC Sample	Method	Requirement
Cyanide, Total	Method Blank	ILM03.0 ILMO4.0	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria ILMO3.0: Concentration less than CRDL or less than 10x sample concentration Criteria ILMO4.0: If method blank is > CRDL, sample results are acceptable if they are≥ 10-times method blank level. Corrective Action: Reprepare all samples associated with unacceptable blank
	Laboratory Control Sample	ILM03.0 ILMO4.0	Frequency: 1 with each batch of samples processed or for each SDG, whichever is more frequent Criteria: Water - 80-120% Solid - Meet control limits established for solid reference material Corrective Action: Reprepare all samples associated with unacceptable LCS
	Matrix Spike	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG, whichever is more frequent Criteria: 75-125% unless sample result > 4x spike amount Corrective Action: Flag data associated with unacceptable Matrix Spike, perform post distillation spike at 2 x CRDL or 2x sample concentration whichever is greater
	Matrix Spike Duplicate	ILM03.0 ILMO4.0	Not Applicable
	Duplicate	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG whichever is more frequent Criteria: RPD ≤ 20% or ± CRDL if sample or duplicate value < 5x CRDL Corrective Action: Flag all associated data associated if duplicate results outside control limits
	Surrogates	ILM03.0 ILMO4.0	Not Applicable
	Internal Standards	ILM03.0 ILMO4.0	Not Applicable

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
ICAP (excludes mercury)	Method Blank	ILM03.0 ILMO4.0	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria ILMO3.0: Concentration less than CRDL or less than 10x sample concentration Criteria ILMO4.0: If method blank is > CRDL, sample results are acceptable if they are≥ 10-times method blank level. Corrective Action: Reprepare all samples associated with unacceptable blank
	Laboratory Control Sample	ILM03.0 ILMO4.0	Frequency: 1 with each batch of samples processed or for each SDG, whichever is more frequent Criteria: Water - 80-120% except silver and antimony Solid - Meet control limits established for solid reference material Corrective Action: Reprepare all samples associated with unacceptable LCS
	Matrix Spike	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG whichever is more frequent Criteria: 75-125% unless sample result > 4x spike amount Corrective Action: Flag data associated with unacceptable Matrix perform post digestion spike at 2xCRDL or 2x sample concentration whichever is greater
	Matrix Spike Duplicate	ILM03.0 ILMO4.0	Not Applicable
	Duplicate	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG whichever is more frequent Criteria: RPD ≤ 20% or ± CRDL if sample or duplicate value < 5x CRDL Corrective Action: Flag all data associated with duplicate results outside control limits

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
ICAP (excludes mercury) (continued)	Serial Dilution	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG whichever is more frequent Criteria: <10% D when sample concentration > 50x IDL Corrective Action: Flag all data associated with results outside control limits
	Surrogates	ILM03.0 ILMO4.0	Not Applicable
	Internal Standards	ILM03.0 ILMO4.0	Not Applicable.
GFAA (excludes mercury)	Method Blank	ILM03.0 ILMO4.0	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria ILMO3.0: Concentration less than CRDL or less than 10x sample concentration Criteria ILMO4.0: If method blank is > CRDL, sample results are acceptable if they are≥ 10-times method blank level. Corrective Action: Reprepare all samples associated with unacceptable blank
	Laboratory Control Sample	ILM03.0 ILMO4.0	Frequency: 1 with each batch of samples processed or for each SDG, whichever is more frequent Criteria: Water - 80-120% except silver and antimony Solid - Meet control limits established for solid reference material Corrective Action: Reprepare all samples associated with unacceptable LCS
	Matrix Spike	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG whichever is more frequent Criteria: 75-125% unless sample result > 4x spike amount Corrective Action: Flag data associated with unacceptable Matrix
	Matrix Spike Duplicate	ILM03.0 ILMO4.0	Not Applicable

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
GFAA (excludes mercury) (continued)	Duplicate	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG whichever is more frequent Criteria: RPD ≤ 20% or ± CRDL if sample or duplicate value < 5x CRDL Corrective Action: Flag all associated data associated if duplicate results outside control limits
	Analytical Spike	ILM03.0 ILMO4.0	Frequency: 1 with each sample except matrix spike Criteria: Evaluate per method requirements Corrective action: Perform per method requirements
	Surrogates	ILM03.0 ILMO4.0	Not Applicable
	Internal Standards	ILM03.0 ILMO4.0	Not Applicable.
Mercury (CVAA)	Method Blank	ILM03.0 ILMO4.0	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria ILMO3.0: Concentration less than CRDL Criteria ILMO4.0: If method blank is > CRDL, sample results are acceptable if they are≥ 10-times method blank level. Corrective Action: Reprepare all samples associated with unacceptable blank
	Laboratory Control Sample	ILM03.0 ILMO4.0	Frequency: 1 with each batch of samples processed or for each SDG, whichever is more frequent Criteria: Water - 80-120% Solid - Meet control limits established for solid reference material Corrective Action: Reprepare all samples associated with unacceptable LCS
	Matrix Spike	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG Criteria: 75-125% unless sample result > 4x spike amount Corrective Action: Flag data associated with unacceptable Matrix Spike

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Mercury (CVAA) (continued)	Matrix Spike Duplicate	ILM03.0 ILMO4.0	Not Applicable
	Duplicate	ILM03.0 ILMO4.0	Frequency: 1 with each group of samples of a similar matrix type and concentration or for each SDG whichever is more frequent Criteria: RPD ≤ 20% or ± CRDL if sample or duplicate value < 5x CRDL Corrective Action: Flag all associated data associated if duplicate results outside control limits
	Surrogates	ILM03.0 ILMO4.0	Not Applicable
	Internal Standards	ILM03.0 ILMO4.0	Not Applicable.
PCDD, PCDF	Method Blank	DFLM01.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Chemical interference or electronic noise must be less than 5% of the appropriate internal standard ion A peak that meets identification criteria must be less than 2% of the signal of the appropriate internal standard ion Corrective Action: Reprepare all samples with positive results or those not meeting all identification criteria associated with unacceptable blank
	Laboratory Control Sample	DFLM01.1	Not Applicable
	Matrix Spike	DFLM01.1	Frequency: 1 for each matrix analyzed for each SDG Criteria: 50-150% Corrective Action: Verify all calculations and spiking; no further action required
	Matrix Spike Duplicate	DFLM01.1	Not Applicable

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
PCDD, PCDF (continued)	Duplicate	DFLM01.1	Frequency: 1 for each matrix analyzed for each SDG Criteria: RPD ≤ 50% Corrective Action: Verify all calculations and spiking; no further action required
	Surrogates	DFLM01.1	Not Applicable
	Internal Standards	DFLM01.1	Frequency: Internal standards are spiked into all samples and QC samples Criteria: 25 - 150% Corrective Action: Re-extract and reanalyze all samples with unacceptable surrogate recoveries
Pesticides/PCBs	Method Blank	OLM03.1	Frequency: 1 with each case of samples received (up to 20 samples), for each extraction procedure within each SDG, whichever is most frequent or whenever samples are extracted Criteria: Concentration < CRQL Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank
	Laboratory Control Sample	OLM03.1	Not Applicable.
	Matrix Spike	OLM03.1	Frequency: 1 with each case of samples received (up to 20 samples), for each extraction procedure or for each SDG, whichever is most frequent Criteria: Percent recovery for eachanalyte should be within advisory limits given in method Corrective Action: Flag data associated with Matrix Spike recoveries outside of advisory limits

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Pesticides/PCBs (continued)	Matrix Spike Duplicate	OLM03.1	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each SDG, whichever is most frequent Criteria: Percent recovery for eachanalyte should be within advisory limits given in method RPD between MS/MSD should be within advisory limits given in method Corrective Action: Flag data associated with Matrix Spike recoveries or RPD outside of advisory limits
	Duplicate	OLM03.1	Not Applicable
	Surrogates	OLM03.1	Frequency: Surrogates spiked onto all samples and QC samples Criteria: Percent recovery for each surrogate in samples should be within 30-150% Percent recovery for each surrogate in the method blank must be 30-150% Corrective Action: Flag unacceptable surrogate recoveries in samples Re-extract all samples associated with unacceptable surrogate recoveries in the method blank
	Internal Standards	OLM03.1	Not Applicable.
	Method Blank	OLM01.8	Frequency: 1 with each case of samples received (up to 20 samples and including matrix spikes andreanalyses) that are of similar matrix (water or soil) or similar concentration (soil), or 1 with each 14 calendar day period (7 calendar day for 14-day data turnaround contracts) during which samples in a case are received), or 1 whenever samples are extracted by the same procedure (continuous liquid - liquid extraction orsonication) Criteria: Concentration < CRQL Corrective Action: Re-extract and re-analyze all samples associated with unacceptable blank

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Pesticides/PCBs (continued)	Laboratory Control Sample	OLM01.8	Not Applicable
	Matrix Spike	OLM01.8	Frequency: 1 with every 20 samples of each matrix Criteria: Percent recovery should be within advisory limits given in method Corrective Action: Flag data associated with matrix spike recoveries outside of advisory limits
	Matrix Spike Duplicate	OLM01.8	Frequency: 1 with every 20 samples of each matrix Criteria: Percent recovery and RPD should be within advisory limits given in method Corrective Action: Flag data associated with percent recovery or RPD outside of advisory limits
	Duplicate	OLM01.8	Not Applicable
	Surrogates	OLM01.8	Frequency: Spiked onto all samples and QC samples Criteria: Advisory limits are 60% - 150% Corrective Action: Flag surrogate recoveries outside of advisory limits
	Internal Standards	OLM01.8	Not Applicable
Semivolatiles by GC/MS	Method Blank	OLM03.1	Frequency: 1 with each batch of samples processed not to exceed 20 samples Criteria: Concentration less than CRQL except phthalates which must be ≤ 5x CRQL Corrective Action: Re-extract and re-analyze all samples associated with unacceptable blank
	Laboratory Control Sample	OLM03.1	Not Applicable.

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Semivolatiles by GC/MS (continued)	Matrix Spike	OLM03.1	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each SDG, whichever is most frequent Criteria: Percent recovery for eachanalyte should be within advisory limits given in method Corrective Action: Flag data associated with Matrix Spike outside of advisory limits
	Matrix Spike Duplicate	OLM03.1	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each SDG, whichever is most frequent Criteria: Percent recovery for eachanalyte should be within advisory limits given in method RPD between MS/MSD should be within advisory limits given in method Corrective Action: Flag data associated with Matrix Spike recoveries or RPD outside of advisory limits
	Duplicate	OLM03.1	Not Applicable
	Surrogates	OLM03.1	Frequency: Surrogates spiked onto all samples and QC samples Criteria: Percent recovery for each surrogate must be within limits given in method (one base/neutral and/or one acid surrogate may be outside of limits but not below 10%) Corrective Action: Flag data associated with unacceptable recoveries or reanalyze all samples with unacceptable surrogate recoveries as required in method
	Internal Standards	OLM03.1	Frequency: Internal Standards are spiked onto all samples and QC samples Criteria: Internal Standard areas must be within -50% to + 100% from the last daily calibration check standard Corrective Action: Reanalyze all samples with unacceptable areas

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Semivolatiles by GC/MS (continued)	Method Blank	OLM01.8	Frequency: 1 with each case of samples received (up to 20 samples) and including matrix spikes and reanalyses) that are of similar matrix (water or soil) or similar concentration (soil), or 1 with each 14 calendar day period (7 calendar day for 14-day data turnaround contracts) during which samples in a case are received, or 1 whenever samples are extracted by the same procedure (continuous liquid-liquid extraction or sonication) Criteria: Concentration ≤ CRQL except phthalates which must be < 5 x CRQL Corrective Action: Re-extract and re-analyze all samples associated with unacceptable blank
	Laboratory Control Sample	OLM01.8	Not Applicable
	Matrix Spike	OLM01.8	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each 14 day calendar period (7 calendar day period for 14 day data turnaround contracts) during which field samples in a case were received, whichever is most frequent Criteria: Percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with Matrix Spike recoveries outside of advisory limits
	Matrix Spike Duplicate	OLM01.8	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each 14 day calendar period (7 calendar day period for 14 day data turnaround contracts) during which field samples in a case were received, whichever is most frequent Criteria: Percent recovery for each analyte should be within advisory limits given in method. RPD between MS/MSD should be within advisory limits given in method. Corrective Action: Flag data associated with Matrix Spike recoveries or RPD outside of advisory limits

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Semivolatiles by GC/MS (continued)	Duplicate	OLM01.8	Not Applicable
	Surrogates	OLM01.8	Frequency: Surrogates spiked onto all samples and QC samples Criteria: Percent recovery for each surrogate must be within limits given in method (one base/neutral and/or one acid surrogate may be outside of limits, but not below 10%) Corrective Action: Flag data associated with unacceptable recoveries or reanalyze all samples with unacceptable surrogate recoveries as required in method
	Internal Standards	OLM01.8	Frequency: Internal Standards are spiked onto all samples and QC samples Criteria: Internal Standard areas must be within -50% to + 100% from the last daily calibration check standard Corrective Action: Reanalyze all samples with unacceptable areas
Volatiles by GC/MS	Method Blank	OLM03.1	Frequency: 1 per 12 hours Criteria: Concentration less than CRQL exceptmethylene chloride, acetone, 2-butanone must be≤ 5x CRQL Corrective Action: Reanalyze all samples associated with unacceptable blank
	Laboratory Control Sample	OLM03.1	Not Applicable
	Matrix Spike	OLM03.1	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each SDG, whichever is most frequent Criteria: Percent recovery for eachanalyte should be within advisory limits given in method Corrective Action: Flag data associated with Matrix Spike outside of advisory limits

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Volatiles by GC/MS (continued)	Matrix Spike Duplicate	OLM03.1	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each SDG, whichever is most frequent Criteria: Percent recovery for eachanalyte should be within advisory limits given in method RPD between MS/MSD should be within advisory limits given in method Corrective Action: Flag data associated with Matrix Spike recoveries or RPD outside of advisory limits
	Duplicate	OLM03.1	Not Applicable
	Surrogates	OLM03.1	Frequency: Surrogates spiked onto all samples and QC samples Criteria: Percent recovery for each surrogate must be within limits given in method Corrective Action: Reanalyze all samples with unacceptable surrogate recoveries
	Internal Standards	OLM03.1	Frequency: Internal Standards are spiked onto all samples and QC samples Criteria: Internal Standard areas must be within -50% to + 100% from the last daily calibration check standard Corrective Action: Reanalyze all samples with unacceptable Internal Standard areas
	Storage Blank	OLM03.1	Frequency: 1 per SDG Criteria: Concentration less than CRQL exceptmethylene chloride, acetone, 2-butanone must be≤ 5x CRQL Corrective Action: Narrate with corrective action plan

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Volatiles by GC/MS (continued)	Method Blank	OLM01.8	Frequency: 1 per 12 hours Criteria: Concentration less than CRQL exceptmethylene chloride, acetone, and 2-butanone must be≤ 5x CRQL Corrective Action: Re-purge and re-analyze all associated samples
	Laboratory Control Sample	OLM01.8	Not Applicable
	Matrix Spike	OLM01.8	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each 14 day calendar period (7 calendar day period for 14 day data turnaround contracts) during which field samples in a case were received, whichever is most frequent Criteria: Percent recovery for eachanalyte should be within advisory limits given in method Corrective Action: Flag data associated with Matrix Spike recoveries outside of advisory limits
	Matrix Spike Duplicate	OLM01.8	Frequency: 1 with each case of samples received (up to 20 samples), for each concentration level (soils) or for each 14 day calendar period (7 calendar day period for 14 day data turnaround contracts) during which field samples in a case were received, whichever is most frequent Criteria: Percent recovery for eachanalyte should be within advisory limits given in method. RPD between MS/MSD should be within advisory limits given in method. Corrective Action: Flag data associated with Matrix Spike recoveries or RPD outside of advisory limits
	Duplicate	OLM01.8	Not Applicable
	Surrogates	OLM01.8	Frequency: Surrogates spiked onto all samples and QC samples Criteria: Percent recovery for eachanalyte should be within advisory limits given in method Corrective Action: Re-analyze all samples with unacceptable surrogate recoveries

TABLE 8.4-7
USEPA Contract Laboratory Program Statement of Work Quality Control Samples (Continued)

Analysis	QC Sample	Method	Requirement
Volatiles by GC/MS (continued)	Internal Standards	OLM01.8	Frequency: Internal Standards are spiked onto all samples and QC samples Criteria: Internal Standard areas must be within -50% to + 100% from the last daily calibration check standard Corrective Action: Re-analyze all samples with unacceptable Internal Standard areas
	Storage Blank	OLM01.8	Not Applicable

Notes:

SDG = Sample Delivery Group

TEACHERS' RETIREMENT SYSTEM - GMO SITE

HEALTH AND SAFETY PLAN

ATTACHMENT 3

Title: Health and Safety Plan

Revision Number: 2

Date: February 14, 2002

Replaces: Version 1

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EMERGENCY PHONE NUMBERS

IN THE EVENT OF AN EMERGENCY DIAL 911

AMBULANCE SERVICE	911
FIRE DEPARTMENT	911
EMERGENCY RESCUE SERVICE	911
POLICE DEPARTMENT	911
NATIONAL RESPONSE CENTER	1-800-424-8802
POISON CONTROL CENTER	1-800-732-2200
NORTHWESTERN MEMORIAL HOSPITAL	(312) 908-2000
ILLINOIS DEPARTMENT OF NUCLEAR SAFETY (IDNS) EMERGENCY NUMBER	(217) 785-0600
PROJECT COORDINATOR (Richard Berggreen)	(847) 279-2500
ILLINOIS EMERGENCY MANAGEMENT	(217) 782-7860
USEPA REGION 5 24-HOUR EMERGENCY NUMBER	(312) 353-2318

1.0 SCOPE OF PLAN

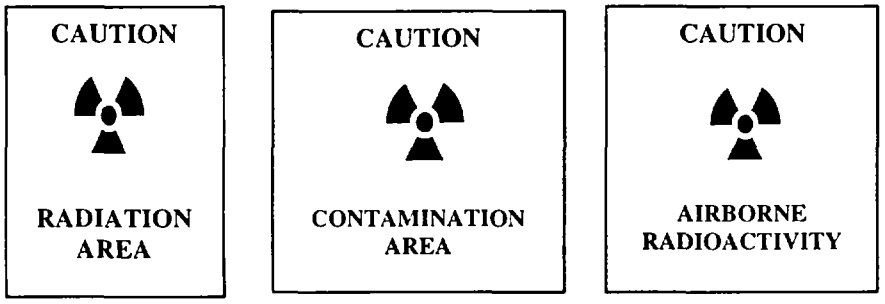
The following Health and Safety Plan (HASP) will be utilized and modified as necessary in order to minimize and prevent exposures to hazardous substances and conditions related to all excavation and restoration activities at the GMO site (Site). All personnel assigned to this project will be required to review thoroughly the contents of the HASP and to strictly adhere to the policies and procedures listed herein. This HASP is for use only by the Teachers' Retirement System of the State of Illinois (TRS) their designated contractors and consultants, and approved Site visitors. USEPA, and other agencies, are not considered visitors and will be required to conform to their own Health and Safety Plans.

This plan meets the requirements of OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and applicable subparts of OSHA 29 CFR 1926, 1910 and 10 CFR. Visitors will be required to review the health and safety plan and read and sign the visitor information sheet (Figure 1.1).

FIGURE 1.1
VISITOR INFORMATION SHEET

NOTICE TO VISITOR: ALL VISITORS MUST BE ESCORTED AT ALL TIMES WHILE ON THIS SITE.

CAUTON. Radioactive materials may be present on this site. Radioactive materials may be found throughout the site. Grounds, buildings and equipment have low levels of contamination.



CONTROLLED AREAS: Do not enter areas with these signs unless you have an escort or health physics has given specific approval and you understand access limitations.

You must wear protective clothing in controlled areas. Health physics will provide you with instructions.

You must wear a personal radiation dosimeter if you enter an area which is controlled.

No smoking, eating, drinking or chewing in controlled areas.
NO EXCEPTIONS.

.Notify Health Physics if you do not understand these instructions.

Figure 1.1

2.0 SAFETY MANAGEMENT

The following safety management structure, Figure 2.1, will be utilized for the implementation, administration, and monitoring of the HASP.

2.1 Health and Safety Coordinator

The Health and Safety Coordinator (HSC), Mr. Keith Carlson, shall assume overall responsibility for the HASP. The HSC or designee shall monitor and maintain quality assurance of the HASP until project completion. Principal duties of the HSC include:

- Review project background data,
- Approve all HASP modifications,
- Administer and enforce the HASP,
- Evaluate the adequacy of personal protective equipment (PPE) to be used by Site personnel,
- Conduct required on-site training except tailgate safety meetings that will be conducted by the Field Team Leader (Mr. Dumas Guerrier),
- Brief visitors on work Site conditions, and
- Administer personnel and perform ambient air monitoring procedures.

The HSC or designee has the authority to stop work in the event conditions develop which pose an unreasonable risk to Site personnel or persons in the vicinity.

PROJECT MANAGEMENT ORGANIZATION CHART

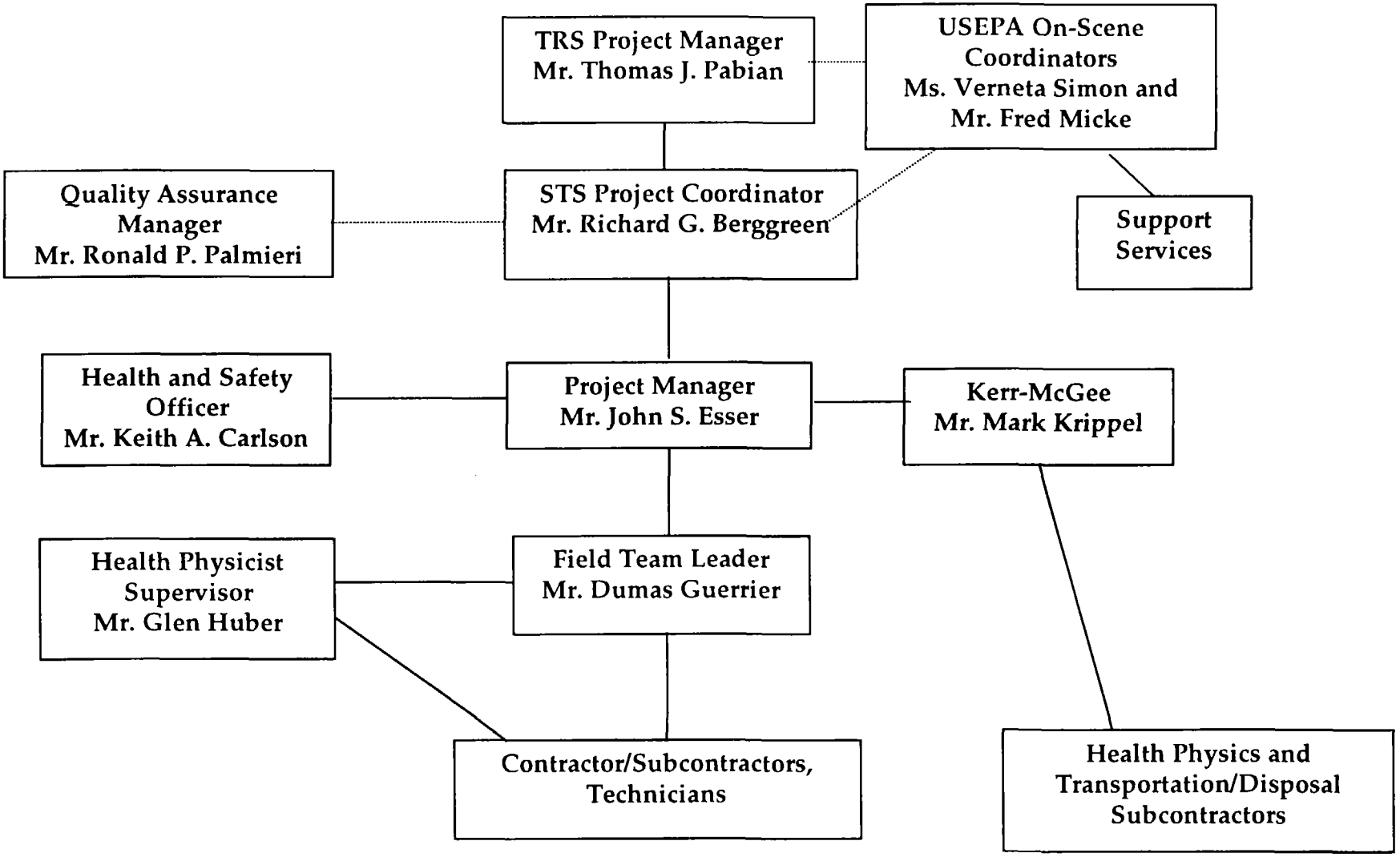


Figure 2-1

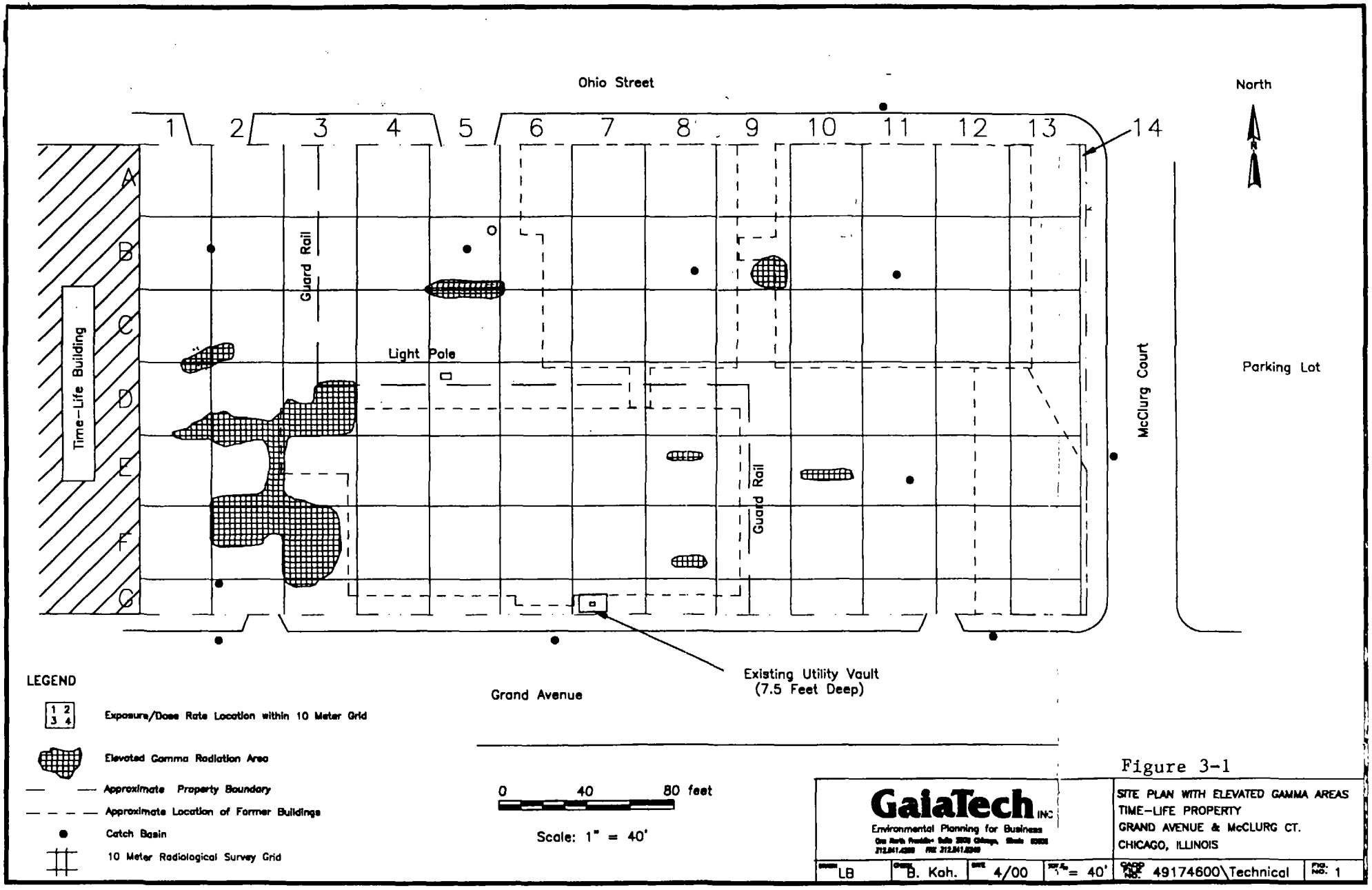
3.0 PERSONNEL RESPONSIBILITIES

The HSC or designee will administer and supervise the HASP at the work-site level. He will monitor all operations and will be the primary on-site contact for health and safety issues, and will have full authority to stop operations if conditions are judged to be hazardous to on-site personnel or the public.

The HSC will brief all Site personnel on the contents of the HASP. Personnel will be required to review the HASP, and have the opportunity to ask questions about the planned work or hazards. The Field Team Leader, Mr. Dumas Guerrier, will conduct tailgate safety meetings to familiarize the Site personnel with Site conditions, boundaries, and physical hazards. Site personnel will conduct their assigned tasks in accordance with the HASP at all times. As necessary, the Field Team Leader will conduct radiation training and provide briefings on radiation issues that arise during construction. These activities will take place as part of the tailgate safety meetings, or during special meetings to address more immediate concerns, dependent on the issues being addressed.

If at any time Site personnel observe unsafe conditions, faulty equipment or other conditions which could jeopardize personnel health and safety, they are required to immediately report their observations to the HSC or Field Team Leader.

Work zones will be established at the Site. These zones include clean/support zones, decontamination zones, and exclusion zones. Known impacted areas where exclusion zones are to be established during the removal effort are shown on Figure 3.1. Although the clean/support zones are anticipated to remain fixed, other zones will move about the Site as excavation work progresses.


Ohio Street
North
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E
F
G
Time-Life Building
Guard Rail
Light Pole
Guard Rail
McClurg Court
Parking Lot
Existing Utility Vault
(7.5 Feet Deep)
Grand Avenue
LEGEND
Exposure/Dose Rate Location within 10 Meter Grid
Elevated Gamma Radiation Area
Approximate Property Boundary
Approximate Location of Former Buildings
Catch Basin
10 Meter Radiological Survey Grid
0
40
80 feet
Scale: 1" = 40'
GaiaTech INC
Environmental Planning for Business
SITE PLAN WITH ELEVATED GAMMA AREAS
TIME-LIFE PROPERTY
GRAND AVENUE & McCLURG CT.
CHICAGO, ILLINOIS
LB
B. Koh.
4/00
1" = 40'
49174600\Technical
1

Figure 3-1

4.0 HAZARD ASSESSMENT

The following represents potential hazards associated with this project.

4.1 Principal Contaminants (Known or Suspected)

Radioactive Contamination

- Thorium: the entire thorium (Th-232) decay chain
- Uranium: the entire uranium (U-238) decay chain
- Radium: Ra-226 and Ra-228
- Radon: Rn-220 and Rn-222

The known total radium concentration present in the soil exceeds 3000 pCi/g for some locations within the project site. The following primary routes of entry to the body will be considered:

ROUTE	ENTRY MADE VIA:
Inhalation	Airborne dust containing heavy metal radionuclides and radon.
Ingestion	Airborne dust containing heavy metal radionuclides/contaminants.
	Improper or poor personal hygiene practices.
Eye and Skin	Direct contact with contaminants.
	Improper or poor personal hygiene practices.
	Airborne dust containing heavy metal/radionuclide contaminant.
	Cuts and abrasions.
Direct Exposure	Penetrating gamma radiation in air and soil.
	Exposure to X-rays.

Chemical Contamination

- Chlordane and Related Pesticides

Chlordane was formerly used as an insecticide. It is a persistent organochlorine compound that was banned by the EPA in 1990. Exposure to high concentrations of chlordane via inhalation, ingestion and skin contact is hazardous. Chlordane is a suspect carcinogen. Actual chlordane hazard on this site is considered low because of its concentration in the soils and low vapor pressure (0.00001 mmHg).

The use of personal protective equipment, proper procedures and dust suppression activities will minimize any hazard to site personnel from either the elevated radioactivity or chlordane contamination. Specific safety procedures will be covered in subsequent sections of this Site Safety Plan.

Route	Entry Made Via
Inhalation	Airborne dust
Ingestion	Airborne dust
	Improper or poor personal hygiene
Skin and Eye	Direct contact with contaminated soil
	Improper or poor personal hygiene
	Airborne dust
	Cuts and abrasions

4.2 Physical Hazards

Before field activities begin, the HSC will conduct a Site reconnaissance to identify any real or potential hazards created from Site activities. Physical hazards inherent to construction activities and power-operated equipment may exist.

4.2.1 Heat Stress

Field activities in hot weather create a potential for heat stress. The warning symptoms of heat stress include fatigue; loss of strength; reduced accuracy, comprehension and retention; and reduced alertness and mental capacity. To prevent heat stress, personnel shall receive adequate water supplies and electrolyte replacement fluids, and maintain scheduled work/rest periods.

The Field Team Leader or designee shall continuously visually monitor personnel for signs of heat stress. In addition, field personnel will be instructed to observe for symptoms of heat stress and methods on how to control it. One or more of the following control measures can be used to help control heat stress.

- Provision of adequate liquids to replace lost body fluids. Employees must replace body fluids lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst, 12 to 16 ounces every half-hour is recommended. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement. Replacement fluids can be commercial mixes such as Gatorade.
- Establishment of a work regimen that will provide adequate rest periods for cooling down. This may require additional shifts of workers.
- Breaks should be taken in a cool and shaded rest area (77 degrees is best).
- Employees shall remove impermeable protective garments during rest periods.

- Employees shall not be assigned other tasks during rest periods.

- All employees shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

4.2.2 Cold Stress

Field activities are anticipated during cold weather during a period when temperatures average below freezing. The following guidelines will be followed.

Persons working outdoors in temperatures of 40 degrees and below may suffer from cold exposure. During prolonged outdoor periods with inadequate clothing, effects of cold exposure may even occur at temperatures well above freezing. Cold exposure may cause severe injury by freezing exposed body surfaces (frostbite) or result in profound generalized cooling, possibly causing death. Areas of the body which have high surface area-to-volume ratios such as fingers, toes and ears are the most susceptible to frostbite.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10° F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when external chemical-protective equipment is removed if the clothing underneath is perspiration-soaked.

Local injury resulting from cold is included in the generic term "frostbite". There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite: Characterized by sudden blanching or whitening of skin.
- Superficial frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite: Tissues are cold, pale, and solid; extremely serious injury.

Prevention of frostbite is vital. Keep the extremities warm. Wear insulated clothing as part of one's protective gear during extremely cold conditions. Check for symptoms of frostbite at every break. The onset is painless and gradual - you might not know you have been injured until it is too late.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in water 95° to 100°F. Give individual a warm drink - not coffee, tea, or alcohol. The victim should not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws; then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

4.2.3 Electrical Hazards

Overhead power lines, downed electrical wires, buried cables and improper use of electrical extension cords can pose a danger of shock or electrocution. All Site personnel should immediately report to the Field Team Leader any condition that could result in a potential electrical hazard.

The Field Team Leader will notify Site personnel during the safety meetings of the locations of known underground cables and utilities.

4.2.4 Noise Hazard

Operation of equipment may present a noise hazard to workers. Site personnel will utilize hearing protection when noise levels are determined to be in excess of 29 CFR 1910.95 requirements. Noise monitoring will be performed by the HSC as needed.

4.2.5 Overt Chemical Exposure

Typical response procedures include:

SKIN CONTACT:
Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eye wash will be provided on-site at the work zone and support zone as appropriate. If affected, eyes should be continuously flushed for a minimum of 15 minutes.

INHALATION:
Move to fresh air and transport to hospital. Decontaminate as other actions permit.

INGESTION:
Transport to emergency medical facility. Decontaminate as permitted by other requirements.

PUNCTURE WOUND OR LACERATIONS:
Transport to emergency medical facility. Field Team Leader will provide chemical safety information to medical personnel as requested. Decontaminate as permitted by other requirements.

4.2.6 Adverse Weather Conditions

In the event of adverse weather conditions, the Field Team Leader will determine if work can continue without endangering the health and safety of field workers. Some items to be considered before determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions.
- Limited visibility.
- Potential for electrical storms or high winds.

4.3 Medical Evaluation and Surveillance Program

All field project personnel shall receive a medical evaluation in accordance with 29 CFR 1910.120. Personnel who receive a medical evaluation will be notified by the medical contractor as to the outcome of their evaluation. This will be in the form of a confidential report addressed to the individual and will contain a breakdown of the clinical findings. In addition, it will indicate any areas of concern which would justify further medical consultation by the individual's personal physician. In the event that the areas of concern are of a severe nature, a follow-up notification will be made to the individual by the medical consultant to answer any questions the employee may have.

4.3.1 Dosimetry/Personnel Monitoring

All project personnel shall participate in a dosimetry program administered by the HSC. (The dosimetry program shall comply with 32 IAC 340[1] , i.e. dosimeters shall be processed by a dosimetry processor accredited by the National Voluntary Laboratory Accreditation

[1] The IDNS regulations are usually more restrictive than US Nuclear Regulatory Commission (NRC) regulations. However, if there is a conflict between IDNS and NRC regulations, the NRC regulations will be used to determine compliance.

Program.) The HSC shall maintain records of all radiation exposures incurred by field personnel including all contractors. These records will be maintained in an up-to-date manner to comply with the requirements of 32 IAC 340.4010. The HSC shall review the results of personal exposure monitoring to determine compliance with exposure limit requirements.

4.3.2 Requirement for Dosimetry

Personal dosimetry is required for anyone who enters a radiologically controlled area in which he/she may receive in one calendar year a dose in excess of 10% of the limits in 32 IAC 340. Any person who works in a radiation area will be required to have a personal dosimeter. As a matter of policy, all individuals shall be required to use a dosimeter (either self-reading type, film badge or Thermoluminescence Detector (TLD)) whenever they enter the Exclusion Zone.

4.3.3 Bioassay

Bioassay is the determination of the types and amounts of radioactive materials, which are inside the body. By analyzing the rate of deposition, the rate of excretion, and any other available information regarding placement in the body, internal exposures from radioactive materials can be estimated.

Procedures for bioassay will be consistent with the previous Lindsay Light Health and Safety Plan. Bioassays are not anticipated to be required for the excavation and removal activities proposed, based on levels documented as present.

The decision to use bioassay shall be made by the Health and Safety Coordinator. In the event that a worker has an excessive intake or the potential to receive greater than 10% of the Annual Limit on Intake (ALI) , bioassay shall be ordered. Data from Lapel Air Samplers

shall be used as a factor in determining whether or not bioassay is warranted. If workers are found to have been present in locations where airborne radioactivity concentrations are found to be greater than 30% of the Derived Air Concentration, bioassay will be considered.

4.3.4 Emergency Medical Treatment

Emergency first aid should be administered on-site as appropriate. The individual should be decontaminated if possible, depending on the severity of the injury, and transported to the nearest medical facility, if needed. Treatment of the injury is of primary concern and decontamination a secondary concern. Levels of radioactive contamination at the Site could be acutely hazardous if decontamination is not undertaken during an emergency situation. The Field Team Leader will complete the appropriate incident report, if warranted. See Section 4.4, Accident and Incident Reporting.

An emergency first-aid station will be established and will include a first-aid kit for onsite emergency first aid.

Provisions for emergency medical treatment shall be integrated with the following guidelines:

- At least one individual qualified to render first aid and Cardiopulmonary Resuscitation (CPR) will be assigned to each shift.
- At least one individual trained in radiation emergency response will be assigned to each shift
- Emergency first aid stations in the immediate work vicinity.
- Conspicuously posted phone numbers and procedures for contacting ambulance services, fire department, police, and medical facilities.
- Maps and directions to medical facilities.

- Conspicuously posted evacuation routes and gathering area locations shall be posted around the Site.

4.4 Accident and Incident Reporting

All accidents, injuries, or incidents will be reported to the HSC. This accident/incident will be reported as soon as possible to the employee's supervisor. An Accident/Incident Form will be completed by the Field Team Leader, and a copy will be forwarded to the STS Project Manager. A copy of the form is shown as Figure 4.1.

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

COMPANY		DATE	
INVESTIGATION TEAM			
EMPLOYEE'S NAME & ID			
SEX	AGE	JOB DESCRIPTION	
DEPARTMENT & LOCATION			
ACCIDENT DATE & TIME			
DATE & TIME ACCIDENT REPORTED TO SUPERVISOR			
NATURE OF INCIDENT			
NATURE OF INJURY			
REFERRED TO MEDICAL FACILITY/DOCTOR ☐ YES ☐ NO			
EMPLOYEE RETURNED TO WORK ☐ YES DATE/TIME _____ ☐ NO			
☐ INJURED EMPLOYEE INTERVIEW/STATEMENT - ATTACHED			
WITNESSES			
☐ WITNESSES INTERVIEWS/STATEMENTS ATTACHED			
☐ PHOTOGRAPHS OF SITE - ATTACHED			
☐ DIAGRAMS OF SITE - ATTACHED			
EQUIPMENT RECORDS - ATTACHED - REVIEWED	☐ YES	☐ NO	
ACCIDENT/EXPOSURE INCIDENT DESCRIPTION			

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION		
DATE & TIME	LOCATION	
EMPLOYEES INVOLVED		
PREVENTIVE ACTION RECOMMENDATIONS		
CORRECTIVE ACTIONS COMPLETED	MANAGER RESPONSIBLE	DATE COMPLETED
EMPLOYEE LOST TIME - TEMPORARY HELP - CLEANUP - REPAIR - DISCUSSION		
ACCIDENT COST ANALYSIS	INVESTIGATION	COMPLIANCE	TOTAL COST
MEDICAL			
PRODUCTION LOSS			
REPORT PREPARED BY	DATE COMPLETED		
SAFETY COMMITTEE REVIEW	☐ YES	☐ NO	
CORRECTIVE ACTION	DATE STARTED		
SAFETY COMMUNICATION NOTICE PREPARED	DATE		
SAFETY DIRECTOR SIGNATURE			

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION	
DATE & TIME	LOCATION
EMPLOYEES INVOLVED	
EMPLOYEE INTERVIEW/STATEMENT - INJURED EMPLOYEE - WITNESS	
EMPLOYEE NAME	
INTERVIEWED BY	

ACCIDENT DIAGRAM/PHOTOGRAPHS

5.0 TRAINING

All Site personnel shall be trained and certified in accordance with 29 CFR 1910.120.

5.1 Project- and Site-Specific Training

Prior to project start-up, all assigned personnel shall receive an initial project- and site-specific training session. This training shall include, but not be limited to, the following areas:

- Review of the Health and Safety Plan;
- Review of general radiation principles and compounds;
- Review of applicable radiological chemical and physical hazards;
- PPE levels to be used by Site personnel;
- Site security control;
- Emergency response and evacuation procedures;
- Project communication;
- Required decontamination procedures;
- Prohibited on-site activities;
- Instructions to workers in accordance with 10 CFR 1912; and
- U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Woman Policies (Females).

5.2 Visitor Orientation

All non-essential personnel and visitors who plan to enter the exclusion zone will be briefed on the HASP requirements and 10 CFR 1912 requirements prior to entry with a trained Site escort. In addition, female visitors will be instructed regarding U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Woman Policies.

5.3 Safety Tailgate Meetings

Before the start of the work week, on Monday morning, the Field Team Leader will assemble the Site personnel for a brief safety meeting. Additional meetings will be conducted throughout the week, as needed, to address safety concerns and precautions. The purpose of these meetings will be to discuss project status, problem areas, conditions, safety concerns, PPE levels and to reiterate HASP requirements. The Field Team Leader will complete a Safety Meeting Report (Figure 5.1) to indicate the contents of the meeting and the attendees.

5.4 First Aid

At least one (1) individual, trained and qualified to administer first aid and CPR in accordance with American Red Cross requirements, who is also trained in radiological response, will be present at the Site.

5.5 Safe Work Permit

Site workers in special work conditions such as confined space, hot work, trenching, or other physical hazards, must be skilled at such work and trained to recognize these as special work conditions. Confined space is defined by OSHA 1910.146. Section 13 of this HASP contains further information on the confined space program to be followed.

Figure 5.2 shows the Safe Work Permit to be completed by the HSC and signed by workers for special work conditions.

Figure 5.3 show the issues which will be addressed in the event soil is encountered which exhibits low level contamination. The potential low level contamination includes the presence of chlorinated pesticides, possible residual petroleum products from an existing or former underground storage tank or other source of fuel or polynuclear aromatics (PNAs) contamination, such as tar, cinders, or coal ash.

FIGURE 5.1
SAFETY MEETING REPORT (Page 1 of 2)

DATE		DURATION OF MEETING	
		FROM: ☐ A.M. ☐ P.M.	TO: ☐ A.M. ☐ P.M.
NUMBER PRESENT	NUMBER ABSENT	MEETING CONDUCTED BY	DID MEETING INCLUDE REQUIRED TRAINING? ☐ YES (DESCRIBE BELOW) ☐ NO

HEALTH AND SAFETY COORDINATOR'S PRESENTATION	DISCUSSION OF SAFE/UNSAFE WORK PRACTICES, MATERIALS, PRECAUTIONS, HAZARDS, EQUIPMENT FAMILIARIZATION, ETC.
SITE WORKER FEEDBACK	COMMENTS, QUESTIONS, COMPLAINTS, ETC.
HEALTH AND SAFETY COORDINATOR'S CORRECTIVE ACTION PLAN	KNOWN PLANS FOR CORRECTION, PARTS ON ORDER, ITEMS TO BE DISCUSSED WITH DEPART. HEAD, AND CORRECTION OF ITEM PREVIOUSLY SUBMITTED
PROJECT MANAGER'S COMMENTS	RESOLUTION OF QUESTIONS, ITEMS OR ISSUES RAISED IN MEETING OR WITH SUPERVISOR

HEALTH AND SAFETY COORDINATOR	PROJECT MANAGER
FIELD TEAM LEADER	HAVE SITE WORKERS ATTENDING SIGN ON REVERSE SIDE. FORWARD A COPY TO THE PROJECT COORDINATOR

FIGURE 5.1

SAFETY MEETING REPORT (PAGE 2 OF 2)

TO BE SIGNED BY ALL SITE WORKERS ATTENDING THE MEETING

I HAVE RECEIVED AND UNDERSTAND THE INFORMATION AND/OR TRAINING INDICATED ON THE REVERSE SIDE.

SIGNATURE	DATE	SIGNATURE	DATE

LIST ALL SITE WORKERS ABSENT FROM THE MEETING	

FIGURE 5.2
SAFE WORK PERMIT (Page 1 of 2)

COMPLETED PERMIT MUST BE POSTED AT THE ENTRY OR WORK SITE.

ISSUED BY	DATE	TIME (FROM) ☐ A.M. ☐ P.M.	TIME (TO) ☐ A.M. ☐ P.M.
ACCEPTED BY		RESPONSIBILITY TRANSFERRED TO (NAME)	
LIST ALL WORKS (ON BACK) OR ATTACH ROSTER			

SECTION 1 — GENERAL AREA WORK PERMIT

1. WORK LIMITED TO THE FOLLOWING: (DESCRIPTION AND AREA/EQUIPMENT)

2. SAFETY EQUIPMENT (OTHER THAN AREA REQUIREMENTS) ☐ NONE

☐ RAIN SUIT	☐ GLOVES	☐ FACE SHIELD	☐ GROUND FAULT CIRCUIT INT.	☐ AIR PACK (SCBA)	☐ FIRE RESISTANT CLOTHING
☐ CHEMICAL SUIT	☐ HEARING PROTECTION	☐ HOOD	☐ BARRICADES/WARNING SIGN	☐ SUPPLIED AIR	☐ LONG SLEEVES
☐ RUBBER BOOTS	☐ CHEMICAL GOGGLES	☐ FALL RESTRAINT DEVICE	☐ COMMUNICATIONS EQPT (EST)	☐ RESPIRATOR	☐ OTHER

3. THE PERSON RECEIVING THE PERMIT VERIFIES THAT ALL WORKERS:

A. HAVE BEEN THROUGH THE SAFETY ORIENTATION	☐ YES	E. KNOW THE LOCATION OF THE PHONE OR INTERCOM	☐ YES
B. UNDERSTAND APPLICABLE HAZCOM AND RADIATION REQUIREMENTS	☐ YES	F. KNOW THE PROCEDURES FOR SAFE JOB COMPLETION	☐ YES
C. HAVE DISCUSSED HAZARDS OF THE JOB AND AREA	☐ YES	G. HAVE INSPECTED ALL TOOLS/EQUIPMENT	☐ YES
D. KNOW THE LOCATION/USE OF SAFETY EQUIPMENT	☐ YES	H. UNDERSTAND THE CLEAN UP REQUIREMENTS	☐ YES

PERMIT RECEIVER INITIALS _____

4. POTENTIALLY AFFECTED AREA PERSONNEL AND WORKERS NOTIFIED OF WORK TO BE DONE ☐ YES ☐ N/A

5. THE FOLLOWING RESPONSIBILITIES HAVE BEEN COMMUNICATED TO THE PERSON RECEIVING THIS PERMIT:

☐ CONDITIONS FOR WORK STOPPAGE	☐ PERFORMING THE WORK SAFELY	☐ COMPLETION OF SECTION 6 AND PERMIT RETURN
☐ CREW ACCOUNTABILITY	☐ REPORTING CHANGES THAT AFFECT JOB SAFETY	

SECTION 2 — AIR TESTS

PRIOR TO ENTRY OR HOT WORK ☐ DOES NOT APPLY

TEST IN ORDER INDICATED

1. OXYGEN METER TEST PERFORMED	☐ YES ☐ N/A	READING	%O_2	RANGE 19.5-23.5% O_2	TESTED BY	LOCATION OF TEST	TIME	☐ AM ☐ PM
2. COMBUSTIBLE GASES AND VAPORS TEST	☐ YES ☐ N/A	READING	%LEL	MAXIMUM 10% LEL	TESTED BY	LOCATION OF TEST	TIME	☐ AM ☐ PM
3. TESTS FOR TOXICS	☐ YES ☐ N/A	READING	☐ PPM ☐ MA/M³	PEL/TLV ☐ PPM ☐ MA/M³	TESTED BY	LOCATION OF TEST	TIME	☐ AM ☐

SECTION 3 — HOT WORK

☐ DOES NOT APPLY

	YES	N/A		YES	N/A
1. FIRE EXTINGUISHER (TYPE) _____ IS IT FULL?			8. GROUND LEAD ATTACHED TO WORK		
2. SURVEY AREA FOR COMBUSTIONS AND OPENINGS, HOSES, TRENCHES, ETC.			9. PREVENTION OF HEAT EXPOSURE TO GASKET, SEALS, LINERS		
3. COMBUSTIBLE MATERIALS REMOVED OR PROTECTED			10. OTHER WORK IN AREA WHICH SHOULD BE STOPPED		
4. HEAT/SPARK CONTROL - TARPS, COVERS, WATER, ETC.			11. MATERIAL PRESENT WHICH EMITS VAPOR WHEN HEATED		
5. PRECAUTION TAKEN FOR HIDDEN COMBUSTIBLES			12. RADIANT HEAT TRANSFER CONSIDERED		
6. PURGE GAS USED TYPE _____			13. EQUIPMENT OPERATING OR CONTAINS ORIGINAL CONTENTS		
7. ADJACENT AREAS SAFE/SEWERS PROTECTED			14. DUCTS OR CONVEYORS PLUGGES OR PROTECTED		

SECTION 4 — CONFINED SPACE

☐ DOES NOT APPLY

	YES	NO	N/A		YES	NO	N/A
1. CONFINED SPACE ENTRY REQUIRED?				5. HAVE AUTHORIZED ENTRANTS SIGNED OPPOSITE SIDE OF THIS FORM?			
2. SPACE TO BE ENTERED _____				6. HAVE DESIGNATED ATTENDANTS SIGNED OPPOSITE SIDE OF THIS FORM?			
3 PURPOSE OF ENTRY _____				7. HAVE ALL NECESSARY HAZARD CONTROL MEASURES BEEN TAKEN?			
4. IS SPACE A PERMIT-ENTRY SPACE? IF YES, COMPLETE OPPOSITE COLUMN				8. HAS ALL REQUIRED EQUIPMENT BEEN PROVIDED?			
	YES	NO	N/A		YES	NO	N/A

SECTION 5 — TRENCHING/EXCAVATION

☐ DOES NOT APPLY

1. HAS THE AREA BEEN INSPECTED FOR UNDERGROUND POWER LINES OR PRODUCT LINES?				4. HAVE PRECAUTIONS BEEN TAKEN IF THE TRENCH/EXCAVATION DEVELOPS INTO A CONFINED SPACE?			
2. DOES THE TRENCH REQUIRE SHORING/BRACING/SUPPORT?				5. HAVE OVERHEAD POWER/PRODUCT LINES BEEN REMOVED OR IDENTIFIED?			
3. HAS THE SOIL BEEN EVALUATED FOR STABILITY?				6. WILL LEAKING WATER OR RAIN WATER AFFECT THE STABILITY OF THE TRENCH/EXCAVATION?			

SAFE WORK PERMIT (Page 2 of 2)

SECTION 6			YES	NO	N/A		YES	NO	N/A
	QUESTIONS TO BE COMPLETED ON PERMIT EXPIRATION OR JOB COMPLETION.	1. HAS THE JOB BEEN COMPLETED?				5. HAVE SAFETY DEVICES BEEN REINSTALLED?			
	WORKER CLOSEOUT SIGNATURE	2. HAS THE AREA BEEN CLEANED OF WORK MATERIAL?				6. HAS HOT WORK AREA BEEN SURVEYED FOR SMOLDERING MATERIALS?			
	TIME ☐ AM ☐ PM	3. HAVE MANAGEMENT PERSONNEL BEEN INFORMED JOB IS DONE?				7. SPECIAL PRECAUTIONS, CONCERNS OR REMARKS			
		4. HAVE ALL LOCKS AND/OR TAGS BEEN REMOVED?				COMMENTS:			

OBSERVERS, WATCHERS, RESCUERS	I HAVE BEEN INSTRUCTED AS A CONFINED SPACE ATTENDANT, SAFETY WATCHER OR RESCUER AND UNDERSTAND MY DUTIES.			
	SIGNATURE	DATE	SIGNATURE	DATE

PERSONS AUTHORIZED TO PERFORM WORK AND/OR TO ENTER CONFINED SPACE	I HAVE BEEN INSTRUCTED IN AND AM AWARE OF THE POSSIBLE HAZARDS AND CONDITIONS I MAY ENCOUNTER IN THIS ENTRY WORK							
	SIGNATURE	TIME		DATE	SIGNATURE	TIME		DATE
		IN	OUT			IN	OUT	

COMMENTS	

AUDIT PURPOSE ONLY	

CORRECTIVE ACTIONS	

COMPLETED BY	NAME	TITLE	DATE

FIGURE 5.3
SITE SAFETY PLAN
LOW CONTAMINATION OF FUEL,
CHLORINATED PESTICIDES AND PNAs IN SOILS

SUMMARY INFORMATION

DATE: _____ UPDATE: _____

PROJECT NAME: _____ PROJECT NO: _____

LOCATION: _____

SITE CONTACT AND PHONE NUMBER: _____

TYPE OF FACILITY: (active or inactive - describe previous use, previous agency action, soil type, topography, surrounding community)

PLAN PREPARED BY: _____

SITE SAFETY OFFICER: _____ CPR/FIRST AID TRAINED STAFF: _____

REVIEWED BY: _____ DATE: _____

WORK SCOPE/CONSTRUCTION/INVESTIGATION
Task 1 _____
Task 2 _____
Task 3 _____

PROPOSED START DATE: _____

UNUSUAL FEATURES/SITE SECURITY (include site map): _____

UTILITIES: ☐ Marked ☐ Scheduled Meet Date _____ Time _____

ANALYTICAL DATA (to be summarized below or attached, if available)

_____

_____

CONFINED SPACE: ☐ Yes ☐ No (If yes, describe and address permitting and entry procedures in an attachment.) _____

_____

AIR MONITORING:
Monitoring equipment: HNu meter with 10.2 eV lamp or _____
Action level = 15 PID units in breathing zone for Level C upgrade. Stop work = 50 PID units in breathing zone.
☐ 0_2 meter, ☐ FID, ☐ Detector tubes, ☐ L.E.L. meter, ☐ Other _____

Other action levels: _____

PERSONAL PROTECTION: Level of Protection: ☐ A ☐ B ☐ C ☐ D
Special Requirements _____

COMMUNICATION EQUIPMENT: (Mobile Phone or other phone location and number, etc.)

_____

Scheduled Safety Meetings Interval: (daily, weekly, as needed)

SPECIAL SITE EMERGENCY COMMUNICATION PROCEDURES: (Evacuation signals, routes, spill containment)

HEAT/COLD STRESS CONTROLS:

SPECIAL PHYSICAL HAZARD CONTROLS: Barricades for work area, reflective vests, other, etc.

_____

LOCAL EMERGENCY RESOURCES and telephone numbers
Emergency Eye Wash/Shower Location:
Fire Extinguisher: _____
Police: _____
Fire Department: _____
Poison Control: _____
HOSPITAL: _____
Address: _____
Telephone: _____
Directions (supply map): _____

_____

EMERGENCY CONTACTS (name and phone number)
1. Construction Manager Contact: _____
2. Owner Contact: _____
3. Contractor Contact: _____
4. Subcontractor Contact: _____
5. Subcontractor Contact: _____
6. _____
7. _____

PRE-ENTRY SAFETY BRIEFING
I have received and read the _____ Low Contamination Health and Safety Plan. I understand the plan and had the opportunity to ask questions. I understand the information and instructions in the plan. I understand that medicine can complicate the effects from exposure to toxic chemicals. If I am taking any prescription or over the counter medicine or have a current medical condition which may increase my risks, I will advise my supervisor or Site Safety Officer.

Signature	Responsibility	Date

6.0 COMMUNICATIONS

6.1 General Communications

The Field Team Leader will have available at the Site the means for telephone communications, or an equivalent means of communication, for summoning emergency assistance from the fire/ambulance and police departments in the event they are required. The telephone will also act as a direct link to technical personnel for information pertaining to all phases of the project.

6.2 Radio/Telephones

Short-range walkie-talkies or cellular telephones will be made available to designated personnel working at the Site.

6.3 Emergency Warning

In the event of an emergency condition, the Field Team Leader will notify project personnel verbally if all are within immediate hearing and via a bullhorn if the Site area is large. The Field Team Leader will also notify visitors present within the area. Site personnel will immediately proceed to a pre-designated assembly area as designated by the Field Team Leader during the daily safety meeting. Personnel will remain in the designated area until further instructions are received by the Field Team Leader.

All communication equipment will be tested at the beginning of each day to verify operational integrity.

6.4 Hand Signals

Hand signals will be used by field teams in conjunction with the buddy system. Hand signals shall be familiar to the entire field team before operations commence and should be reviewed during site-specific training.

Signal	Meaning
Hand gripping throat	Out of air; can't breathe
Grip partner's wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm all right; I understand
Thumbs down	No; negative

6.5 Site Security

Only authorized personnel will be permitted on the Site in accordance with the requirements of the Site Security Plan (Appendix 6 to the Removal Action Work Plan) and this HASP. Visitors and other non-essential personnel may enter the work area only upon authorization by the Field Team Leader. This restricted access will ensure that the Field Team Leader can communicate with each person authorized to enter the work area.

7.0 PERSONNEL EXPOSURE AND AIR QUALITY MONITORING

7.1 Air Quality (Dust)

Due to the nature of the principal contaminants associated with the project (radiation and chlordane), dust suppression will be important as a means of minimizing exposure levels and off-site migration of contaminants. A key control measure to minimize exposure levels and off-site migration of contaminants will be a policy of "no visible dust". The Field Team Leader will routinely monitor the project area. Acceptable dust levels (controlling all visible dust) will result in airborne dust levels of less than 1 mg/m^3. The OSHA nuisance dust standard of 15 mg/m^3 is not acceptable at this site, because of contaminants in the dust.

7.2 Airborne Radioactivity Monitoring

Monitoring for airborne radioactivity exposure is as important as monitoring for external radiation exposure. Monitoring for airborne radioactivity exposure requires the following elements:

- Air sampling for radioactive particulates,
- Recordkeeping regarding personnel work locations and time in location,
- Respiratory protective equipment records regarding devices used by workers in airborne radioactivity areas,
- Counting and analyzing air sample filters,
- Calculating air concentrations of radioactive material, and
- Comparing air concentrations to applicable air quality criteria

By closely monitoring these three elements, a continuous record of personnel exposure to airborne radioactivity is maintained.

Lapel samplers worn for personal air monitoring shall be utilized for airborne radioactivity monitoring any time a worker enters a radiological exclusion zone. The filters from the lapel samplers shall be analyzed the following day after use for comparison purposes to assess the need for procedural changes. It is expected that naturally occurring radon and thorium daughters will interfere with analyses. Additional evaluation of samples shall be performed when determined necessary based upon elevated results. If sample analysis shows concentrations greater than background levels a follow-up analysis shall be performed. The follow-up analysis shall be performed after four days to allow for the decay of the thoron daughter Pb-212 (10.6 hour half life). The "four day count" should be free from radon daughter interference and will serve as the official measurement of Th-Alpha.

High volume air samplers shall be utilized so that effluent air quality can be gathered on a daily basis. High volume air sampling allows for much shorter collection times than low volume sampling and has equivalent dust loading for needed collection durations. Both high and low volume air samplings require a sufficient volume of air to be collected in order for the Minimum Detectable Activity (MDA) to be below the most restrictive air effluent guidelines. Daily analysis of samples will allow for necessary procedural changes to be made and alert health and safety staff to potential problems on a continuous basis, rather than once per week.

Time decay of interfering nuclides generally refers to radon-222 decay and daughters but may also include thoron decay. The specific times for decay of samples are best addressed in procedures rather than in the health and safety plan.

After filters have been collected and decayed overnight, there will be a morning count of the filter that will serve to identify high gross counts for the previous day. This will alert health and safety staff of a potential problem which they can investigate more promptly. The count, after 4 days decay, will serve to be the official measurement of Th-Alpha.

7.3 Internal Monitoring

Internal monitoring to determine intakes of radioactive material will be performed as needed based upon the results of the air sampling program. Bioassay methods to be considered should include in-vivo, as well as in-vitro, assessments. Routine bioassay of workers is not anticipated based upon the low concentrations of radioactivity in soils to be excavated.

7.4 External Radiation Monitoring

External radiation monitoring of workers will be performed using film badges or thermoluminescent dosimeters. Dosimetry will be provided and processed by a service holding National Voluntary Laboratory Accreditation Program (NVLAP) certification. Pocket dosimeters may also be utilized for visitors and other infrequent personnel requiring access to the Site.

7.5 Radiological Surveys

Radiological surveys will be performed to ensure that radiation levels and contamination levels are within applicable guidelines for workers and the general public. Radiation surveys will be performed using the following instrumentation:

- Ludlum Model 2221 Portable Scaler/Ratemeter with 2"x2" NaI probe (or equivalent). This instrument will be used to conduct surface soil scans. Instrument specific action levels shall be used to determine approximate radiological soil concentrations. Any areas where the count rate is greater than the determined action level shall be considered exclusion zones and marked appropriately.

- Ludlum Model 3 Survey Meter with pancake G-M probe (or equivalent). This instrument will be used to conduct surveillance surveys of both personnel and equipment leaving exclusion zones. The action level for both equipment and personnel surveys is any count rate that exceeds background level. Decontamination procedures detailed in section 9.0 of the HSP will be used when contamination is located.

- Ludlum Model 3 Survey Meter with 1"x1" NaI probe "MicroR meter" (or equivalent) and Eberline Model RO-2 Ion Chamber (or equivalent). These instruments will be used periodically to ensure that dose rates in work areas as well as the Site perimeter are below prescribed levels. The action levels for both on and off site are detailed in Section 7.8 of the HSP in Table 7.1

Airborne radioactivity measurements will be performed as described in the Air Monitoring Plan (Appendix 8 to the Removal Action Work Plan).

7.6 Contamination Monitoring

Samples shall be obtained periodically in work areas to ensure that radioactivity is present at acceptable levels and is prevented from leaving the Site. Decontamination of elevated areas will be performed to maintain contamination at levels that are ALARA.

Before leaving the exclusion zone, Site personnel shall be checked through use of a hand-held frisker to ensure that contamination is not present on skin or clothes. The frisker will be a Ludlum Model 3 survey meter with a pancake G-M probe (or equivalent). The Field Team Leader will be immediately informed regarding any contamination on individuals and will initiate appropriate decontamination techniques. Proper disposition of contaminated personal effects and clothing also will be the responsibility of the Field Team Leader.

7.7 Total Organic Vapor Monitoring

In addition to the radiological contaminants, there is a very slight potential of encountering organic vapors. Thus, no routine screening for organic vapors will be conducted during the removal action. However, if organic odors are encountered during the field work screening for total organic vapors will be conducted with a photoionization detector (PID), or similar type equipment, on a daily basis. The screening will evaluate ambient photoionization volatile organic vapors and some semivolatile organic vapors.

Total organic vapors in ambient air will be obtained periodically with a PID during daily field activities. The PID provides real-time readings of exposure to volatile organics and some semi-volatile organics. Measurements will be made daily, prior to activities, to determine background levels. Monitoring measurements will be taken when:

- operations change,
- work moves to a different portion of the Site, and
- personnel observe contaminated materials.

These screening operations will be used to identify conditions requiring an upgrade to full-face respirators as described in Section 7.8.2.

7.8 Action Levels

7.8.1 Radiological Action Levels

Radiological action levels for on-site workers will be determined by performing surveillance surveys as well as airborne particulate monitoring for the presence of radioactivity. Properly trained Health Physics Technicians will perform radiological monitoring. The radioactive contamination on the Site is particulate and insoluble in water.

Therefore, there will be no fixed contamination on the workers. Action levels as determined by radioactive monitoring can be found in Table 7.1.

To avoid the need for upgrade of personal protection equipment due to airborne contamination, engineering controls such as the use of water to minimize dust levels will be implemented as necessary during excavation and restoration activities.

7.8.2 Organic Vapors Action Levels

STS Consultants, Ltd. is taking a conservative approach to organic vapor monitoring at the Site. A PID will be used to periodically monitor for organic vapors or when odors indicated the possibility of organic contamination. Operations will be discontinued if the PID reads 5 ppm or greater above background and the area will be evacuated. The Site Health and Safety Officer will retest the area wearing a full-face respirator. Operations will not resume until the PID reads less than 5 ppm, and remains below 5 ppm.

TABLE 7-1
ACTION LEVELS AS DETERMINED BY RADIOACTIVITY

Note:

Personnel shall not be exposed to airborne radioactivity such that their weekly intake exceeds 12 Derived Air Concentration (DAC)-hours without prior approval of the Field Team Leader or designee.

Level of protection may be increased to Level C (full-face air purifying respirator) when airborne monitoring indicates that contamination levels have reached 30% of the DAC. All assessments shall incorporate ALARA principles. Engineering controls shall be used prior to assignment of respiratory protective equipment.

Signs shall be posted at entrances to areas where airborne radioactivity levels exceed, or have the potential to exceed, 25% of the DAC.

The most restrictive DAC of the nuclides which may be present onsite is Th-232. The DAC for Th-232 Class W is $5x10^{-13}$ uCi/ml. The air effluent limit is $4x10^{-15}$ uCi/ml. Engineering controls will be utilized so that no visible dust is present and airborne radionuclide concentrations will be kept ALARA.

Radiation Type	Action Level	Level of Respiratory Protection/Action
a. Contamination on smear samples of equipment	33 dpm/100 cm^2 gross alpha	Decontamination required prior to release for unrestricted use.
b. Contamination surveys of personnel or equipment	Count rate greater than background levels	Decontamination required prior to leaving exclusion zone.
c. Airborne Radioactivity	30% DAC[c]	Consider Level C (full-face APR) based upon ALARA evaluation. Ensure proper posting. Consider internal monitoring
d. Ambient Gamma (work areas)	5 mrem/hr[d]	Consider procedures for shielding of soils. Ensure proper posting.
e. Ambient Gamma (off-site areas)	2 mrem/hr[e]	Implement immediate controls to reduce dose equivalent rate.

Notes

(c) Potential Airborne Radioactivity Area as defined in 10 CFR 20. Workers with 1000 DAC-hours per year to date must wear modified Level C (full-face APR) until the end of the calendar year.

(d) The ambient gamma dose equivalent rate action level of 5 mrem/hr stems, from the 10 CFR 20 radiation area definition. If the ambient gamma dose equivalent rate reaches 2 mrem/hr, one or more of the following actions will be implemented: The source may be shielded; the working distance from the source may be increased; or the worker's exposure time may be limited.

(e) The ambient gamma action level for off-site is based upon the 10 CFR 20 requirements to maintain dose equivalent rates in unrestricted areas such that they do not exceed 0.002 rem in any one hour.

8.0 PERSONAL PROTECTIVE EQUIPMENT

It is anticipated that most excavation activities in designated exclusion zones can be conducted in Level D personal protective equipment (PPE), with a contingency upgrade to Level C, based on the action levels listed in Section 7. Level C will be used when required by Special Work Permits, or when directed by the Field Team Leader.

Level D personal protective clothing and equipment for excavation activities includes:

- Coveralls, disposable or washable through a contaminated clothing vendor. Coveralls are to be removed at the boundary of the exclusion zone.
- Hard hat
- Steel toed boots and chemically resistant booties (exclusion zone)
- Cotton or leather gloves (no soil contact); Nitrile gloves (Edmont 37-15 or equivalent) 0.40 mm thickness to be used if hand contact with soils is probable.
- Safety glasses
- Dust mask (optional)

Level C protective clothing and equipment includes:

- Full-face air-purifying respirator (NIOSH/MSHA approved) fitted with radionuclides/HEPA cartridges and/or organic vapor cartridges, depending on which action levels are exceeded (see Section 7 of this HASP)
- Coveralls
- Tyvek coveralls - required in areas when splashing by contaminated soils or water is a possibility
- Nitrile gloves (Edmond 37-15 or equivalent) 0.40 mm thickness
- Disposable latex inner gloves - required in areas when splashing by contaminated soils or water is a possibility
- Nitrile outer gloves (taped) - required in areas when splashing by contaminated soils or water is a possibility
- Steel toe boots with outer chemically resistant booties (taped)
- Hard hat

Action levels used to determine the need to upgrade or downgrade the levels of protection are described in Section 7 of this HASP.

9.0 CONTAMINATION REDUCTION PROCEDURES

9.1 Equipment

Portable equipment will be decontaminated with soap and water and rinsed with tap water. Heavy equipment will be steam-cleaned with water and, if necessary, a detergent solution.

9.2 Personnel

If levels of radioactivity show that individuals can remove coveralls and other personal protective clothing and equipment before leaving the exclusion zone and, thus complete decontamination, the individuals may leave the exclusion zone. If, however, levels of radioactivity show that individuals cannot achieve decontamination by the removal of coveralls and showering is required, they will be dressed in clean coveralls, boots and gloves and be transported to Northwestern Memorial Hospital to complete decontamination.

If substantial skin contamination occurs on an individual working with radioactive materials, the following specific procedures should be followed to prevent fixation of the material in the skin or absorption of the radioactivity through the skin.

> **Immediate Action**: Notify the HSC or Field Team Leader, who will supervise the decontamination. If contamination is spotty, the HSC or Field Team Leader will supervise the cleaning of the individual spots with swabs, soap, or water. If the contamination is general, the HSC or Field Team Leader may recommend washing the area gently in warm or cool water (not hot) using hand soap (not detergent) for one minute. Rinse, dry, and monitor for radioactivity. This soap wash step may be repeated three times.

Evaluation: If the above procedure fails to remove all the skin contamination, the treatment should cease. An evaluation of the skin contamination should be performed by the HSC or Field Team Leader including an estimate of the dose commitment to the skin, and the quantity and identity of the nuclides contaminating the skin If additional decontamination steps are necessary, they are performed and documented by the HSC. The guidelines for Personnel Decontamination in the Radiological Health Handbook, HEW 1970, beginning on page 194, can be used as applicable. **CAUTION**: Do not use chemicals for personnel decontamination until full evaluation of the contamination is made by the HSC or Field Team Leader.

9.3 Contamination Prevention

Work practices that minimize the spread of contamination will reduce worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

- knowing the limitations of all personal protective equipment being used

  avoiding walking through areas of obvious or known contamination
- refraining from handling or touching contaminated materials directly. Do not sit or lean on potentially contaminated surfaces
- ensuring personal protective equipment has no cuts or tears prior to donning
- fastening all closures on suits, covering with tape if necessary
- taking steps to protect against any skin injuries
- staying upwind of airborne contaminants

- When working in contaminated areas, refraining from eating, chewing gum, smoking, or engaging in any activity from which contaminated materials may be ingested

9.4 Disposal Procedures

All discarded materials, waste materials, or other field equipment and supplies should be handled in such a way as to preclude the spread of contamination, creating a sanitary hazard, or causing litter to be left on-site. All potentially contaminated waste materials (e.g., clothing, gloves) shall be monitored and segregated in accordance with monitoring results into either radioactive or non-radioactive waste. Appropriate labels shall be affixed to all containers of radioactive materials.

10.0 GENERAL WORK PRECAUTIONS

10.1 General Work Precautions

The following general work precautions apply to all Site personnel.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the work area.
- Hands and face must be thoroughly washed upon leaving the work area. Wash water will be provided at the Site for this purpose.
- Whenever levels of radioactivity warrant, the entire body should be thoroughly washed, as soon as possible, after the protective coveralls and other clothing are removed as part of the decontamination process.
- No facial hair that interferes with a satisfactory fit of the mask-to-face-seal is allowed on personnel required to wear respirators.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, discolored surfaces, kneel on ground, lean, sit, or place equipment on drums, containers, or the ground.
- Medicine, drugs and alcohol may interfere with or impair judgment and reaction times. Therefore, usage of prescribed drugs must be specifically approved by a qualified physician and made known to the Field Team Leader prior to an individuals' presence on the work-site. Alcoholic beverage intake is strictly prohibited at the Site and prior to work.
- All personnel must be familiar with standard operating procedures and any additional instructions and information contained in the HASP.
- All personnel must adhere to the requirements of the HASP.
- Contact lenses are not permitted when respiratory protection is required or where the possibility of a splash exists.

- Personnel must be cognizant of symptoms for radiological exposure onsite, for heat stress and cold stress, and knowledgeable regarding emergency measures contained in the Emergency Contingency Plan.

- Respirators shall be cleaned and disinfected after each day's use or more often, if necessary.

- Prior to donning, respirators shall be inspected for worn or deteriorated parts. Emergency respirators or self-contained devices will be inspected at least once a month and after each use.

- Each employee shall be familiar with the project's Respiratory Protection Program.

10.2 Operational Precautions

The following operational precautions must be observed at all times.

- All Site personnel shall be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications.

- All required respiratory protective devices and clothing shall be worn by all personnel going into areas designated for wearing protective equipment.

- All Site personnel shall use the buddy system when wearing respiratory protective equipment. At a minimum, a third person, suitably equipped as a safety backup, is required during extremely hazardous entries.

- During continual operations, on-site workers act as a safety backup to each other. Off-site personnel provide emergency assistance.

- Personnel should practice any unfamiliar operations prior to undertaking the actual procedure.

- Entrance and exit locations shall be designated and emergency escape routes delineated. Warning signals for Site evacuation must be established.

- Personnel and equipment in the contaminated. work area should be minimized, consistent with effective Site operations.

- Work areas for various operational activities shall be established.

- Procedures for leaving a contaminated area shall be planned and implemented prior to going on-site. Work areas and decontamination procedures shall be established based on expected Site conditions.

- Frequent and regular inspection of Site operations will be conducted to ensure compliance with the HASP. If any changes in operation occur, the HASP will be modified to reflect those changes.

11.0 SANITARY FACILITIES

11.1 Potable Water

a. An adequate supply of potable drinking water shall be maintained at all times immediately outside the Site. Drinking water shall meet all federal, state and local health requirements.
b. Drinking water shall be supplied to project personnel via approved dispensing sources.
c. Paper cups shall be permitted for the drinking of potable water supplies.
d. Drinking water dispensers shall be clearly marked and shall, in no way, have the potential for contamination from non-potable supplies.
e. Site personnel must be fully decontaminated prior to approaching the drinking water supply.

11.2 Toilet Facilities

a. Adequate toilet facilities shall be provided at the Site.
b. These facilities shall be in the form of portable chemical toilets.
c. Routine servicing and cleaning of the toilets should be established with the selected contractor and shall be in accordance with federal, state, and local health regulations.
d. Site, personnel must be fully decontaminated prior to approaching the toilet facilities.

11.3 Washing Areas

a. Adequate washing areas shall be provided for personal use within the work area.
b. Washing areas shall be maintained in a sanitary condition and will be provided with adequate supplies of soap, towels for drying, and covered waste receptacles.
c. Washing areas shall be maintained and sanitized daily.
d. No eating, drinking or smoking shall be permitted in the work area. This policy will be strictly enforced by the Field Team Leader.

12.0 FIRE CONTROL EQUIPMENT

An adequate number of approved portable fire extinguishers (class rated A, B and C) shall be readily available at the Site at all times.

All Site personnel shall be trained in the use of the extinguishers. Extinguishers shall only be used on outbreak stage fires or fires of minor nature. The local fire department shall be contacted in the event of a larger fire and Site evacuation procedures should be commenced in accordance with the procedures described in the Emergency Contingency Plan.

13.0 CONFINED SPACE PROGRAM

13.1 Purpose

In the event that confined space work is a necessity, a Confined Space Program will be implemented. Training in the recognition of confined spaces is a component of the health and safety training program.

The purpose of the Confined Space Program is to establish procedures to protect personnel from this serious hazard in the course of their work; and at a minimum, to comply with 29 CFR OSHA 1910.146. This document assigns responsibilities and sets standards for personnel engaged in activities where confined spaces may be present.

13.2 Responsibilities

13.2.1 Health and Safety Coordinator

The Health and Safety Coordinator administers the Confined Space Program. The Health and Safety Coordinator's responsibilities include:

- Review of the HASP for potential confined space hazards and design alternative approaches to accomplish the confined space tasks;
- Coordinating and managing the Confined Space Program in the event one is required;
- Establishing priorities for implementation of the program;
- Assisting with recognition and implementation of the Confined Space Program;
- Advising project management on confined space issues; and

- Communicating the Confined Space Program to personnel by training related to specific Site activities.

13.2.2 Project Manager

The Project Manager directs the application of the Confined Space Program to project work. The Project Manager is responsible for:

- Working with the Health and Safety Coordinator to prepare information describing activities that might be conducted in a confined space area;
- Assuring that all personnel engaged in project activities are familiar with the definition of a confined space;
- Assuring that personnel .are familiar with .the Confined Space Program, and that project activities are conducted in compliance with the Confined Space Program;
- Assuming the responsibilities of the Field Team Leader if another person is not assigned these responsibilities.

13.2.3 Field Team Leader

The Field Team Leader is responsible for the implementation of the Confined Space Program on-site during field activities. The Field Team Leader is responsible for:

- Overseeing implementation of the Confined Space Program during field operations; and
- Reporting confined space work activity, and any violations of the Confined Space Program, to the Project Manager and the Health and Safety Coordinator.

13.2.4 Personnel

Personnel are responsible for:

- Familiarizing themselves with the Confined Space Program and following it;
- Becoming familiar with the criteria for determining a confined space, and with the monitoring, permitting, and other requirements of the program; and
- Reporting immediately a confined space condition to the Field Team Leader.

13.3 Definition of a Confined Space

Confined space means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work
2. Has limited or restricted means for entry or exit (such as pits, storage bins, hoppers, crawl spaces, and storm cellar areas)
3. Is not designed for continuous employee occupancy

Any workspace meeting all of these criteria is a confined space and the Confined Space Program must be followed.

13.4 Confined Space Entry Procedures

13.4.1 Safety Work Permit Required

All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The Safe Work Permit for entry into a confined space must be completed before work begins; it verifies completion of the items necessary for

confined space entry. The Permit will be kept at the Site for the duration of the confined space work. If there is an interruption of work, or the alarm conditions change, a new Permit must be obtained before work begins.

A permit is not required when the space can be maintained for safe entry by 100% fresh air mechanical ventilation. This must be documented and approved by the Health and Safety Coordinator. Mechanical ventilation systems, where applicable, shall be set at 100% fresh air.

The Field Team Leader must certify that all hazards have been eliminated on the Entry Permit. If conditions change, a new permit is required.

13.4.2 Pre-entry Testing for Potential Hazards

a. Surveillance

Personnel first will survey the surrounding area to assure the absence of hazards such as contaminated water, soil, or sediment, barrels, tanks, or piping where vapors may drift into the confined space.

b. Testing

No personnel will enter a confined space if any one. of these conditions exists during pre-entry testing. Determinations will be made for the following conditions:

1. Presence of toxic gases or dusts: Equal to or more than 5 parts per million (ppm) on the organic vapor analyzer with an alarm, above background outside the confined space area; or other action levels for specific gases, vapors, or dusts as specified in the Health and Safety Plan and the Confined Space Permit based on knowledge of Site constituents;

2. Presence of explosive/flammable gases: Equal to or greater than 10% of the Lower Explosive Limit (LEL) as measured with a combustible gas indicator or similar instrument (with an alarm); and

3. Oxygen Deficiency: A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume as measured with an oxygen meter.

Pre-entry test results will be recorded and kept at the Site for the duration of the job by the Field Team Leader. Affected personnel can review the test results.

c. Authorization

Only the Field Team Leader and the Health and Safety Coordinator can authorize any personnel to enter into a confined space. This is reflected on the Safe Work Permit for entry into a confined space. The Field Team Leader must assure that conditions in the confined space meet permit requirements before authorizing entry.,

d. Safe Work Permit

A Safe Work Permit for confined space entry must be filled out by the Health and Safety Coordinator or Field Team Leader. A copy of the Safe Work Permit is included as Figure 5.2.

e. Attendants

One worker will stand by outside the confined space ready to give assistance in the case of an emergency. Under no circumstances will the standby worker enter the confined space or leave the standby position. There shall be at least one other worker not in the confined space within sight or call of the standby worker.

f. Observation and Communication

Communications between standby worker and entrant(s) shall be maintained at all times. Methods of communication that may be specified in the Safe Work Permit and the HASP may include voice, voice by powered radio, tapping or rapping codes, signaling tugs on rope, and standby worker's observations that activity appears normal.

13.4.3 Rescue Procedures

Acceptable rescue procedures include entry by a team of rescuers only if the appropriate self-contained breathing apparatus (SCBA) is available; or use of public emergency services.

The standby worker must be trained in first aid, CPR, and respirator use. A first aid kit should be on hand and ready for emergency use. The standby worker must be trained in rescue procedures. Retrieval of an unconscious victim in a confined space will only be conducted by trained rescue personnel. An emergency call to 911 will be initiated to assist the victim.

13.5 Training

Personnel who will engage in field activities will be given annual training on the requirements and responsibilities in the Confined Space Program and on OSHA 1910.146. Only trained personnel can work in confined spaces. Workers should be experienced in the tasks to be performed, instructed in proper use of respirators, lifelines and other equipment, and practice emergency procedures and self-rescue.

Before each Site activity, the determination of confined space work will be part of the Site characterization process. Training in the site-specific confined space activities will be part of the site-specific health and safety training:

13.6 Safe Work Practices

- Warning signs should be posted. These include warnings for entry permits, respirator use, prohibition of hot work and emergency procedures and phone numbers.

- Cylinders containing oxygen, acetylene or other fuel such as gasoline must be removed a safe distance from the confined space work area.

- Purging and ventilating is done before work begins to remove hazardous vapors from the space. The space should be monitored to ensure that the gas used to purge the space (e.g. tank) has also been removed. Local exhaust should be used where general exhaust is not practical.

- The buddy system is used at all times. A standby person always must be posted within sight of, or in communication with, the person inside the confined space. The standby should not enter the confined space, but instead will call for help in an emergency and not leave the post. Communication should be maintained at all times with workers inside the confined space.

- Emergency planning in the HASP and a Safe Work Permit must be approved in advance and the proper rescue equipment must be immediately available.

14.0 ELECTRICAL LOCKOUT/TAGOUT

The Field Team Leader must approve all work in areas requiring lockout/tagout procedures. Specific procedures and permitting requirements will be specified in the HASP, or in a revised HASP based on the need for a worker to work around electrical equipment.

All systems must be locked out and tagged before the work begins. This includes pipes, air lines, electrical equipment and mechanical devices. The equipment must be start tested and approved for use by a worker by the Health and Safety Coordinator or the Field Team Leader by start-testing to make sure the locked-out equipment does not operate.

TEACHERS' RETIREMENT SYSTEM – GMO SITE

PESTICIDE INVESTIGATION REPORT

ATTACHMENT 4

Title: Pesticide Investigation Report

Revision Number: 0

Date: February 25, 2002 Replaces: New

STS CONSULTANTS, LTD.

Pesticide Investigation Report
341 East Ohio Street
Chicago, Illinois

Teachers' Retirement System of the State of Illinois

STS Project No. 1-25585-XG
February 25, 2002

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Teachers' Retirement System of the State of Illinois
STS Project No. 1-25585-XG
February 25, 2002

PESTICIDE INVESTIGATION REPORT
341 EAST OHIO STREET SITE
CHICAGO, ILLINOIS

1.0 PROJECT OVERVIEW

STS Consultants, Ltd. (STS) completed ten borings in August 2001 on the 341 East Ohio Street site to characterize the radiologically-impacted material to be removed for disposal at EnviroCare in Clive, Utah. As part of the waste characterization, the ten soil borings were located so as to sample those soils previously identified in other investigations as radiologically-impacted. The locations of the borings, identified as B-1 through B-10, are shown on Figure 1. This waste characterization sampling was to evaluate whether any of the material which is known or suspected to exceed the radiological cleanup criteria established by the U.S. Environmental Protection Agency (USEPA) also includes other hazardous substances which cause it to constitute characteristic Resource Conservation and Recovery Act (RCRA) hazardous waste. RCRA characteristic analyses include toxicity (TCLP volatiles, TCLP semi-volatiles, TCLP pesticides/herbicides, TCLP metals), corrosivity (pH), reactivity (reactive sulfide, reactive cyanide), and flammability (flashpoint).

During the initial waste characterization sampling, pesticide-impacted soils were discovered at one of the borings, B-3, at concentrations and using test methods that indicated the possible presence of RCRA characteristic hazardous waste by toxicity. As a result, STS completed additional field investigations in November 2001 to further define the extent of pesticide-impacted soils on site and to determine whether any such pesticide-impacted soils constitute RCRA hazardous wastes by toxicity. These borings, identified as P-1 through P-10, were laid out to cover the boring location where pesticides were detected in the initial phase of the investigation, the former location of underground storage tanks (USTs) where pesticides were previously detected in sampling for the closure of the tanks (1988), and along the north margin of a former RCRA permitted hazardous waste storage area. Boring locations are shown on the attached Figure 1.

The Amended Removal Action Work Plan, which will be submitted to USEPA for this site, will provide for the removal of pesticide-impacted soils during the excavation process in order to achieve compliance with the Tier 1 residential values for ingestion and inhalation under the Tiered Approach to Corrective Action Objectives (TACO) regulations at 35 Ill. Admin. Code Part 742, Appendix B, Table A. The soil component of the groundwater ingestion pathway values will not be utilized in light of the City of Chicago's

groundwater ordinance. Based on these cleanup objectives, we estimate that approximately 1,500 cubic yards of pesticide-impacted soils will be removed from the site, some of which are radiologically-impacted and will be disposed of at the EnviroCare facility in Utah. However, if the volume of pesticide-impacted soils to be removed from the site based on these cleanup standards significantly exceeds 1,500 cubic yards, a request for modified cleanup standards may be submitted to USEPA and to the Illinois Environmental Protection Agency (IEPA), but no such modified cleanup standards for pesticides will be used without approval of USEPA and IEPA. The limits of the pesticide-impacted soils will be laid out on the basis of the previously completed borings and possibly additional field tests using immunoassay kits. Confirmatory sampling will be performed pursuant to the Amended Removal Action Work Plan to verify compliance with applicable pesticide cleanup standards.

2.0 SITE HISTORY

B. Koh & Associates, Inc. (Koh) completed a radiological survey on the subject site in May 2000, as documented in Koh's report entitled "Summary of Radiological Survey" dated May 2000 (Koh, May 2000). Koh identified seven areas on the subject site where a combination of surface gamma scans and downhole logging and analysis exhibited evidence of elevated gamma radiation and thorium content in the soil. The ten soil borings advanced during August 2001 in the initial phase of the waste characterization sampling were located to sample those areas previously identified by Koh as having elevated levels of gamma radiation and thorium content.

STS also reviewed other subsurface investigation results from previous environmental investigations of the subject site in order to determine whether previous investigations contained relevant information regarding the presence or distribution of potential hazardous waste. Specifically, STS reviewed the following reports:

- Environmental Reconnaissance of the Sandoz-Velsicol Property dated August 18, 1988 prepared by STS (Environmental Reconnaissance Report)
- Additional Field Exploration at the Sandoz-Velsicol Property dated September 27, 1988 prepared by STS
- Preliminary Assessment/Visual Site Inspection dated December 16, 1993 (PA Report) performed by PRC Environmental Management, Inc. for the U.S. Environmental Protection Agency
- Phase II Soil and Groundwater Investigation dated May 11, 2000 (GaiaTech Phase II Study) prepared by GaiaTech Incorporated.

STS performed an environmental reconnaissance of the then Sandoz-Velsicol property in 1988, as described in the Environmental Reconnaissance Report, including soil borings, chemical analyses of

seven soil samples and one groundwater sample, and observations during the removal of two 8000-gallon underground storage tanks for storage of either No. 5 fuel oil or Bunker C oil. These two USTs were located in close proximity to sample B-3 of the August 2001 waste characterization sampling. The former locations of the USTs (outlined with dashed lines on the north side of the 330 East Grand Avenue building) can be seen on Figure 1. The exact location of the USTs on the north side of the 330 East Grand Avenue building is not known. In STS's Environmental Reconnaissance Report, dated August 18, 1998, the USTs are mapped approximately 60 feet east of the northwest corner of the 330 East Grand Avenue building. These tanks, however, are referred to several times in the Environmental Reconnaissance Report as being located at the northwest corner of the building. This northwest location is close to the permitted RCRA Hazardous Waste Storage Facility located inside the building. In a subsequent report issued on September 27, 1988, entitled Additional Field Exploration at the Sandoz-Velsicol Property, these same USTs are mapped in the northwest corner. Review of records from the 1988 work was not able to unequivocally resolve the uncertainty. Upon review of the reports and discussion of the field activities conducted as part of these reports, we feel that the more probable location of the USTs is in the northwest corner of the building. Figure 3 shows the outline of both possible locations.

The following information from the Environmental Reconnaissance Report presents results of the underground storage tank removal and sampling:

> "The two 8,000 gallon underground storage tanks at the back (North) side of the 330 E. Grand building which contained Bunker C oil or No. 5 fuel oil were removed on August 4, 1988. The tanks were purged and cleaned prior to STS' arrival on the site. STS observed the removal of the two tanks. Visual observation of the removed tanks did not identify any holes in the tanks. The excavation was sand and pea gravel backfill. The excavated soils and pit did not have any petroleum odors. No free product or stained soils were observed."

The Environmental Reconnaissance Report indicates that seven soil samples and one groundwater sample, including a grab sample from the bottom of the underground storage tank excavation, were taken and analyzed for volatile organic compounds, herbicides, pesticides, base/neutral and acid extractable compounds. The data in the Environmental Reconnaissance Report indicate total concentrations for chlordane, heptachlor and 2, 4-D at 3 mg/kg, 6 mg/kg, and 3 mg/kg, respectively, from one sample labeled UST. That sample was from the UST excavation reportedly located approximately 40 feet to the east of B-3.

The sample results from the bottom of the UST are contained in Attachment A. STS also conducted sampling beyond the UST locations, consisting of 14 borings site-wide, including one groundwater sample. This additional sampling in 1988 detected no elevated concentrations of pesticides in any of the soil boring locations. Analysis of the groundwater sample showed all parameters to be below detection limits, at the low microgram per liter (approximately part per billion) range.

The PA report states that Velsicol developed herbicides, insecticides and plant growth regulants at its laboratory facilities on the site. These laboratories generated four waste streams: spent solvents, surplus reagents and intermediates, commercial pesticide products, and non-hazardous solid refuse. The hazardous wastes were stored in the former Container Storage Area (CSA), shown on Figure 2 as SWMU-1. The PA report contained the following description of the CSA, which was operated from 1947 until 1988:

> "The unit was attached to a three-story research and development laboratory building at 330 East Grand Avenue. The unit was a 30-by-32 foot room with a concrete floor. The room was enclosed by brick walls and a steel roof. No floor drains were present. During RCRA closure, several hairline cracks were observed in the concrete floor: however, there was no evidence of release in the form of leaks, spills or staining (Velsicol, 1988)."

The PA report concluded that no further investigation of the CSA was warranted.

STS also reviewed the GaiaTech Phase II Study and found that two of the GaiaTech samples, GP-3 and GP-9, are in the general vicinity of boring B-3. Sample GP-9 is near the location of the former CSA. Figure 4 shows the various boring locations from the GaiaTech Phase II Study. GaiaTech completed a total of sixteen soil borings and analyzed each boring for the full list of target compound list (TCL) compounds. No elevated levels of pesticides were detected in any of the soil borings. GaiaTech also sampled groundwater from a temporary monitoring well installed in GP-3 for pesticides and found no elevated levels of pesticides in the groundwater sample.

Based on the proximity of boring B-3 to the location of the former CSA, notwithstanding the GaiaTech results, it is possible that the former CSA on the subject site is the source of the pesticides detected in boring B-3.

3.0 SAMPLING METHODOLOGY

3.1 Borings B-1 through B-10

Drilling for the waste characterization exploration for possible RCRA hazardous waste was completed in August 2001 and consisted of ten borings, B-1 through B-10. Sample boring depths varied from 8.5 feet to 12 feet, with samples extending two feet into natural sand soil. Samples were collected via a hollow stem auger and a split spoon sampler. Recovered material from each split spoon was bagged individually. When the last sample from each borehole was retrieved, all recovered material from that borehole was composited by mixing and homogenizing the material. Because these borings were drilled in locations known to be radiologically impacted, all cuttings from the drilling were placed in Supersacks and segregated in accordance with the drilling plan. Those cuttings remain in a locked container on site.

Sample bottles were then filled from the homogenized sample from each boring, providing a single sample for each boring. The sample bottles from each boring were screened for elevated radiation. The borings were surveyed for elevated gamma radiation through downhole logging of each boring in 6-inch increments. STS measured gamma radiation for each of the ten soil borings using a 2 x 2 NaI detector through a 3-inch diameter PVC casing placed in the borehole. The samples were analyzed by a subcontract laboratory, Severn Trent Laboratories (STL), for waste characterization and radionuclides. The results are presented in the Results Section of this report.

Soil samples were sent to STL for waste characterization analysis. Laboratory analyses for RCRA waste characteristics were performed on all ten composite samples for both Totals and Toxicity Characteristic Leaching Procedure (TCLP) test method. RCRA characteristic analyses included TCLP volatiles, TCLP semi-volatiles, TCLP pesticides/herbicides, TCLP metals, corrosivity (pH), reactive sulfide, reactive cyanide, and flammability (flashpoint). Laboratory quality assurance/quality control (QA/QC) processes were performed to verify the accuracy of all test results.

3.2 Borings P-1 through P-10

As a result of the detection of pesticides in B-3, the former presence of the CSA and the previous detection of pesticides in the UST sample, the second phase of drilling was proposed. This second phase consisted of ten borings, P-1 through P-10 laid out in an elliptical pattern surrounding sample B-3 from the initial phase, at both of the possible UST locations, and the former CSA location. Drilling of these ten borings was completed in November 2001. Ten locations were sampled with several offsets needed due to obstructions encountered in the subsurface. Samples were collected via a split spoon

sampler. The borings extended one foot into native sand soil for a depth of 10 feet, with the exception of P-1A, an offset from P-1, and P-10, both of which extended to 12 feet to penetrate a concrete slab or debris encountered at 10 to 11 feet. The slab at P-1 is assumed to be the tie-down slab for the USTs removed from the site at that location in 1988. The concrete at P-10 appeared to be rubble fill. The borings were continuously sampled in 2-foot intervals. The soil cuttings from each 2-foot sample interval were contained separately in plastic bags. These cuttings were surveyed for elevated gamma radiation. After the borings were down-hole logged for gamma radiation, the cuttings that exhibited elevated gamma readings and cuttings from intervals which had elevated gamma readings in down-hole logging were segregated as radiologically-impacted. Those cuttings remain in a locked container on site.

For this second phase of the sampling, the samples were field screened for pesticides using an immunoassay test procedure capable of delineating total pesticide concentrations in the following ranges: less than 20 ug/kg, 20 to 100 ug/kg, 100 to 600 ug/kg, and greater than 600 ug/kg. The greater than 600 ug/kg threshold is of interest as this concentration is 20 times the TCLP characteristic hazardous waste concentration for chlordane. Chlordane is the pesticide detected at the highest concentration in boring B-3. The 20 times factor is the dilution involved in the TCLP protocol relative to the total analysis method. The immunoassay test procedure was used to provide real-time indications in the field of the extent of pesticide-impacted soils which might exceed the TCLP hazardous waste concentration, to determine if another round of samples would be required to define the spatial extent of any hazardous waste pesticide-impacted soils.

A groundwater sample was collected and analyzed for USEPA Priority Pollutants as well as the discharge requirements of the City of Chicago. Results of the groundwater sample are presented later in this report.

The borings were surveyed for gamma radiation through downhole logging of each boring in 6-inch increments. STS measured gamma radiation for each of the ten soil borings using a 2 x 2 NaI detector in a 3-inch diameter PVC casing.

Soil samples were sent to STL for measurement of the total pesticides concentrations. Those samples exhibiting total levels more than 20 times the TCLP characteristic hazardous waste threshold were analyzed for pesticides by TCLP. Laboratory QA/QC processes were performed to verify the accuracy of all test results.

4.0 RESULTS

4.1 Radium

The ten composite samples from borings B-1 through B-10 were analyzed for total radium (Ra-226 plus Ra-228) by STL. Note that Ac-228 is used as a surrogate to measure the Ra-228 activity.

Sample	Ra-226 (pCi/g)	Ac-228 (pCi/g)	Total Radium (pCi/g)
B-1	151	218	369
B-2	5.77	4.6	10.37
B-3	0.64	1.22	1.86
B-4	5.16	32.7	37.86
B-5	209	336	545
B-6	0.96	1.2	2.16
B-7	0.82	0.53	1.35
B-8	4.44	33.6	38.04
B-9	14.9	72	86.9
B-10	0.384	0.36	0.744

Composite samples B-1, B-2, B-4, B-5, B-8 and B-9 were found to exceed the cleanup threshold of 7.1 pCi/g total radium established by USEPA.

Gamma readings for borings P-1 through P-10 were measured in 6-inch increments. Copies of the downhole field logs are presented in Attachment B. The following presents those borings for which at least one interval registered an elevated gamma reading in counts per 30 seconds above the apparent cut-off value equivalent to 7.2 pCi/g. The 30-second count equivalent to 7.2 pCi/g is 18,804.

These results show an interval of elevated gamma radiation approximately 1 to 2 feet thick, at depths from 1 to 4 feet, generally from 1 to 2.5 or 3 feet deep. These depths are measured from the top of the asphalt pavement on site. This interval of elevated gamma radiation lies within the interval impacted by pesticides in borings P-1, -2, -4, -5, and -6. Additionally, a second interval of elevated gamma radiation in P-6 was identified between 6 and 7.5 feet below ground surface.

Boring	**Depth (ft)**	**Counts per 30 seconds**
P-1A	1.5 – 2.0	20,650
	2.0 – 2.5	48,743
	2.5 – 3.0	21,971
P-2	2.0 – 2.5	23,960
	2.5 – 3.0	42,825
	3.0 – 3.5	92,894
	3.5 – 4.0	47,746

P-4	1.5 – 2.0	32,252
	2.0 – 2.5	49,919
	2.5 – 3.0	23,872
P-5	1.5 – 2.0	19,438
P-6	1.5 – 2.0	35,425
	2.0 – 2.5	105,212
	2.5 – 3.0	42,197
	3.0 – 3.5	20,084
	6.0 – 6.5	26,817
	6.5 – 7.0	50,557
	7.0 – 7.5	57,546

4.2 RCRA Characterization Analyses

TCLP results of the initial RCRA analyses on borings B-1 through B-10 for possible hazardous wastes are provided in Table 1. Boring B-3 was found to have a chlordane concentration above the hazardous waste criteria for Toxicity, per the TCLP test method. The results indicated a TCLP concentration of 580 ug/L[1] as compared to the hazardous waste criterion of 30 ug/L. Chlordane levels in the remaining borings were all below the reporting limit of 5 ug/L. Other pesticides were also detected in the sample from boring B-3 including endrin, lindane, heptachlor and heptachlor epoxide. None of these were detected at levels above the RCRA characteristic hazardous waste limit for each such constituent. The complete laboratory sample results are included in Attachment C.

4.3 Immunoassay Field Test Results

The immunoassay test kit methodology is a semi-quantitative means of estimating the level of total chlordane and other chlordane-related pesticides in soil. The immunoassay kit is a colorimetric test that does not differentiate between chlordane and other structurally similar compounds. As well as chlordane, the Envirogard Chlordane test kit used in this study is sensitive to endrin, endosulfan I, endosulfan II, dieldrin, heptachlor, aldrin, toxaphene, gamma-BHC, alpha-BHC and delta-BHC. Therefore, although the sensitivity to each pesticide differs, the reaction of the kit to these pesticides is additive. The concentration of chlordane is estimated by the comparison of the soil results with standards that are analyzed concurrently. Each group of soil samples analyzed in this study included a blank (negative control), 20 µg/kg, 100 µg/kg and 600 µg/kg standard.

The field immunoassay test results, presented in Table 2, show at least one sample with contamination at levels over the 600 ug/kg threshold in 8 of the 10 borings. Borings P-6 and P-7 were the only borings

[1] The initial analysis had an incorrect sample volume in the calculation for the extraction, which resulted in under-reporting the concentration by a factor of ten (10) at 58 ug/L. This correction was noted in the Case Narrative for the re-analysis. The re-analysis reported 540 ug/L.),

with no samples above this concentration on the field tests. The highest readings in each boring tend to be in the upper samples, 0-2 feet deep, but readings over the 600 ug/kg level extended to 8 feet deep in P-1, P-5 and P-9, and as deep as 10 feet in P-3 and P-10.

These analyses also show the contamination extends beyond the limits of the drilling to the east, north and west, with possible limits defined only to the south and southwest. At the western (boring P-4) and northern (borings P-7 and P-8) boundaries of the investigation area the pesticide contamination appears to be confined to a depth of 0 to 2 feet (refer to Figure 1). On the southern boundary, boring P-6 was relatively clean, but boring P-5 exhibited elevated levels to a depth of 6 to 8 feet. The fact that the contamination appears limited to the surface and that the surface concentration is substantially less than that at P-1 and P-2 may suggest that the limits of contamination may be just beyond the outer borings on the north, west and south. However, on the eastern edge of the investigation area (borings P-9 and P-10) the contamination appears to extend to a depth of 8 - 10 feet with the highest levels observed in the subsurface (4 to 10 feet deep). These deeper zones and higher levels make it difficult to estimate the horizontal extent of contamination along the eastern boundary.

4.4 Pesticide Analyses

Nineteen different pesticides were identified in the laboratory analyses of the samples from discrete intervals in borings P-1 through P-10. Data on the full suite of pesticides detected are provided on Table 3 (Note these data reflect final laboratory reports dated November 29 and 30, 2001, and reflect minor revisions from preliminary data reported in the project status report dated November 20, 2001.) These laboratory data generally agree with the field data on pesticide concentrations using the immunoassay test. In each case, the samples reported by the laboratory to be greater than 600 µg/kg chlordane (technical) were identified as greater than 600 µg/kg by the field test kit (i.e., no false negatives). In three samples from borings P-2 (S-2 and S-4) and P-3 (S-2) the test kit estimated chlordane levels as greater than 600 µg/kg when laboratory results were less than 600 µg/kg (potential false positives). However, a more thorough review of the laboratory data suggest that these field kit false positives are likely attributable to the additive effects of the immunoassay kit's sensitivity to the presence of other pesticides. The immunoassay and laboratory analyses agree that the contamination extends beyond the limits of this drilling program. The maximum concentration of chlordane is 120,000 ug/kg, with 18 samples from 8 different borings (P-1 through P-5, and P-8 through P-10) showing levels over 1,000 ug/kg chlordane.

Discrete samples from eight borings, P-1, P-2, P-3, P-4, P-5, P-8, P-9, and P-10, exhibited total chlordane levels more than 20 times the TCLP characteristic hazardous waste threshold. These samples were subsequently analyzed by TCLP. However, none of the samples exceeded TCLP limits for chlordane.

Several of these borings also exceeded 20 times the TCLP threshold for other pesticides: Heptachlor in P-1, P-2, P-3, P-4, P-5, P-8, P-9, and P-10; heptachlor epoxide in P-1, P-2, P-4, P-5, and P-10; and endrin in P-1, P-2, P-3, P-4, and P-5. Again, none of these samples exceeded TCLP limits for any of the analyzed pesticides.

The pesticide-impacted soils are proposed to be removed to the Illinois Site Remediation Program TACO Tier 1 Residential Limit for inhalation or ingestion, whichever is lower. Results of the total pesticide analysis showed exceedances over referenced TACO standards for chlordane, aldrin, lindane, dieldrin, heptachlor, and heptachlor epoxide. Other pesticides were detected in the samples but not in exceedance of the TACO Tier 1 residential standards. Based on the available field data, it is anticipated that the volume of pesticide-impacted soils to be removed will be approximately 1,500 cubic yards. However, if the volume of pesticide-impacted soils to be removed from the site based on these cleanup standards significantly exceeds 1,500 cubic yards, a request for modified cleanup standards may be submitted to USEPA and IEPA but no such modified cleanup standards for pesticides will be used without approval of USEPA and IEPA. The following presents the TACO Tier 1 Residential Limits for inhalation and ingestion, and the samples which exceeded these limits. Table 3 contains the results of the pesticide analyses for samples P-1 through P-10.

Pesticide	Ingestion (mg/kg)	Inhalation (mg/kg)	Samples with Exceedance of Standards
Aldrin	0.04	3	P-1, P-2, P-10
Chlordane	1.8	72	P-1, P-2, P-3, P-4, P-5, P-8, P-9, P-10
Dieldrin	0.04	1	P-1, P-2, P-10
Heptachlor	0.1	0.1	P-1, P-2, P-3, P-4, P-5, P-8, P-9, P-10
Heptachlor epoxide	0.07	5	P-1, P-2, P-4, P-5, P-8, P-10
Lindane	0.5	-- [1]	P-2, P-3, P-5, P-9

[1] No toxicity criteria available for the route of exposure.

4.5 Groundwater

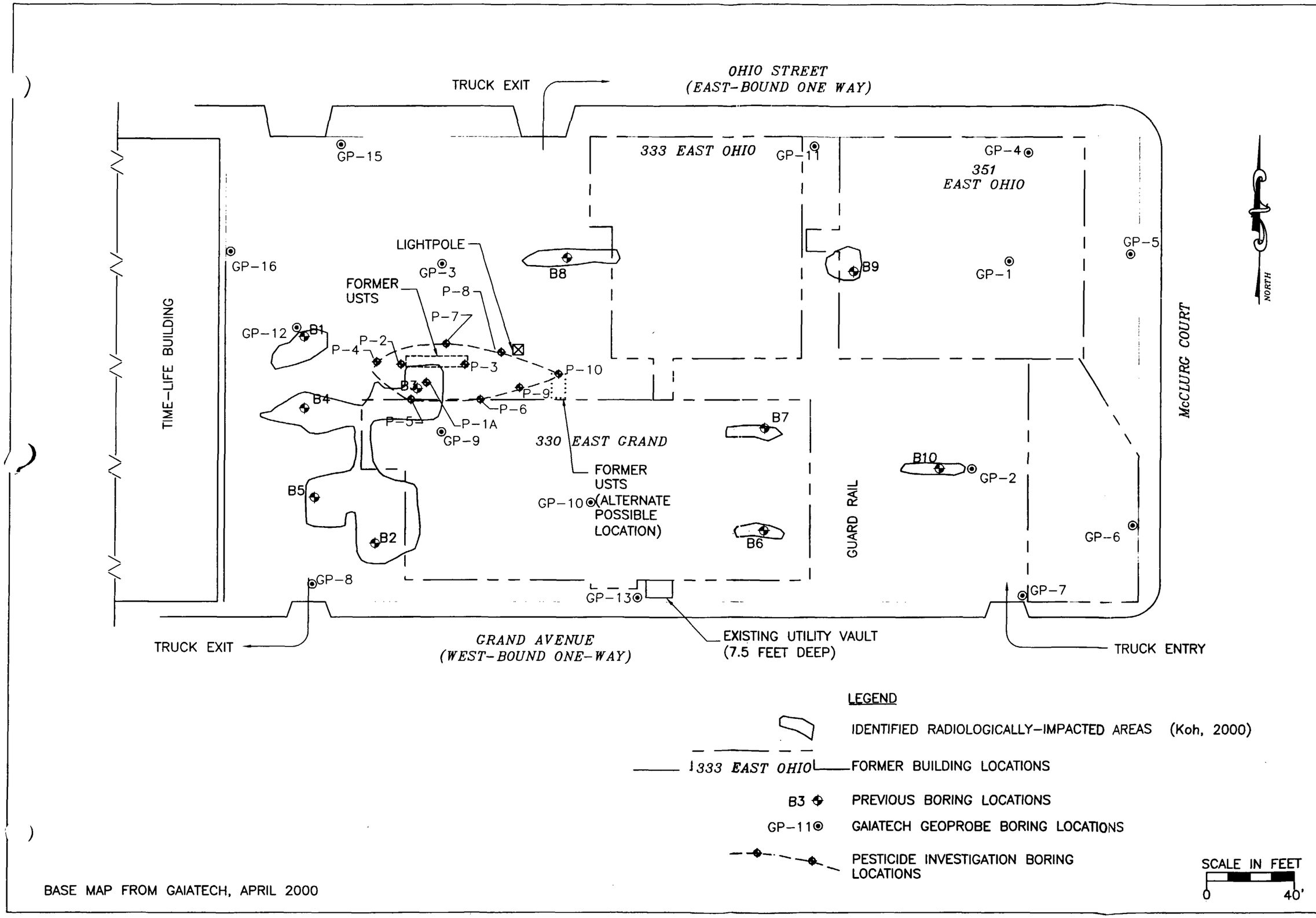
A groundwater sample was gathered during the sampling of borings P-1 through P-10 from boring P-7 using sample containers provided by Grace Laboratory, where the sample was analyzed. The sample was analyzed for volatile organic compounds, semivolatile organic compounds, pesticides, PCBs, herbicides, USEPA priority pollutants, and fats, oils and grease as required by the Metropolitan Water Reclamation District of Greater Chicago and the City of Chicago Sewer Department. There were no exceedances of groundwater standards and no detections, with the exception of chloroform, which was detected in the sample at the concentration of 3.5 ug/L. The allowable discharge limit for chloroform is 309 ug/L. A copy of the analytical data is provided in Attachment D.

5.0 CONCLUSIONS

Two sets of borings, B-1 through B-10 and P-1 through P-10, were advanced on site and tested for elevated gamma readings and RCRA waste characterization. Although one sample, B-3, showed chlordane levels in excess of the allowable TCLP limits, additional sampling adjacent to and surrounding this sample failed to show any exceedances of the toxicity waste characteristic threshold for chlordane or any other RCRA pesticide. The positive TCLP result in B-3 could not be reproduced. As a result we conclude that there is no RCRA characteristic hazardous waste present on site based on the TCLP pesticide analysis.

Composite samples B-1, B-2, B-4, B-5, B-8 and B-9 were found to exceed the cleanup threshold of 7.1 pCi/g total radium established by USEPA. Downhole boring results for borings P-1, P-2, P-4, P-5, and P-6 show an interval of elevated gamma radiation approximately 1 to 2 feet thick, at depths from 1 to 4 feet, generally from 1 to 2.5 or 3 feet deep. This zone lies within the zone impacted by pesticides. Additionally, a second interval of elevated gamma radiation in P-6 was identified between 6 and 7.5 feet below ground surface. In that these pesticide-impacted soils are not characteristic hazardous waste, it is our understanding that the soil is allowed to be disposed at EnviroCare of Utah. All radiologically-impacted soils, including the pesticide-impacted soil, will be removed for disposal at EnviroCare in Utah. Inasmuch as the soil does not exceed the characteristic hazardous waste threshold for any analyzed parameters and is therefore not classified as a hazardous waste, we understand the soil can be disposed at EnviroCare of Utah under their existing permit.

Results of the total pesticide analysis indicated exceedances for the following pesticides over the TACO Tier 1 residential standards for ingestion or inhalation in 35 Ill. Admin. Code Part 742, Appendix B, Table A: chlordane, aldrin, lindane, dieldrin, heptachlor, and heptachlor epoxide. The pesticide-impacted soils will be removed to the Illinois Site Remediation Program TACO Tier 1 Residential Limit for inhalation or ingestion, whichever is lower. However, if the volume of pesticide-impacted soils to be removed from the site based on these cleanup standards significantly exceeds 1,500 cubic yards, a request for modified cleanup standards may be submitted to USEPA and IEPA, but no such modified cleanup standards will be used without approval of USEPA and IEPA. The pesticide removal will be coordinated with the removal of the radiologically-impacted soil. As the pesticide excavations are made, the soil will be screened for radioactivity in 18-inch lifts. All pesticide-impacted soil which is not radiologically-impacted over the radiological cleanup standard will be disposed of at a landfill permitted to accept this pesticide-impacted soil.



BASE MAP FROM GAIATECH, APRIL 2000

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CHECKED BY JRA	DATE 12/3/01	
APPROVED BY RGB	DATE 12/3/01	
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PESTICIDE INVESTIGATION BORING PLAN
GMO SITE
CHICAGO, ILLINOIS

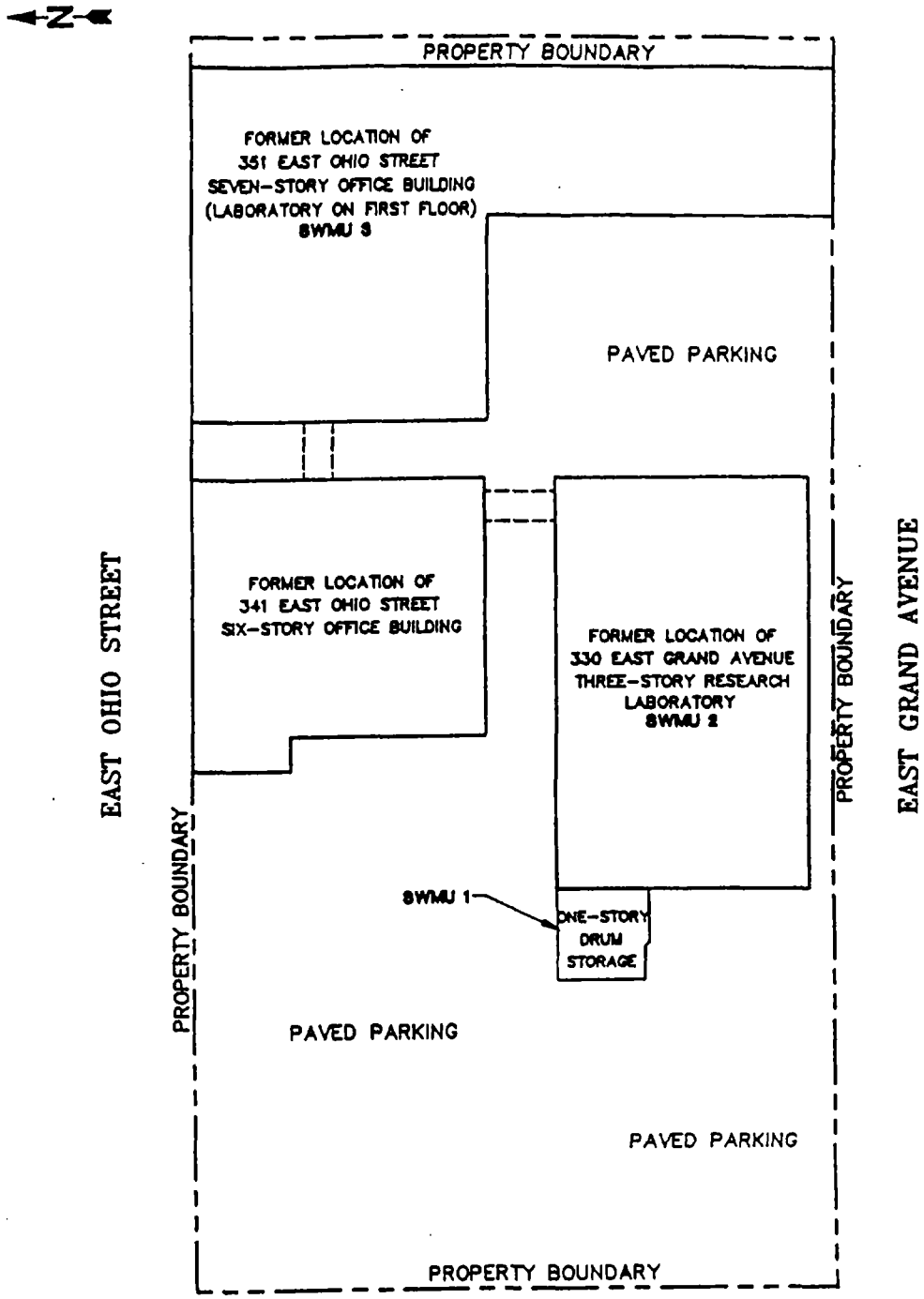
STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 25585-XG

STS PROJECT FILE 01-LOC-DIAG_A.dwg

SCALE 1"=40'±

FIGURE NO. 1

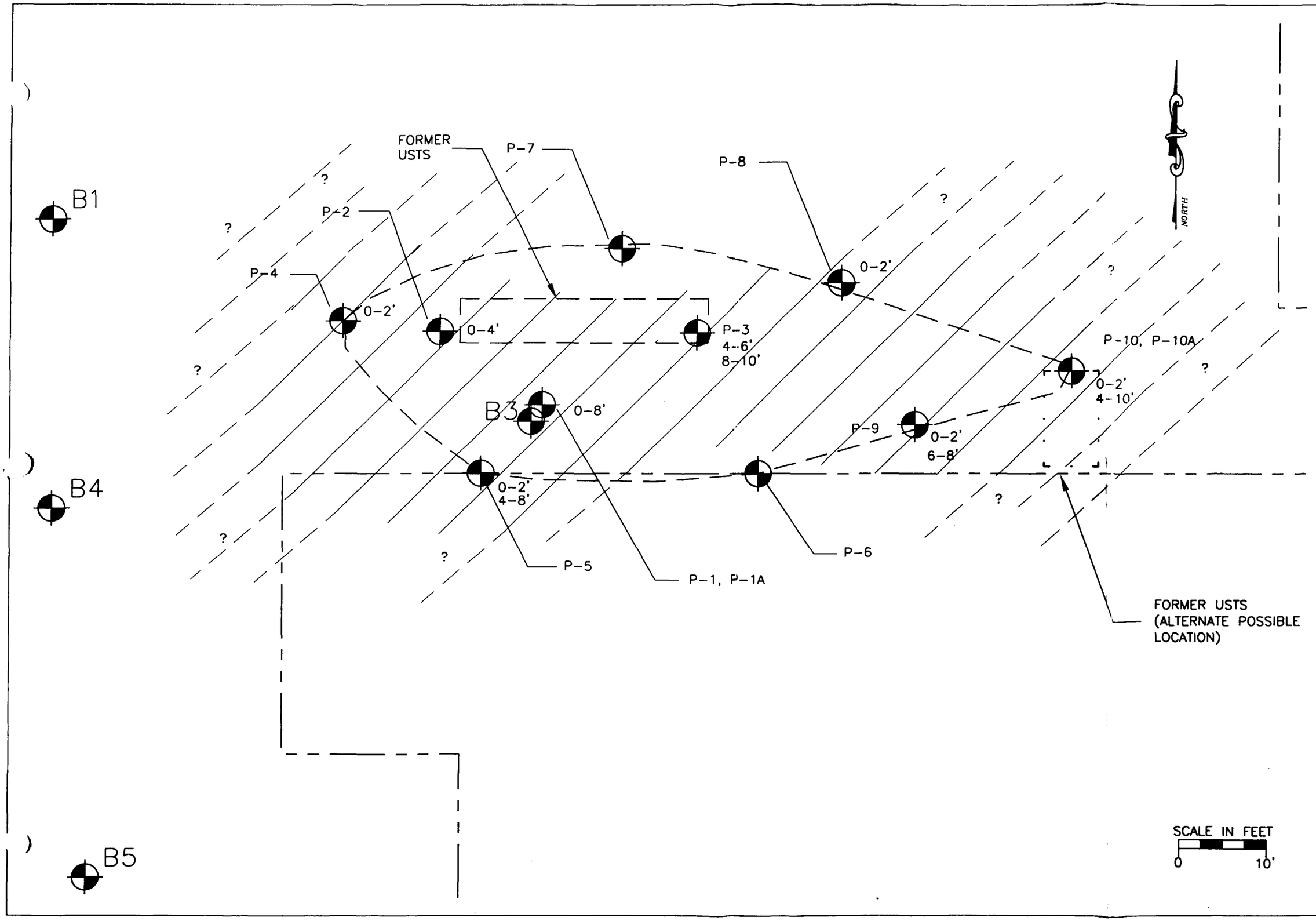


SWMU 1 FORMER CONTAINER STORAGE AREA
SWMU 2 FORMER WASTEWATER TREATMENT UNIT 1 (LOCATED WITHIN 330 EAST GRAND AVENUE BUILDING; EXACT LOCATION UNKNOWN)
SWMU 3 FORMER WASTEWATER TREATMENT UNIT 2 (LOCATED WITHIN 351 EAST OHIO STREET BUILDING; EXACT LOCATION UNKNOWN)

STS Consultants Ltd.
Consulting Engineers

FACILITY LAYOUT DIAGRAM
341 E. OHIO STREET
CHICAGO, ILLINOIS

DRAWN BY	KKB	2-25-02
CHECKED BY		
APPROVED BY	RGB	2-25-02
CADFILE	SCALE NTS	
STS PROJECT NO. 25585-XG	FIGURE NO. 2	



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TACO TIER 1 RESIDENTIAL
STANDARDS EXCEEDANCES
341 E. OHIO SITE
CHICAGO, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO.
25585-XG

STS PROJECT FILE
FIG.2.dwg

SCALE
1"=10'

FIGURE NO.
3

Table 1
RCRA Waste Characterization Analyses

Parameter	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	RCRA Level	Units
Chlordane	ND	ND	580	ND	ND	ND	ND	ND	ND	ND	30	ug/L
Endrin	ND	ND	0.73	ND	ND	ND	ND	ND	ND	ND	20	ug/L
gamma-BHC (Lindane)	ND	ND	0.84	ND	ND	ND	ND	ND	ND	ND	400	ug/L
Heptachlor	ND	ND	3.3	ND	ND	ND	ND	ND	ND	ND	8	ug/L
Heptachlor epoxide	ND	ND	0.88	ND	ND	ND	ND	ND	ND	ND	8	ug/L
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10,000	ug/L
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500	ug/L
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200	ug/L
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	700	ug/L
Methyl ethyl ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200,000	ug/L
Chloroform	5.3	5.5	6.3	5.1	5.1	5.6	5.2	5.0	5.3	ND	6,000	ug/L
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500	ug/L
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500	ug/L
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500	ug/L
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500	ug/L
Tetrachloroethene	13	10	10	9.3	8.6	8.0	7.5	7.4	7.4	ND	700	ug/L
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100,000	ug/L
Pyridine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,000	ug/L
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7,500	ug/L
o- Cresol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200,000	ug/L
m- and p-Cresol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200,000	ug/L
Hexachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,000	ug/L
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2,000	ug/L

Parameter	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	RCRA Level	Units
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500	ug/L
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2,000	ug/L
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	400,000	ug/L
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	130	ug/L
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	130	ug/L
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100,000	ug/L
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10,000	ug/L
2,4,5-TP (Silvex)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,000	ug/L
Arsenic	18	2.2	3.8	9.4	423	10.6	2.7	6.1	2.3	9.1	5,000	ug/L
Barium	1620	227	466	306	152	246	393	343	1220	507	100,000	ug/L
Cadmium	11.0	9.2	5.3	5.7	9	4.7	0.85	3.7	3.7	0.7	1,000	ug/L
Chromium	ND	2.2	ND	ND	4	ND	ND	ND	ND	ND	5,000	ug/L
Lead	907	179	79.2	652	1820	168	21.2	86.0	39.2	136	5,000	ug/L
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,000	ug/L
Selenium	ND	6.8	8.0	3.8	5.9	3.3	5.2	5.0	7.0	8.1	1,000	ug/L
Copper	39.6	108	40.3	147	35.9	23.6	7.4	16.1	15.7	7.3	-	ug/L
Zinc	8330	2150	589	1720	1780	1510	35.5	1130	145	335	-	ug/L
Mercury	ND	ND	0.16	0.24	0.12	0.16	0.13	0.16	0.14	0.14	200	ug/L

ND Non-detectable
* The regulatory level of total cresol is 200 mg/l for all forms of cresol (o-, m-, and p-cresol).
\- No RCRA regulatory limit set.

Several compounds can be listed in different ways, although the chemical is the same. Table 1 presents compounds as listed in Table 1 of 40 CFR, 261.24. The analysis reports from the lab present the compounds as listed below.
1,1-Dichloroethylene = 1,1-Dichloroethene
Methyl ethyl ketone = 2-Butanone
o-Cresol = 2-Methylphenol
m-Cresol and p-Cresol = 4-Methylphenol

Table 2
Field Immunoassay Test Results

11/8/01				11/9/01 AM				11/9/01 PM				11/12/01			
Sample	Depth (ft)	Reading	Est. Conc. (ug/kg)	Sample	Depth (ft)	Reading	Est. Conc. (ug/kg)	Sample	Depth (ft)	Reading	Est. Conc. (ug/kg)	Sample	Depth (ft)	Reading	Est. Conc. (ug/kg)
Test Standards				Test Standards				Test Standards				Test Standards			
0		1.4	-	0		2.83	-	0		2.31	-	0		2.17	-
20		1.09	-	20		2.63	-	20		2.06	-	20		1.67	-
100		0.64	-	100		1.94	-	100		1.33	-	100		1.08	-
600		0.32	-	600		1.12	-	600		0.68	-	600		0.53	-
Samples				Samples				Samples				Samples			
P1-S1		0.03	>600	P3-S1		0.54	>600	P6-S1		0.77	340	P7-S1		0.56	580
P1-S2		0.03	>600	P3-S2		0.67	>600	P6-S2		1.82	35	P7-S2		2.09	5
P1-S3		0.05	>600	P3-S3		0.25	>600	P6-S3		1.57	50	P7-S3		1.1	95
P1-S4		0.05	>600	P3-S4		1.03	675	P6-S4		1.13	200	P7-S4		1.63	20
P1A-S1		0.43	350	P3-S5		0.69	>600	P6-S5		2.22	10	P7-S5		2.38	0
P1A-S2		0.36	550	P4-S1		0.7	>600	P1A-S1		1.03	300	P8-S1		0.17	>600
P2-S1		0.04	>600	P4-S2		2.89	0	P2-S5		1.71	40	P8-S2		0.78	350
P2-S2		0.17	>600	P4-S3		1.96	100	P3-S4		0.59	650	P8-S3		0.91	210
P2-S3		0.4	450	P4-S4		2.87	0					P8-S4		1.04	125
P2-S4		0.48	300	P4-S5		2.9	0					P8-S5		1.8	10
P2-S5		0.95	35	P5-S1		0.17	>600					P9-S1		0.14	>600
				P5-S2		0.68	>600					P9-S2		2.04	5
				P5-S3		0.25	>600					P9-S3		1.25	60
				P5-S4		0.41	>600					P9-S4		0.23	>600
				P5-S5		1.7	225					P9-S5		2.28	0
				P1-S1a		0.85	~800					P10-S1		0.28	>600
												P10-S2		1.54	30
												P10-S3		0.18	>600
												P10-S4		0.24	>600
												P10A-S1		0.13	>600
												P10A-S2		2.00	5
Notes:		a - sample diluted 1:100, therefore actual concentration about 80,000 ug/kg													

TABLE 3–PESTICIDE ANALYSES (TOTALS) DETECTED COMPOUNDS

Boring, Sample No.	Depth, ft.	Chlordane (Tech.)	Aldrin	Beta-BHC	Delta-BHC	Gamma-BHC (Lindane)	Alpha-Chlordane
		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
P-1, S-1	0 to 2	54,000	--	320	--	--	3,600
P-1, S-2	2 to 4	19,000	--	--	--	--	1,300
P-1, S-3	4 to 6	18,000	--	--	--	--	1,200
P-1, S-4	6 to 8	34,000	50	210	--	--	2,200
P-1 A, S-1	8 to 10	460	--	--	--	--	--
P-1 A, S-2	10 to 12	--	--	--	--	--	--
P-2, S-1	0 to 2	120,000	290	370	180	--	7,700
P-2, S-2	2 to 4	1,000	--	--	--	820	--
P-2, S-3	4 to 6	--	--	--	--	--	--
P-2, S-4	6 to 8	--	--	--	--	--	--
P-2, S-5	8 to 10	--	--	--	--	--	--
P-3, S-1	0 to 2	580	--	--	--	1,500	620
P-3, S-2	2 to 4	--	--	--	--	750	570
P-3, S-3	4 to 6	2,500	--	--	--	--	1700
P-3, S-4	6 to 8	--	--	--	--	--	--
P-3, S-5	8 to 10	730	--	--	--	490	2,300
P-4, S-1	0 to 2	2,300	--	--	--	--	2,700
P-4, S-2	2 to 4	--	--	--	--	--	--
P-4, S-3	4 to 6	--	--	--	--	--	--
P-4, S-4	6 to 8	--	--	--	--	--	--
P-4, S-5	8 to 10	--	--	--	--	--	--
P-5, S-1	0 to 2	12,000	--		--	--	--
P-5, S-2	2 to 4		--	580	--	1200	1000
P-5, S-3	4 to 6	2,900	--	--	--	--	1,900
P-5, S-4	6 to 8	1,100	--	--	--	--	920
P-5, S-5	8 to 10		--	--	--	--	--
P-6, S-1	0 to 2	490	--	--	--	--	780
P-6, S-2	2 to 4	--	--	--	--	--	--
P-6, S-3	4 to 6	--	--	--	--	--	590
P-6, S-4	6 to 8	--	--	--	--	--	730
P-6, S-5	8 to 10	--	--	--	--	--	--
P-7, S-1	0 to 2	--	--	--	--	--	--
P-7, S-2	2 to 4	--	--	--	--	--	--
P-7, S-3	4 to 6	--	--	--	--	--	--
P-7, S-4	6 to 8	--	--	--	--	--	--
P-7, S-5	8 to 10	--	--	--	--	--	--
P-8, S-1	0 to 2	9,200	--	--	--	--	480
P-8, S-2	2 to 4	--	--	--	--	--	--
P-8, S-3	4 to 6	--	--	--	--	--	--
P-8, S-4	6 to 8	--	--	--	--	--	--
P-8, S-5	8 to 10	--	--	--	--	--	--
P-9, S-1	0 to 2	4,800	--	41	--	--	660
P-9, S-2	2 to 4	--	--	--	--	--	--
P-9, S-3	4 to 6	--	--	--	--	--	--
P-9, S-4	6 to 8	7,900	--	--	--	1,100	790
P-9, S-5	8 to 10	--	--	--	--	--	
P-10, S-1	0 to 2	1,600	--	--	--	--	110
P-10, S-2	2 to 4	--	--	--	--	--	--
P-10, S-3	4 to 6	22,000	180	--	48	--	760
P-10, S-4	6 to 8	9,700	75	--	--	--	400
P-10A, S-1	8 to 10	25,000	--	--	--	--	2,400
P-10A, S-2	10 to 12	--	--	--	--	--	--

"—" = non-detect

Severn Trent Laboratory Reports November 29 and 30, 2001.

TABLE 3–PESTICIDE ANALYSES (TOTALS) DETECTED COMPOUNDS

Boring, Sample No.	Depth, ft.	Gamma-Chlordane	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endrin	Endrin ketone
		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
P-1, S-1	0 to 2	6,700	150	220	1,600	440	1,200	--
P-1, S-2	2 to 4	2,900	150	90	370	--	910	140
P-1, S-3	4 to 6	2,100	240	110	700	120	850	120
P-1, S-4	6 to 8	3,600	300	140	600	140	2,300	200
P-1A, S-1	8 to 10	370	--	--	--	--	--	--
P-1A, S-2	10 to 12	450	--	--	--	--	--	--
P-2, S-1 .	0 to 2	13,000	1,600	480	2,500	1,100	5,400	590
P-2, S-2	2 to 4	990	--	--	--	--	380	--
P-2, S-3	4 to 6	--	--	--	--	--	--	--
P-2, S-4	6 to 8	--	--	--	--	--	--	--
P-2, S-5	8 to 10	--	--	--	--	--	--	--
P-3, S-1	0 to 2	770	480	--	--	--	--	--
P-3, S-2	2 to 4	480	--	--	--	--	--	--
P-3, S-3	4 to 6	3600	500	--	410	--	5,500	--
P-3, S-4	6 to 8	--	--	--	--	--	--	--
P-3, S-5	8 to 10	1,700	--	--	--	--	680	--
P-4, S-1	0 to 2	3,900	880	--	620	--	440	--
P-4, S-2	2 to 4	--	--	--	--	--	--	--
P-4, S-3	4 to 6	--	--	--	--	--	--	--
P-4, S-4	6 to 8	--	--	--	--	--	--	--
P-4, S-5	8 to 10	--	--	--	--	--	--	--
P-5, S-1	0 to 2	--	--	--	--	--	--	--
P-5, S-2	2 to 4	--	830	--	--	--	--	440
P-5, S-3	4 to 6	2,700	--	--	--	--	1100	--
P-5, S-4	6 to 8	1,600	--	--	--	--	--	--
P-5, S-5	8 to 10	--	--	--	--	--	--	--
P-6, S-1	0 to 2	770	--	--	460	--	--	--
P-6, S-2	2 to 4	--	--	--	--	--	--	--
P-6, S-3	4 to 6	--	500	--	--	--	--	--
P-6, S-4	6 to 8	--	490	--	--	--	--	--
P-6, S-5	8 to 10	--	--	--	--	--	--	--
P-7, S-1	0 to 2	--	--	--	--	--	--	--
P-7, S-2	2 to 4	--	--	--	--	--	--	53
P-7, S-3	4 to 6	--	--	--	--	--	--	--
P-7, S-4	6 to 8	--	--	--	--	--	--	--
P-7, S-5	8 to 10	--	--	--	--	--	--	--
P-8, S-1	0 to 2	820	--	--	63	--	87	--
P-8, S-2	2 to 4	--	--	--	--	--	--	--
P-8, S-3	4 to 6	--	--	--	--	--	--	--
P-8, S-4	6 to 8	--	--	--	--	--	--	--
P-8, S-5	8 to 10	--	--	--	--	--	--	--
P-9, S-1	0 to 2	760	93	--	51	--	230	--
P-9, S-2	2 to 4	--	--	--	--	--	--	--
P-9, S-3	4 to 6	--	--	--	--	--	--	--
P-9, S-4	6 to 8	1,100	180	64	280	--	52	--
P-9, S-5	8 to 10	--	--	--	--	--	--	--
P-10, S-1	0 to 2	210	--	--	--	--	44	--
P-10, S-2	2 to 4	--	--	--	--	--	--	--
P-10, S-3	4 to 6	2,800	--	97	98	--	160	--
P-10, S-4	6 to 8	1,300	--	44	--	--	74	--
P-10A, S-1	8 to 10	3,000	380	57	80	71	220	--
P-10A, S-2	10 to 12	--	--	--	--	--	--	--

"—" = non-detect

Severn Trent Laboratory Reports November 29 and 30, 2001.

TABLE 3–PESTICIDE ANALYSES (TOTALS) DETECTED COMPOUNDS

Boring, Sample No.	Depth, ft.	Heptachlor	Heptachlor epoxide	Endosulfan I	Endosulfan II	Endrin Aldehyde	Methoxychlor
		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
P-1, S-1	0 to 2	6,200	590	73	220	470	57J
P-1, S-2	2 to 4	2,100	220	66	96	--	40J
P-1, S-3	4 to 6	2,100	220	73	110	--	--
P-1, S-4	6 to 8	3,700	400	41	210	--	--
P-1A, S-1	8 to 10	500	--	--	--	--	--
P-1A, S-2	10 to 12	--	--	--	--	--	--
P-2, S-1	0 to 2	13,000	1,700	200	330	920	180
P-2, S-2	2 to 4	1,400	--	--	--	--	--
P-2, S-3	4 to 6	--	--	--	--	--	--
P-2, S-4	6 to 8	--	--	--	--	--	--
P-2, S-5	8 to 10	--	--	--	--	--	--
P-3, S-1	0 to 2	780	--	--	--	--	--
P-3, S-2	2 to 4	--	--	--	--	--	--
P-3, S-3	4 to 6	3,300	--	--	--	--	--
P-3, S-4	6 to 8	--	--	--	--	--	--
P-3, S-5	8 to 10	--	--	--	--	--	--
P-4, S-1	0 to 2	3,200	1,200	--	--	--	--
P-4, S-2	2 to 4	--	--	--	--	--	--
P-4, S-3	4 to 6	--	--	--	--	--	--
P-4, S-4	6 to 8	--	--	--	--	--	--
P-4, S-5	8 to 10	--	--	--	--	--	--
P-5, S-1	0 to 2	--	--	--	--	--	--
P-5, S-2	2 to 4	--	--	--	--	--	--
P-5, S-3	4 to 6	4,300	500	--	--	--	--
P-5, S-4	6 to 8	1,700	--	--	--	--	--
P-5, S-5	8 to 10	--	--	--	--	--	--
P-6, S-1	0 to 2	--	--	--	--	--	--
P-6, S-2	2 to 4	--	--	--	--	--	--
P-6, S-3	4 to 6	--	--	--	--	--	--
P-6, S-4	6 to 8	--	--	--	--	--	--
P-6, S-5	8 to 10	--	--	--	--	--	--
P-7, S-1	0 to 2	--	--	--	--	49	--
P-7, S-2	2 to 4	--	--	--	--	--	--
P-7, S-3	4 to 6	--	--	--	--	--	--
P-7, S-4	6 to 8	--	--	--	--	--	--
P-7, S-5	8 to 10	--	--	--	--	--	--
P-8, S-1	0 to 2	680	110	--	--	--	--
P-8, S-2	2 to 4	--	--	--	--	--	--
P-8, S-3	4 to 6	--	--	--	--	--	--
P-8, S-4	6 to 8	--	--	--	--	--	--
P-8, S-5	8 to 10	--	--	--	--	--	--
P-9, S-1	0 to 2	410	68	--	--	--	--
P-9, S-2	2 to 4	--	--	--	--	--	--
P-9, S-3	4 to 6	--	--	--	--	--	--
P-9, S-4	6 to 8	1,100	62	--	--	--	--
P-9, S-5	8 to 10	--	--	--	--	--	--
P-10, S-1	0 to 2	220	49	--	--	--	--
P-10, S-2	2 to 4	--	--	--	--	--	--
P-10, S-3	4 to 6	4,100	290	--	--	--	--
P-10, S-4	6 to 8	1,700	120	--	--	--	--
P-10A, S-1	8 to 10	4,100	400	--	--	--	--
P-10A, S-2	10 to 12	--	--	--	--	--	--

"—" = non-detect
J = Estimated result. Results less than reporting limit.
Severn Trent Laboratory Reports November 29 and 30, 2001.

Attachment A

Sample Results from the Underground Storage Tank Excavation (1988)

Burmah

STS Consultants
Attn: Audrius Remeikis

August 17, 1988

PROGRAM: STS 25585XF

Date Received: 8-8-88
ALD Number: 42415
Client I.D.: UST
8-4-88

Pesticides and PCB's, mg/kg

Aldrin	BDL
a-BHC	BDL
b-BHC	BDL
g-BHC	BDL
d-BHC	BDL
Chlordane	3
4,4'-DDT	BDL
4,4'-DDE	BDL
4,4'-DDD	BDL
Dieldrin	BDL
a-Endosulfan	BDL
b-Endosulfan	BDL
Endosulfan Sulfate	BDL
Endrin	BDL
Endrin Aldehyde	BDL
Heptachlor	6
Heptachlor Epoxide	BDL
PCB-1242	BDL
PCB-1254	BDL
PCB-1221	BDL
PCB-1232	BDL
PCB-1248	BDL
PCB-1260	BDL
PCB-1016	BDL
Toxaphene	BDL

BDL - Below Detection Level EPA Methods 8240, 8250.

Sample detection limits, mg/kg:
Volatile Organic fraction - 0.5
Base-Neutral/Pesticide fraction - 2
Acid fraction - 2

STS/8L

Susan K. Scott
Laboratory Supervisor

Burmah

STS Consultants
Attn: Audrius Remeikis

August 17, 1988

PROGRAM: STS 25585XF

Date Received: 8-8-88
ALD Number: 42415
Client I.D.: UST
8-4-88

Base/Neutral Compounds (cont'd.), mg/kg

Fluorene	BDL
Hexachlorobenzene	BDL
Hexachlorobutadiene	BDL
Hexachlorocyclopentadiene	BDL
Hexachloroethane	BDL
Indeno(1,2,3-cd)pyrene	BDL
Isophorone	BDL
Naphthalene	BDL
Nitrobenzene	BDL
N-Nitrosodimethylamine	BDL
N-Nitroso-di-n-propylamine	BDL
N-Nitrosodiphenylamine	BDL
Phenanthrene	BDL
Pyrene	BDL
1,2,4-Trichlorobenzene	BDL

Acid Compounds, mg/kg

2-Chlorophenol	BDL
2,4-Dichlorophenol	BDL
2,4-Dimethylphenol	BDL
4,6-Dinitro-o-cresol	BDL
2,4-Dinitrophenol	BDL
2-Nitrophenol	BDL
4-Nitrophenol	BDL
p-Chloro-m-cresol	BDL
Pentachlorophenol	BDL
Phenol	BDL
2,4,6-Trichlorophenol	BDL

Burmah

STS Consultants
Attn: Audrius Remeikis

August 17, 1988

PROGRAM: STS 25585XF

Date Received: 8-8-88

ALD Number:	42415
Client I.D.:	UST
	8-4-88

Base/Neutral Compounds, mg/kg

Acenaphthene	BDL
Acenaphthylene	BDL
Anthracene	BDL
Benzidine	BDL
Benzo(a)anthracene	BDL
Benzo(a)pyrene	BDL
Benzo(b)fluoranthene	BDL
Benzo(ghi)perylene	BDL
Benzo(k)fluoranthene	BDL
Bis(2-chloroethoxy)methane	BDL
Bis(2-chloroethyl)ether	BDL
Bis(2-chloroisopropyl)ether	BDL
Bis(2-ethylhexyl)phthalate	BDL
4-Bromophenyl phenyl ether	BDL
Butylbenzyl phthalate	BDL
2-Chloronaphthalene	BDL
4-Chlorophenyl phenyl ether	BDL
Chrysene	BDL
Dibenzo(a,h)anthracene	BDL
1,2-Dichlorobenzene	BDL
1,3-Dichlorobenzene	BDL
1,4-Dichlorobenzene	BDL
3,3-Dichlorobenzidine	BDL
Diethyl phthalate	BDL
Dimethyl phthalate	BDL
Di-n-butyl phthalate	BDL
2,4-Dinitrotoluene	BDL
2,6-Dinitrotoluene	BDL
Di-n-octyl phthalate	BDL
1,2-Diphenylhydrazine	BDL
Fluoranthene	BDL

(a) Isomeric Pair - Value incorporated with Phenanthrene.
(b) Isomeric Pair - Value incorporated with Chrysene.
(c) Isomeric Pair - Value incorporated with Benzo(k)fluoranthene.

STS/6L

Burmah

STS Consultants
Attn: Audrius Remeikis

August 17, 1988

PROGRAM: STS 25585XF

Date Received: 8-8-88	
ALD Number:	42415
Client I.D.:	UST 8-4-88
Physical Description:	All 100% Soils
2,4-D, mg/kg	3
2,4,5-TP, mg/kg	<0.1

Volatile Organic Compounds, mg/kg

Acrolein	BDL
Acrylonitrile	BDL
Benzene	BDL
Bromoform	BDL
Carbon Tetrachloride	BDL
Chlorobenzene	BDL
Chlorodibromomethane	BDL
Chloroethane	BDL
2-Chloroethylvinyl ether	BDL
Chloroform	BDL
Dichlorobromomethane	BDL
1,1-Dichloroethane	BDL
1,2-Dichloroethane	BDL
1,1-Dichloroethylene	BDL
1,2-Dichloropropane	BDL
1,3-Dichloropropene	BDL
Ethylbenzene	BDL
Methyl Bromide	BDL
Methyl Chloride	BDL
Methylene Chloride	BDL
1,1,2,2-Tetrachloroethane	BDL
Tetrachloroethylene	BDL
Toluene	BDL
Trans-1,2-Dichloroethylene	BDL
1,1,1-Trichloroethane	BDL
1,1,2-Trichloroethane	BDL
Trichloroethylene	BDL
Trichlorofluoromethane	BDL
Vinyl Chloride	BDL

STS/5L

Attachment B

Downhole Field Logs

GMO Site

DOWNHOLE FIELD LOG
Project #25585XG

Date: 8-20-2001
Technician: Brett Barton

Instrument Model # Ludlum 2221
Serial # 132844
Probe Model # PR 44-10
Serial # 168144

Operational Check: 18700cpm

Cutoff Value = 7.2pCi/gm =
18,059 counts per 30 Sec.

• Shielded (2")

Boring # B-1 / Location H.5 - 3.25 (Max Depth 7.5 ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	86139	15.5	
1	341206	16	
1.5	992865	16.5	
2	>999960	17	
2.5	>999960	17.5	
3	614919	18	
3.5	299541	18.5	
4	219195	19	
4.5	86168	19.5	
5	37683	20	
5.5	30545	20.5	
6	25745	21	
6.5	13400	21.5	
7	10288	22	
7.5	11521	22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG

Project #25585XG

Date: 8-20-2001

Instrument Model # Ludlum 2221

Serial # 127242

Probe Model # PR 44-10

Serial # 168148

• Shielded (2")

Technician: Brett Barton

Operational Check: 18700cpm

Cutoff Value = 7.2pCi/gm =

18,804 counts per 30 Sec.

Boring # B-2 / Location B.5 - 5.25 (Max Depth 9ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	168094	15.5	
1	150027	16	
1.5	56052	16.5	
2	35464	17	
2.5	27961	17.5	
3	21006	18	
3.5	21155	18.5	
4	21794	19	
4.5	26850	19.5	
5	30927	20	
5.5	33153	20.5	
6	31714	21	
6.5	26472	21.5	
7	29515	22	
7.5	23019	22.5	
8	13265	23	
8.5	7378	23.5	
9	6335	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG
Project #25585XG

Date: 8-20-2001
Technician: Brett Barton

Instrument Model # Ludlum 2221
Serial # 132844
Probe Model # PR 44-10
Serial # 168144

Operational Check: 18700cpm

Cutoff Value = 7.2pCi/gm =
18,059 counts per 30 Sec.

• Shielded (2")

Boring # B-3 / Location G.25 - 6.5 (Max Depth 8.5ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	17353	15.5	
1	23827	16	
1.5	21717	16.5	
2	27851	17	
2.5	23637	17.5	
3	18913	18	
3.5	10646	18.5	
4	9758	19	
4.5	11221	19.5	
5	12070	20	
5.5	8035	20.5	
6	7309	21	
6.5	8629	21.5	
7	8208	22	
7.5	6382	22.5	
8	4830	23	
8.5	4074	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG

Project #25585XG

Date: 8-20-2001

Technician: Brett Barton

Instrument Model # Ludlum 2221

Serial # 132844

Probe Model # PR 44-10

Serial # 168144

Operational Check: 18700cpm

Cutoff Value = 7.2pCi/gm =

18,059 counts per 30 Sec.

• Shielded (2")

Boring # B-4 / Location F.5 - 3.25 (Max Depth 7.5ft)

Depth - FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	29050	15.5	
1	85576	16	
1.5	176228	16.5	
2	103491	17	
2.5	53678	17.5	
3	28589	18	
3.5	19295	18.5	
4	13542	19	
4.5	10537	19.5	
5	9021	20	
5.5	8608	20.5	
6	8278	21	
6.5	5633	21.5	
7	4773	22	
7.5	4885	22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG
Project #25585XG

Date: 8-20-2001
Technician: Brett Barton

Instrument Model # Ludlum 2221
Serial # 127242
Probe Model # PR 44-10
Serial # 168148

Operational Check: 18700cpm

Cutoff Value = 7.2pCi/gm =
18,804 counts per 30 Sec.

• Shielded (2")

Boring # B-5 / Location D - 3.25 (Max Depth 7.5ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	229019	15.5	
1	744577	16	
1.5	>999960	16.5	
2	>999960	17	
2.5	>999960	17.5	
3	>999960	18	
3.5	542161	18.5	
4	262901	19	
4.5	100578	19.5	
5	54792	20	
5.5	40168	20.5	
6	46183	21	
6.5	28676	21.5	
7	18405	22	
7.5	28298	22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG

Project #25585XG

Date: 8-20-2001

Technician: Brett Barton

Instrument Model # Ludlum 2221

Serial # 132844

Probe Model # PR 44-10

Serial # 168144

• Shielded (2")

Operational Check: 18700cpm

Cutoff Value = 7.2pCi/gm =

18,059 counts per 30 Sec.

Boring # B-6 / Location C.75 - 16 (Max Depth 9 ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	14590	15.5	
1	65077	16	
1.5	36439	16.5	
2	12813	17	
2.5	8285	17.5	
3	7353	18	
3.5	7414	18.5	
4	9260	19	
4.5	9204	19.5	
5	6679	20	
5.5	5502	20.5	
6	6429	21	
6.5	4787	21.5	
7	3520	22	
7.5	3091	22.5	
8	3102	23	
8.5	3158	23.5	
9	3259	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG

Project #25585XG

Date: 8-20-2001

Technician: Brett Barton

Instrument Model # Ludlum 2221

Serial # 132844

Probe Model # PR 44-10

Serial # 168144

• Shielded (2")

Operational Check: 18700cpm

Cutoff Value = 7.2pCi/gm =

18,059 counts per 30 Sec.

Boring # B-7 / Location F - 5 (Max Depth 12 ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	4532	15.5	
1	5499	16	
1.5	4793	16.5	
2	5383	17	
2.5	6695	17.5	
3	8318	18	
3.5	8438	18.5	
4	8615	19	
4.5	8348	19.5	
5	7629	20	
5.5	7567	20.5	
6	7484	21	
6.5	7503	21.5	
7	8053	22	
7.5	8378	22.5	
8	8807	23	
8.5	8720	23.5	
9	8324	24	
9.5	8125	24.5	
10	7297	25	
10.5	4949	25.5	
11	3115	26	
11.5	3035	26.5	
12	3030	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG

Project #25585XG

Date: 08-21-01

Technician: Glen Huber

Instrument Model # Ludlum 2221

Serial # 132844

Probe Model # PR 44-10

Serial # 168144

• Shielded (2")

Operational Check: 19200cpm

Cutoff Value = 7.2pCi/gm =

18,059 counts per 30 Sec.

Boring # B-8 / J - 10.5 (Max Depth 9 ft 3 in)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	52464	15.5	
1	186532	16	
1.5	527433	16.5	
2	776980	17	
2.5	405326	17.5	
3	130970	18	
3.5	50042	18.5	
4	26849	19	
4.5	14328	19.5	
5	9099	20	
5.5	10256	20.5	
6	10390	21	
6.5	7921	21.5	
7	5081	22	
7.5	3950	22.5	
8	3810	23	
8.5	3645	23.5	
9	3800	24	
9' 3"	5216	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG

Project #25585XG

Date: 08-21-01

Technician: Glen Huber

Instrument Model # Ludlum 2221

Serial # 132844

Probe Model # PR 44-10

Serial # 168144

• Shielded (2")

Operational Check: 19200cpm

Cutoff Value = 7.2pCi/gm =

18,059 counts per 30 Sec.

Boring # B-9 / J.5 – 18.75 (Max Depth 9 ft 10 in)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	219312	15.5	
1	575019	16	
1.5	904822	16.5	
2	601106	17	
2.5	245547	17.5	
3	94312	18	
3.5	60323	18.5	
4	37790	19	
4.5	14787	19.5	
5	8914	20	
5.5	7309	20.5	
6	6757	21	
6.5	5570	21.5	
7	4981	22	
7.5	5432	22.5	
8	4682	23	
8.5	4482	23.5	
9	4451	24	
9.5	5109	24.5	
9' 10"	5299	25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG

Project #25585XG

Date: 08-21-01

Technician: Glen Huber

Instrument Model # Ludlum 2221

Serial # 132844

Probe Model # PR 44-10

Serial # 168144

• Shielded (2")

Operational Check: 19200cpm

Cutoff Value = 7.2pCi/gm =

18,059 counts per 30 Sec.

Boring # B-10 / E - 20 (Max Depth 8 ft 3 in)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	1990	15.5	
1	3060	16	
1.5	4309	16.5	
2	4209	17	
2.5	4725	17.5	
3	4135	18	
3.5	3415	18.5	
4	3693	19	
4.5	3943	19.5	
5	3487	20	
5.5	3464	20.5	
6	3357	21	
6.5	3539	21.5	
7	3029	22	
7.5	2871	22.5	
8	2709	23	
8' 3''	2828	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/8/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 18,100

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm =

* Shielded (2")

18,804 counts per 30 Sec.

P-1A Boring No.: G.2 – 6.5
(Max Depth 9 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	15917	15.5	
1	13722	16	
1.5	20650	16.5	
2	48743	17	
2.5	21971	17.5	
3	10572	18	
3.5	7797	18.5	
4	9923	19	
4.5	11275	19.5	
5	7512	20	
5.5	6691	20.5	
6	7773	21	
6.5	9629	21.5	
7	9276	22	
7.5	6141	22.5	
8	4374	23	
8.5	4151	23.5	
9	4585	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/8/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 18,100

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm =

* Shielded (2")

18,804 counts per 30 Sec.

P-2 Boring No.: G.8 – 5.8
(Max Depth 9.5 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5229	15.5	
1	7471	16	
1.5	14640	16.5	
2	23960	17	
2.5	42825	17.5	
3	92894	18	
3.5	47746	18.5	
4	17639	19	
4.5	7861	19.5	
5	6083	20	
5.5	5553	20.5	
6	6827	21	
6.5	6066	21.5	
7	6307	22	
7.5	5414	22.5	
8	4315	23	
8.5	3193	23.5	
9	2966	24	
9.5	2898	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/8/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 18,100

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm =

* Shielded (2")

18,804 counts per 30 Sec.

P-3 Boring No.: G.7 – 7.6
(Max Depth 10.5 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3876	15.5	
1	5446	16	
1.5	6451	16.5	
2	6791	17	
2.5	6994	17.5	
3	7084	18	
3.5	7248	18.5	
4	7270	19	
4.5	7422	19.5	
5	6574	20	
5.5	5006	20.5	
6	3183	21	
6.5	2726	21.5	
7	2536	22	
7.5	2395	22.5	
8	2242	23	
8.5	2858	23.5	
9	3670	24	
9.5	4061	24.5	
10	4414	25	
10.5	4230	25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/9/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 17,980

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm =

* Shielded (2")

18,804 counts per 30 Sec.

P-4 Boring No.: H – 5.1
(Max Depth 9.5 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4576	15.5	
1	12322	16	
1.5	32252	16.5	
2	49919	17	
2.5	23872	17.5	
3	12214	18	
3.5	7826	18.5	
4	7528	19	
4.5	5983	19.5	
5	4151	20	
5.5	3768	20.5	
6	4500	21	
6.5	2716	21.5	
7	3696	22	
7.5	3658	22.5	
8	2992	23	
8.5	2630	23.5	
9	2424	24	
9.5	2497	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/9/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 17,980

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm =

* Shielded (2")

18,804 counts per 30 Sec.

P-5 Boring No.: F.7 – 6.2
(Max Depth 7.5 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	8965	15.5	
1	13105	16	
1.5	19438	16.5	
2	12996	17	
2.5	10243	17.5	
3	10557	18	
3.5	10628	18.5	
4	10172	19	
4.5	9182	19.5	
5	8573	20	
5.5	7781	20.5	
6	5086	21	
6.5	2431	21.5	
7	1822	22	
7.5	1677	22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/9/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 17,980

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm =

* Shielded (2")

18,804 counts per 30 Sec.

P-6 Boring No.: F.7 – 7.8
(Max Depth 9 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5673	15.5	
1	11939	16	
1.5	35425	16.5	
2	105212	17	
2.5	42197	17.5	
3	20084	18	
3.5	12740	18.5	
4	9295	19	
4.5	8344	19.5	
5	9926	20	
5.5	17554	20.5	
6	26817	21	
6.5	50557	21.5	
7	57546	22	
7.5	15423	22.5	
8	4002	23	
8.5	2351	23.5	
9	2292	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/12/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 18,000

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm =

* Shielded (2")

18,804 counts per 30 Sec.

P-7 Boring No.: H.3 – 6.9
(Max Depth 9.3 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2973	15.5	
1	6861	16	
1.5	8367	16.5	
2	5467	17	
2.5	4933	17.5	
3	4513	18	
3.5	4284	18.5	
4	4914	19	
4.5	5269	19.5	
5	4589	20	
5.5	6229	20.5	
6	8030	21	
6.5	5926	21.5	
7	4624	22	
7.5	4647	22.5	
8	4906	23	
8.5	4540	23.5	
9	3500	24	
9.3	3088	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/12/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 18,000

Serial No: 12742

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm =

* Shielded (2")

18,804 counts per 30 Sec.

P-8 Boring No.: H.3 – 8.5
(Max Depth 9.5 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2339	15.5	
1	3472	16	
1.5	8232	16.5	
2	9382	17	
2.5	9077	17.5	
3	6542	18	
3.5	5562	18.5	
4	5449	19	
4.5	5497	19.5	
5	4721	20	
5.5	5068	20.5	
6	6555	21	
6.5	4570	21.5	
7	3541	22	
7.5	3525	22.5	
8	4113	23	
8.5	3713	23.5	
9	3365	24	
9.5	2901	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/12/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 18,000

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm = 18,804 counts per 30 Sec.

* Shielded (2")

P-9 Boring No.: G – 8.9
(Max Depth 9 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3287	15.5	
1	6269	16	
1.5	7819	16.5	
2	7917	17	
2.5	7825	17.5	
3	7670	18	
3.5	7926	18.5	
4	8023	19	
4.5	7941	19.5	
5	7613	20	
5.5	7445	20.5	
6	6236	21	
6.5	4627	21.5	
7	3487	22	
7.5	3360	22.5	
8	4770	23	
8.5	7614	23.5	
9	6926	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site
Down Hole Field Log – Pesticide Delineation
Project No. 25585XG

Date: 11/12/01

Technician: Brett Barton

Instrument Model No.: Ludlum 2221

Operational Check: 18,000

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168148

Cutoff Value = 7.2 pCi/gm = 18,804 counts per 30 Sec.

* Shielded (2")

P-10A Boring No.: G.5 – 10
(Max Depth 9.5 ft)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5633	15.5	
1	7809	16	
1.5	9485	16.5	
2	10690	17	
2.5	9455	17.5	
3	7995	18	
3.5	8512	18.5	
4	8778	19	
4.5	8383	19.5	
5	6063	20	
5.5	5505	20.5	
6	5701	21	
6.5	5614	21.5	
7	5809	22	
7.5	4869	22.5	
8	4854	23	
8.5	4318	23.5	
9	5853	24	
9.5	7841	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

GMO Site

DOWNHOLE FIELD LOG

Project #25585XG

Date: 8-20-2001

Technician: Brett Barton

Instrument Model # Ludlum 2221

Serial # 132844

Probe Model # PR 44-10

Serial # 168144

• Shielded (2")

Operational Check: 18700cpm

Cutoff Value = 7.2pCi/gm =

18,059 counts per 30 Sec.

Boring # B-3 / Location G.25 - 6.5 (Max Depth 8.5ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	17353	15.5	
1	23827	16	
1.5	21717	16.5	
2	27851	17	
2.5	23637	17.5	
3	18913	18	
3.5	10646	18.5	
4	9758	19	
4.5	11221	19.5	
5	12070	20	
5.5	8035	20.5	
6	7309	21	
6.5	8629	21.5	
7	8208	22	
7.5	6382	22.5	
8	4830	23	
8.5	4074	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.4		29.5	
15		30	

Attachment C

Laboratory Sample Results

TOTALS

ANALYTICAL REPORT

Waste Characterization

Lot #: F1K100102

Rich Berggreen

STS Acquisitions Co.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

SEVERN TRENT LABORATORIES, INC.

John D. Powell
Project Manager

November 30, 2001

METHODS SUMMARY

F1K100102

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Organochlorine Pesticides	SW846 8081A	SW846 1311/3510
Organochlorine Pesticides	SW846 8081A	SW846 3550
Percent Moisture	MCAWW 160.3 MOD	MCAWW 160.3 MOD

References:

MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

F1K100102

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
ENPGD	001	P-1-S-1	11/08/01	09:00
ENPGH	002	P-1-S-2	11/08/01	09:30
ENPGM	003	P-1-S-3	11/08/01	09:42
ENPGN	004	P-1-S-4	11/08/01	09:57
ENPGP	005	P-1A-S-1	11/08/01	10:57
ENPGQ	006	P-1A-S-2	11/08/01	12:29
ENPGR	007	P-2-S-1	11/08/01	11:27
ENPGT	008	P-2-S-2	11/08/01	12:00
ENPG0	009	P-2-S-3	11/08/01	13:47
ENPG2	010	P-2-S-4	11/08/01	14:00
ENPG4	011	P-2-S-5	11/08/01	14:12
ENPG6	012	P-3-S-1	11/08/01	14:58
ENPG7	013	P-3-S-2	11/08/01	15:00
ENPG8	014	P-3-S-3	11/08/01	08:49
ENPG9	015	P-3-S-4	11/08/01	09:09
ENPHA	016	P-3-S-5	11/08/01	15:35
ENPHC	017	P-4-S-1	11/09/01	08:40
ENPHD	018	P-4-S-2	11/09/01	08:49
ENPHE	019	P-4-S-3	11/09/01	08:56
ENPHF	020	P-4-S-4	11/09/01	09:09
ENPHH	021	P-4-S-5	11/09/01	09:22
ENPHJ	022	P-5-S-1	11/09/01	10:14
ENPHK	023	P-5-S-2	11/09/01	10:22
ENPHL	024	P-5-S-3	11/09/01	10:30
ENPHP	025	P-5-S-4	11/09/01	10:44
ENPHQ	026	P-5-S-5	11/09/01	11:16
ENPHR	027	P-6-S-1	11/09/01	12:41
ENPHT	028	P-6-S-2	11/09/01	12:48
ENPHV	029	P-6-S-3	11/09/01	12:57
ENPHW	030	P-6-S-4	11/09/01	13:08
ENPHX	031	P-6-S-5	11/09/01	14:05

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- *All calculations are performed before rounding to avoid round-off errors in calculated results.*
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1-S-1

GC Semivolatiles

Lot-Sample #...:	F1K100102-001	Work Order #...:	ENPGD1AA	Matrix.....:	SOLID
Date Sampled...:	11/08/01 09:00	Date Received..:	11/10/01		
Prep Date.....:	11/10/01	Analysis Date..:	11/12/01		
Prep Batch #...:	1314113	Analysis Time..:	13:28		
Dilution Factor:	1				
% Moisture.....:	13	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**54000**	**7800**	**ug/kg**
gamma-BHC (Lindane)	ND	39	ug/kg
Heptachlor	**6200 E**	**39**	**ug/kg**
Aldrin	ND	39	ug/kg
Dieldrin	**440**	**39**	**ug/kg**
Endrin	**1200 E**	**39**	**ug/kg**
4,4'-DDT	**1600 E**	**39**	**ug/kg**
alpha-BHC	ND	39	ug/kg
beta-BHC	**320**	**39**	**ug/kg**
delta-BHC	ND	39	ug/kg
alpha-Chlordane	**3600 E**	**39**	**ug/kg**
gamma-Chlordane	**6700 E**	**39**	**ug/kg**
4,4'-DDD	**150**	**39**	**ug/kg**
4,4'-DDE	**220**	**39**	**ug/kg**
Endosulfan I	**73**	**39**	**ug/kg**
Endosulfan II	**220**	**39**	**ug/kg**
Endosulfan sulfate	ND	39	ug/kg
Endrin aldehyde	**470**	**39**	**ug/kg**
Endrin ketone	ND	39	ug/kg
Heptachlor epoxide	**590**	**39**	**ug/kg**
Methoxychlor	**57 J**	**76**	**ug/kg**
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1-S-2

GC Semivolatiles

Lot-Sample #...: F1K100102-002 **Work Order #...:** ENPGH1AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 09:30 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 13:45
Dilution Factor: 1
% Moisture.....: 16 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**19000**	**8100**	**ug/kg**
gamma-BHC (Lindane)	ND	41	ug/kg
Heptachlor	**2100 E**	**41**	**ug/kg**
Aldrin	ND	41	ug/kg
Dieldrin	ND	41	ug/kg
Endrin	**910 E**	**41**	**ug/kg**
4,4'-DDT	**370**	**41**	**ug/kg**
alpha-BHC	ND	41	ug/kg
beta-BHC	ND	41	ug/kg
delta-BHC	ND	41	ug/kg
alpha-Chlordane	**1300 E**	**41**	**ug/kg**
gamma-Chlordane	**2900 E**	**41**	**ug/kg**
4,4'-DDD	**150**	**41**	**ug/kg**
4,4'-DDE	**90**	**41**	**ug/kg**
Endosulfan I	**66**	**41**	**ug/kg**
Endosulfan II	**96**	**41**	**ug/kg**
Endosulfan sulfate	ND	41	ug/kg
Endrin aldehyde	ND	41	ug/kg
Endrin ketone	**140**	**41**	**ug/kg**
Heptachlor epoxide	**220**	**41**	**ug/kg**
Methoxychlor	ND	79	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1-S-3

GC Semivolatiles

Lot-Sample #...:	F1K100102-003	Work Order #...:	ENPGM1AA	Matrix.....:	SOLID
Date Sampled...:	11/08/01 09:42	Date Received..:	11/10/01		
Prep Date.....:	11/10/01	Analysis Date..:	11/12/01		
Prep Batch #...:	1314113	Analysis Time..:	14:02		
Dilution Factor:	1				
% Moisture.....:	14	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**18000**	**7900**	**ug/kg**
gamma-BHC (Lindane)	ND	40	ug/kg
Heptachlor	**2100 E**	**40**	**ug/kg**
Aldrin	ND	40	ug/kg
Dieldrin	**120**	**40**	**ug/kg**
Endrin	**850 E**	**40**	**ug/kg**
4,4'-DDT	**700**	**40**	**ug/kg**
alpha-BHC	ND	40	ug/kg
beta-BHC	ND	40	ug/kg
delta-BHC	ND	40	ug/kg
alpha-Chlordane	**1200 E**	**40**	**ug/kg**
gamma-Chlordane	**2100 E**	**40**	**ug/kg**
4,4'-DDD	**240**	**40**	**ug/kg**
4,4'-DDE	**110**	**40**	**ug/kg**
Endosulfan I	**73**	**40**	**ug/kg**
Endosulfan II	**110**	**40**	**ug/kg**
Endosulfan sulfate	ND	40	ug/kg
Endrin aldehyde	ND	40	ug/kg
Endrin ketone	**120**	**40**	**ug/kg**
Heptachlor epoxide	**220**	**40**	**ug/kg**
Methoxychlor	**40 J**	**77**	**ug/kg**
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1-S-4

GC Semivolatiles

Lot-Sample #...:	F1K100102-004	**Work Order #...:**	ENPGN1AA	**Matrix.....:**	SOLID
Date Sampled...:	11/08/01 09:57	**Date Received..:**	11/10/01		
Prep Date.....:	11/10/01	**Analysis Date..:**	11/12/01		
Prep Batch #...:	1314113	**Analysis Time..:**	15:07		
Dilution Factor:	1				
% Moisture.....:	14	**Method.....:**	*SW846 8081A*		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**34000**	**7900**	**ug/kg**
gamma-BHC (Lindane)	ND	39	ug/kg
Heptachlor	**3700 E**	**39**	**ug/kg**
Aldrin	**50**	**39**	**ug/kg**
Dieldrin	**140**	**39**	**ug/kg**
Endrin	**2300 E**	**39**	**ug/kg**
4,4'-DDT	**600**	**39**	**ug/kg**
alpha-BHC	ND	39	ug/kg
beta-BHC	**210**	**39**	**ug/kg**
delta-BHC	ND	39	ug/kg
alpha-Chlordane	**2200 E**	**39**	**ug/kg**
gamma-Chlordane	**3600 E**	**39**	**ug/kg**
4,4'-DDD	**300**	**39**	**ug/kg**
4,4'-DDE	**140**	**39**	**ug/kg**
Endosulfan I	**41**	**39**	**ug/kg**
Endosulfan II	**210**	**39**	**ug/kg**
Endosulfan sulfate	ND	39	ug/kg
Endrin aldehyde	ND	39	ug/kg
Endrin ketone	**200**	**39**	**ug/kg**
Heptachlor epoxide	**400**	**39**	**ug/kg**
Methoxychlor	ND	76	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1A-S-1

GC Semivolatiles

Lot-Sample #...: F1K100102-005 **Work Order #...:** ENPGP1AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 10:57 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 15:24
Dilution Factor: 20
% Moisture.....: 5.7 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**460**	**360**	**ug/kg**
alpha-Chlordane	ND	36	ug/kg
gamma-Chlordane	**370**	**36**	**ug/kg**
4,4'-DDD	ND	36	ug/kg
4,4'-DDE	ND	36	ug/kg
4,4'-DDT	ND	36	ug/kg
Dieldrin	ND	36	ug/kg
Endosulfan I	ND	36	ug/kg
Aldrin	ND	36	ug/kg
alpha-BHC	ND	36	ug/kg
beta-BHC	ND	36	ug/kg
delta-BHC	ND	36	ug/kg
gamma-BHC (Lindane)	ND	36	ug/kg
Endosulfan II	ND	36	ug/kg
Endosulfan sulfate	ND	36	ug/kg
Endrin	ND	36	ug/kg
Endrin aldehyde	ND	36	ug/kg
Endrin ketone	ND	36	ug/kg
Heptachlor	**500**	**36**	**ug/kg**
Heptachlor epoxide	ND	36	ug/kg
Methoxychlor	ND	70	ug/kg
Toxaphene	ND	1400	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1A-S-2

GC Semivolatiles

Lot-Sample #...: F1K100102-006 **Work Order #...:** ENPGQ1AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 12:29 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 15:42
Dilution Factor: 20
% Moisture.....: 13 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND J	390	ug/kg
Aldrin	ND	39	ug/kg
alpha-BHC	ND	39	ug/kg
beta-BHC	ND	39	ug/kg
delta-BHC	ND	39	ug/kg
gamma-BHC (Lindane)	ND	39	ug/kg
alpha-Chlordane	ND	39	ug/kg
gamma-Chlordane	**450**	**39**	**ug/kg**
4,4'-DDD	ND	39	ug/kg
4,4'-DDE	ND	39	ug/kg
4,4'-DDT	ND	39	ug/kg
Dieldrin	ND	39	ug/kg
Endosulfan I	ND	39	ug/kg
Endosulfan II	ND	39	ug/kg
Endosulfan sulfate	ND	39	ug/kg
Endrin	ND	39	ug/kg
Endrin aldehyde	ND	39	ug/kg
Endrin ketone	ND	39	ug/kg
Heptachlor	ND	39	ug/kg
Heptachlor epoxide	ND	39	ug/kg
Methoxychlor	ND	76	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-2-S-1

GC Semivolatiles

Lot-Sample #...:	F1K100102-007	Work Order #...:	ENPGR1AA	Matrix.....:	SOLID
Date Sampled...:	11/08/01 11:27	Date Received..:	11/10/01		
Prep Date.....:	11/10/01	Analysis Date..:	11/12/01		
Prep Batch #...:	1314113	Analysis Time..:	15:59		
Dilution Factor:	1				
% Moisture.....:	9.3	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**120000**	**7500**	**ug/kg**
gamma-BHC (Lindane)	ND	37	ug/kg
Heptachlor	**13000 E**	**37**	**ug/kg**
Aldrin	**290**	**37**	**ug/kg**
Dieldrin	**1100 E**	**37**	**ug/kg**
Endrin	**5400 E**	**37**	**ug/kg**
4,4'-DDT	**2500 E**	**37**	**ug/kg**
alpha-BHC	ND	37	ug/kg
beta-BHC	**370**	**37**	**ug/kg**
delta-BHC	**180**	**37**	**ug/kg**
alpha-Chlordane	**7700 E**	**37**	**ug/kg**
gamma-Chlordane	**13000 E**	**37**	**ug/kg**
4,4'-DDD	**1600 E**	**37**	**ug/kg**
4,4'-DDE	**480**	**37**	**ug/kg**
Endosulfan I	**200**	**37**	**ug/kg**
Endosulfan II	**330**	**37**	**ug/kg**
Endosulfan sulfate	ND	37	ug/kg
Endrin aldehyde	**920 E**	**37**	**ug/kg**
Endrin ketone	**590**	**37**	**ug/kg**
Heptachlor epoxide	**1700 E**	**37**	**ug/kg**
Methoxychlor	**180**	**73**	**ug/kg**
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E *Estimated result. Result concentration exceeds the calibration range.*

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-2-S-2

GC Semivolatiles

Lot-Sample #...: F1K100102-008 **Work Order #...:** ENPGT1AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 12:00 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 16:16
Dilution Factor: 20
% Moisture.....: 14 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**1000**	**400**	**ug/kg**
Aldrin	ND	40	ug/kg
alpha-BHC	ND	40	ug/kg
beta-BHC	ND	40	ug/kg
delta-BHC	ND	40	ug/kg
gamma-BHC (Lindane)	**820 E**	**40**	**ug/kg**
alpha-Chlordane	ND	40	ug/kg
gamma-Chlordane	**990**	**40**	**ug/kg**
4,4'-DDD	ND	40	ug/kg
4,4'-DDE	ND	40	ug/kg
4,4'-DDT	ND	40	ug/kg
Dieldrin	ND	40	ug/kg
Endosulfan I	ND	40	ug/kg
Endosulfan II	ND	40	ug/kg
Endosulfan sulfate	ND	40	ug/kg
Endrin	**380**	**40**	**ug/kg**
Endrin aldehyde	ND	40	ug/kg
Endrin ketone	ND	40	ug/kg
Heptachlor	**1400 E**	**40**	**ug/kg**
Heptachlor epoxide	ND	40	ug/kg
Methoxychlor	ND	77	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-2-S-3

GC Semivolatiles

Lot-Sample #...: F1K100102-009 **Work Order #...:** ENPG01AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 13:47 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 16:34
Dilution Factor: 20
% Moisture.....: 35 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	520	ug/kg
alpha-BHC	ND	52	ug/kg
beta-BHC	ND	52	ug/kg
delta-BHC	ND	52	ug/kg
gamma-BHC (Lindane)	ND	52	ug/kg
alpha-Chlordane	ND	52	ug/kg
gamma-Chlordane	ND	52	ug/kg
4,4'-DDD	ND	52	ug/kg
4,4'-DDE	ND	52	ug/kg
4,4'-DDT	ND	52	ug/kg
Dieldrin	ND	52	ug/kg
Endosulfan I	ND	52	ug/kg
Endosulfan II	ND	52	ug/kg
Endosulfan sulfate	ND	52	ug/kg
Endrin	ND	52	ug/kg
Endrin aldehyde	ND	52	ug/kg
Endrin ketone	ND	52	ug/kg
Heptachlor	ND	52	ug/kg
Heptachlor epoxide	ND	52	ug/kg
Methoxychlor	ND	100	ug/kg
Toxaphene	ND	2100	ug/kg
Aldrin	ND	52	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-2-S-4

GC Semivolatiles

Lot-Sample #...: F1K100102-010 **Work Order #...:** ENPG21AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 14:00 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 16:51
Dilution Factor: 20
% Moisture.....: 22 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	440	ug/kg
Aldrin	ND	44	ug/kg
alpha-BHC	ND	44	ug/kg
beta-BHC	ND	44	ug/kg
delta-BHC	ND	44	ug/kg
gamma-BHC (Lindane)	ND	44	ug/kg
alpha-Chlordane	ND	44	ug/kg
gamma-Chlordane	ND	44	ug/kg
4,4'-DDD	ND	44	ug/kg
4,4'-DDE	ND	44	ug/kg
4,4'-DDT	ND	44	ug/kg
Dieldrin	ND	44	ug/kg
Endosulfan I	ND	44	ug/kg
Endosulfan II	ND	44	ug/kg
Endosulfan sulfate	ND	44	ug/kg
Endrin	ND	44	ug/kg
Endrin aldehyde	ND	44	ug/kg
Endrin ketone	ND	44	ug/kg
Heptachlor	ND	44	ug/kg
Heptachlor epoxide	ND	44	ug/kg
Methoxychlor	ND	85	ug/kg
Toxaphene	ND	1700	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-2-S-5

GC Semivolatiles

Lot-Sample #...: F1K100102-011 **Work Order #...:** ENPG41AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 14:12 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 18:44
Dilution Factor: 20
% Moisture.....: 3.9 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	350	ug/kg
Aldrin	ND	35	ug/kg
alpha-BHC	ND	35	ug/kg
beta-BHC	ND	35	ug/kg
delta-BHC	ND	35	ug/kg
gamma-BHC (Lindane)	ND	35	ug/kg
alpha-Chlordane	ND	35	ug/kg
gamma-Chlordane	ND	35	ug/kg
4,4'-DDD	ND	35	ug/kg
4,4'-DDE	ND	35	ug/kg
4,4'-DDT	ND	35	ug/kg
Dieldrin	ND	35	ug/kg
Endosulfan I	ND	35	ug/kg
Endosulfan II	ND	35	ug/kg
Endosulfan sulfate	ND	35	ug/kg
Endrin	ND	35	ug/kg
Endrin aldehyde	ND	35	ug/kg
Endrin ketone	ND	35	ug/kg
Heptachlor	ND	35	ug/kg
Heptachlor epoxide	ND	35	ug/kg
Methoxychlor	ND	69	ug/kg
Toxaphene	ND	1400	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-3-S-1

GC Semivolatiles

Lot-Sample #...: F1K100102-012 **Work Order #...:** ENPG61AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 14:58 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 19:01
Dilution Factor: 20
% Moisture.....: 13 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**580**	**390**	**ug/kg**
Aldrin	ND	39	ug/kg
alpha-BHC	ND	39	ug/kg
beta-BHC	ND	39	ug/kg
delta-BHC	ND	39	ug/kg
gamma-BHC (Lindane)	**1500 E**	**39**	**ug/kg**
alpha-Chlordane	**620**	**39**	**ug/kg**
gamma-Chlordane	**770 E**	**39**	**ug/kg**
4,4'-DDD	**480**	**39**	**ug/kg**
4,4'-DDE	ND	39	ug/kg
4,4'-DDT	ND	39	ug/kg
Dieldrin	ND	39	ug/kg
Endosulfan I	ND	39	ug/kg
Endosulfan II	ND	39	ug/kg
Endosulfan sulfate	ND	39	ug/kg
Endrin	ND	39	ug/kg
Endrin aldehyde	ND	39	ug/kg
Endrin ketone	ND	39	ug/kg
Heptachlor	**780 E**	**39**	**ug/kg**
Heptachlor epoxide	ND	39	ug/kg
Methoxychlor	ND	76	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-3-S-2

GC Semivolatiles

Lot-Sample #...: F1K100102-013 **Work Order #...:** ENPG71AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 15:00 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 19:18
Dilution Factor: 20
% Moisture.....: 15 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND J	400	ug/kg
Aldrin	ND	40	ug/kg
alpha-BHC	ND	40	ug/kg
beta-BHC	ND	40	ug/kg
delta-BHC	ND	40	ug/kg
gamma-BHC (Lindane)	**750**	**40**	**ug/kg**
alpha-Chlordane	**570**	**40**	**ug/kg**
gamma-Chlordane	**480**	**40**	**ug/kg**
4,4'-DDD	ND	40	ug/kg
4,4'-DDE	ND	40	ug/kg
4,4'-DDT	ND	40	ug/kg
Dieldrin	ND	40	ug/kg
Endosulfan I	ND	40	ug/kg
Endosulfan II	ND	40	ug/kg
Endosulfan sulfate	ND	40	ug/kg
Endrin	ND	40	ug/kg
Endrin aldehyde	ND	40	ug/kg
Endrin ketone	ND	40	ug/kg
Heptachlor	ND	40	ug/kg
Heptachlor epoxide	ND	40	ug/kg
Methoxychlor	ND	77	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-3-S-3

GC Semivolatiles

Lot-Sample #...: F1K100102-014 **Work Order #...:** ENPG81AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 08:49 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 19:35
Dilution Factor: 20
% Moisture.....: 6.8 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**2500**	**360**	**ug/kg**
Aldrin	ND	36	ug/kg
alpha-BHC	ND	36	ug/kg
beta-BHC	ND	36	ug/kg
delta-BHC	ND	36	ug/kg
gamma-BHC (Lindane)	ND	36	ug/kg
alpha-Chlordane	**1700 E**	**36**	**ug/kg**
gamma-Chlordane	**3600 E**	**36**	**ug/kg**
4,4'-DDD	**500**	**36**	**ug/kg**
4,4'-DDE	ND	36	ug/kg
4,4'-DDT	**410**	**36**	**ug/kg**
Dieldrin	ND	36	ug/kg
Endosulfan I	ND	36	ug/kg
Endosulfan II	ND	36	ug/kg
Endosulfan sulfate	ND	36	ug/kg
Endrin	**5500 E**	**36**	**ug/kg**
Endrin aldehyde	ND	36	ug/kg
Endrin ketone	ND	36	ug/kg
Heptachlor	**3300 E**	**36**	**ug/kg**
Heptachlor epoxide	ND	36	ug/kg
Methoxychlor	ND	71	ug/kg
Toxaphene	ND	1400	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-3-S-4

GC Semivolatiles

Lot-Sample #...: F1K100102-015 **Work Order #...:** ENPG91AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 09:09 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 19:53
Dilution Factor: 20
% Moisture.....: 5.6 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND J	360	ug/kg
Endrin aldehyde	ND	36	ug/kg
Endrin ketone	ND	36	ug/kg
Heptachlor	ND	36	ug/kg
Heptachlor epoxide	ND	36	ug/kg
Methoxychlor	ND	70	ug/kg
Toxaphene	ND	1400	ug/kg
Aldrin	ND	36	ug/kg
alpha-BHC	ND	36	ug/kg
beta-BHC	ND	36	ug/kg
delta-BHC	ND	36	ug/kg
gamma-BHC (Lindane)	ND	36	ug/kg
alpha-Chlordane	ND	36	ug/kg
gamma-Chlordane	ND	36	ug/kg
4,4'-DDD	ND	36	ug/kg
4,4'-DDE	ND	36	ug/kg
4,4'-DDT	ND	36	ug/kg
Dieldrin	ND	36	ug/kg
Endosulfan I	ND	36	ug/kg
Endosulfan II	ND	36	ug/kg
Endosulfan sulfate	ND	36	ug/kg
Endrin	ND	36	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-3-S-5

GC Semivolatiles

Lot-Sample #...: F1K100102-016 **Work Order #...:** ENPHA1AA **Matrix.....:** SOLID
Date Sampled...: 11/08/01 15:35 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 23:24
Dilution Factor: 20
% Moisture.....: 7.1 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**730**	**370**	**ug/kg**
Aldrin	ND	37	ug/kg
Endrin ketone	ND	37	ug/kg
Heptachlor	ND	37	ug/kg
Heptachlor epoxide	ND	37	ug/kg
alpha-BHC	ND	37	ug/kg
beta-BHC	ND	37	ug/kg
delta-BHC	ND	37	ug/kg
gamma-BHC (Lindane)	**490**	**37**	**ug/kg**
alpha-Chlordane	**2300 E**	**37**	**ug/kg**
gamma-Chlordane	**1700 E**	**37**	**ug/kg**
Methoxychlor	ND	71	ug/kg
Toxaphene	ND	1400	ug/kg
4,4'-DDD	ND	37	ug/kg
4,4'-DDE	ND	37	ug/kg
4,4'-DDT	ND	37	ug/kg
Dieldrin	ND	37	ug/kg
Endosulfan I	ND	37	ug/kg
Endosulfan II	ND	37	ug/kg
Endosulfan sulfate	ND	37	ug/kg
Endrin	**680**	**37**	**ug/kg**
Endrin aldehyde	ND	37	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-4-S-1

GC Semivolatiles

Lot-Sample #...: F1K100102-017 **Work Order #...:** ENPHC1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 08:40 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 20:27
Dilution Factor: 20
% Moisture.....: 12 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**2300**	**380**	**ug/kg**
Aldrin	ND	38	ug/kg
alpha-BHC	ND	38	ug/kg
beta-BHC	ND	38	ug/kg
delta-BHC	ND	38	ug/kg
gamma-BHC (Lindane)	ND	38	ug/kg
alpha-Chlordane	**2700 E**	**38**	**ug/kg**
gamma-Chlordane	**3900 E**	**38**	**ug/kg**
4,4'-DDD	**880 E**	**38**	**ug/kg**
4,4'-DDE	ND	38	ug/kg
4,4'-DDT	**620**	**38**	**ug/kg**
Dieldrin	ND	38	ug/kg
Endosulfan I	ND	38	ug/kg
Endosulfan II	ND	38	ug/kg
Endosulfan sulfate	ND	38	ug/kg
Endrin	**440**	**38**	**ug/kg**
Endrin aldehyde	ND	38	ug/kg
Endrin ketone	ND	38	ug/kg
Heptachlor	**3200 E**	**38**	**ug/kg**
Heptachlor epoxide	**1200 E**	**38**	**ug/kg**
Methoxychlor	ND	75	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-4-S-2

GC Semivolatiles

Lot-Sample #...: F1K100102-018 **Work Order #...:** ENPHD1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 08:49 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 20:45
Dilution Factor: 20
% Moisture.....: 16 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	410	ug/kg
Aldrin	ND	41	ug/kg
alpha-BHC	ND	41	ug/kg
beta-BHC	ND	41	ug/kg
delta-BHC	ND	41	ug/kg
gamma-BHC (Lindane)	ND	41	ug/kg
alpha-Chlordane	ND	41	ug/kg
gamma-Chlordane	ND	41	ug/kg
4,4'-DDD	ND	41	ug/kg
4,4'-DDE	ND	41	ug/kg
4,4'-DDT	ND	41	ug/kg
Dieldrin	ND	41	ug/kg
Endosulfan I	ND	41	ug/kg
Endosulfan II	ND	41	ug/kg
Endosulfan sulfate	ND	41	ug/kg
Endrin	ND	41	ug/kg
Endrin aldehyde	ND	41	ug/kg
Endrin ketone	ND	41	ug/kg
Heptachlor	ND	41	ug/kg
Heptachlor epoxide	ND	41	ug/kg
Methoxychlor	ND	79	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-4-S-3

GC Semivolatiles

Lot-Sample #...: F1K100102-019 **Work Order #...:** ENPHE1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 08:56 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 21:02
Dilution Factor: 20
% Moisture.....: 32 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	500	ug/kg
Aldrin	ND	50	ug/kg
alpha-BHC	ND	50	ug/kg
beta-BHC	ND	50	ug/kg
delta-BHC	ND	50	ug/kg
gamma-BHC (Lindane)	ND	50	ug/kg
alpha-Chlordane	ND	50	ug/kg
gamma-Chlordane	ND	50	ug/kg
4,4'-DDD	ND	50	ug/kg
4,4'-DDE	ND	50	ug/kg
4,4'-DDT	ND	50	ug/kg
Dieldrin	ND	50	ug/kg
Endosulfan I	ND	50	ug/kg
Endosulfan II	ND	50	ug/kg
Endosulfan sulfate	ND	50	ug/kg
Endrin	ND	50	ug/kg
Endrin aldehyde	ND	50	ug/kg
Endrin ketone	ND	50	ug/kg
Heptachlor	ND	50	ug/kg
Heptachlor epoxide	ND	50	ug/kg
Methoxychlor	ND	97	ug/kg
Toxaphene	ND	2000	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-4-S-4

GC Semivolatiles

Lot-Sample #...: F1K100102-020 **Work Order #...:** ENPHF1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 09:09 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314113 **Analysis Time..:** 21:19
Dilution Factor: 20
% Moisture.....: 17 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	410	ug/kg
Aldrin	ND	41	ug/kg
alpha-BHC	ND	41	ug/kg
beta-BHC	ND	41	ug/kg
delta-BHC	ND	41	ug/kg
gamma-BHC (Lindane)	ND	41	ug/kg
alpha-Chlordane	ND	41	ug/kg
gamma-Chlordane	ND	41	ug/kg
4,4'-DDD	ND	41	ug/kg
4,4'-DDE	ND	41	ug/kg
4,4'-DDT	ND	41	ug/kg
Dieldrin	ND	41	ug/kg
Endosulfan I	ND	41	ug/kg
Endosulfan II	ND	41	ug/kg
Endosulfan sulfate	ND	41	ug/kg
Endrin	ND	41	ug/kg
Endrin aldehyde	ND	41	ug/kg
Endrin ketone	ND	41	ug/kg
Heptachlor	ND	41	ug/kg
Heptachlor epoxide	ND	41	ug/kg
Methoxychlor	ND	80	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-4-S-5

GC Semivolatiles

Lot-Sample #...:	F1K100102-021	**Work Order #...:**	ENPHH1AA	**Matrix.....:**	SOLID
Date Sampled...:	11/09/01 09:22	**Date Received..:**	11/10/01		
Prep Date.....:	11/10/01	**Analysis Date..:**	11/12/01		
Prep Batch #...:	1314114	**Analysis Time..:**	23:24		
Dilution Factor:	20				
% Moisture.....:	4.2	**Method.....:**	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	350	ug/kg
Toxaphene	ND	1400	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-5-S-1

GC Semivolatiles

Lot-Sample #...: F1K100102-022 **Work Order #...:** ENPHJ1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 10:14 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/12/01
Prep Batch #...: 1314114 **Analysis Time..:** 23:45
Dilution Factor: 20
% Moisture.....: 16 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**12000**	**410**	**ug/kg**
Aldrin	ND	41	ug/kg
alpha-BHC	ND	41	ug/kg
beta-BHC	ND	41	ug/kg
delta-BHC	ND	41	ug/kg
gamma-BHC (Lindane)	ND	41	ug/kg
alpha-Chlordane	ND	41	ug/kg
gamma-Chlordane	ND	41	ug/kg
4,4'-DDD	ND	41	ug/kg
4,4'-DDE	ND	41	ug/kg
4,4'-DDT	ND	41	ug/kg
Dieldrin	ND	41	ug/kg
Endosulfan I	ND	41	ug/kg
Endosulfan II	ND	41	ug/kg
Endosulfan sulfate	ND	41	ug/kg
Endrin	ND	41	ug/kg
Endrin aldehyde	ND	41	ug/kg
Endrin ketone	ND	41	ug/kg
Heptachlor	ND	41	ug/kg
Heptachlor epoxide	ND	41	ug/kg
Methoxychlor	ND	79	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-5-S-2

GC Semivolatiles

Lot-Sample #...: F1K100102-023 **Work Order #...:** ENPHK1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 10:22 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 00:05
Dilution Factor: 20
% Moisture.....: 23 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	440	ug/kg
Aldrin	ND	44	ug/kg
alpha-BHC	ND	44	ug/kg
beta-BHC	**580**	**44**	**ug/kg**
delta-BHC	ND	44	ug/kg
gamma-BHC (Lindane)	**1200 E**	**44**	**ug/kg**
alpha-Chlordane	**1000 E**	**44**	**ug/kg**
gamma-Chlordane	ND	44	ug/kg
4,4'-DDD	**830**	**44**	**ug/kg**
4,4'-DDE	ND	44	ug/kg
4,4'-DDT	ND	44	ug/kg
Dieldrin	ND	44	ug/kg
Endosulfan I	ND	44	ug/kg
Endosulfan II	ND	44	ug/kg
Endosulfan sulfate	ND	44	ug/kg
Endrin	ND	44	ug/kg
Endrin aldehyde	ND	44	ug/kg
Endrin ketone	**440**	**44**	**ug/kg**
Heptachlor	ND	44	ug/kg
Heptachlor epoxide	ND	44	ug/kg
Methoxychlor	ND	86	ug/kg
Toxaphene	ND	1700	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-5-S-3

GC Semivolatiles

Lot-Sample #...: F1K100102-024 **Work Order #...:** ENPHL1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 10:30 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 00:25
Dilution Factor: 20
% Moisture.....: 18 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**2900**	**410**	**ug/kg**
Aldrin	ND	41	ug/kg
alpha-BHC	ND	41	ug/kg
beta-BHC	ND	41	ug/kg
delta-BHC	ND	41	ug/kg
gamma-BHC (Lindane)	ND	41	ug/kg
alpha-Chlordane	**1900 E**	**41**	**ug/kg**
gamma-Chlordane	**2700 E**	**41**	**ug/kg**
4,4'-DDD	ND	41	ug/kg
4,4'-DDE	ND	41	ug/kg
4,4'-DDT	ND	41	ug/kg
Dieldrin	ND	41	ug/kg
Endosulfan I	ND	41	ug/kg
Endosulfan II	ND	41	ug/kg
Endosulfan sulfate	ND	41	ug/kg
Endrin	**1100 E**	**41**	**ug/kg**
Endrin aldehyde	ND	41	ug/kg
Endrin ketone	ND	41	ug/kg
Heptachlor	**4300**	**41**	**ug/kg**
Heptachlor epoxide	**500**	**41**	**ug/kg**
Methoxychlor	ND	80	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-5-S-4

GC Semivolatiles

Lot-Sample #...: F1K100102-025 **Work Order #...:** ENPHP1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 10:44 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 00:46
Dilution Factor: 20
% Moisture.....: 7.6 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**1100**	**370**	**ug/kg**
Aldrin	ND	37	ug/kg
alpha-BHC	ND	37	ug/kg
beta-BHC	ND	37	ug/kg
delta-BHC	ND	37	ug/kg
gamma-BHC (Lindane)	ND	37	ug/kg
alpha-Chlordane	**920 E**	**37**	**ug/kg**
gamma-Chlordane	**1600 E**	**37**	**ug/kg**
4,4'-DDD	ND	37	ug/kg
4,4'-DDE	ND	37	ug/kg
4,4'-DDT	ND	37	ug/kg
Dieldrin	ND	37	ug/kg
Endosulfan I	ND	37	ug/kg
Endosulfan II	ND	37	ug/kg
Endosulfan sulfate	ND	37	ug/kg
Endrin	ND	37	ug/kg
Endrin aldehyde	ND	37	ug/kg
Endrin ketone	ND	37	ug/kg
Heptachlor	**1700 E**	**37**	**ug/kg**
Heptachlor epoxide	ND	37	ug/kg
Methoxychlor	ND	71	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-5-S-5

GC Semivolatiles

Lot-Sample #...: F1K100102-026 **Work Order #...:** ENPHQ1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 11:16 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 01:06
Dilution Factor: 20
% Moisture.....: 8.2 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	370	ug/kg
Aldrin	ND	37	ug/kg
alpha-BHC	ND	37	ug/kg
beta-BHC	ND	37	ug/kg
delta-BHC	ND	37	ug/kg
gamma-BHC (Lindane)	ND	37	ug/kg
alpha-Chlordane	ND	37	ug/kg
gamma-Chlordane	ND	37	ug/kg
4,4'-DDD	ND	37	ug/kg
4,4'-DDE	ND	37	ug/kg
4,4'-DDT	ND	37	ug/kg
Dieldrin	ND	37	ug/kg
Endosulfan I	ND	37	ug/kg
Endosulfan II	ND	37	ug/kg
Endosulfan sulfate	ND	37	ug/kg
Endrin	ND	37	ug/kg
Endrin aldehyde	ND	37	ug/kg
Endrin ketone	ND	37	ug/kg
Heptachlor	ND	37	ug/kg
Heptachlor epoxide	ND	37	ug/kg
Methoxychlor	ND	72	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-6-S-1

GC Semivolatiles

Lot-Sample #...: F1K100102-027 **Work Order #...:** ENPHR1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 12:41 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 01:26
Dilution Factor: 20
% Moisture.....: 15 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**490**	**400**	**ug/kg**
Aldrin	ND	40	ug/kg
alpha-BHC	ND	40	ug/kg
beta-BHC	ND	40	ug/kg
delta-BHC	ND	40	ug/kg
gamma-BHC (Lindane)	ND	40	ug/kg
alpha-Chlordane	**780**	**40**	**ug/kg**
gamma-Chlordane	**770**	**40**	**ug/kg**
4,4'-DDD	ND	40	ug/kg
4,4'-DDE	ND	40	ug/kg
4,4'-DDT	**460**	**40**	**ug/kg**
Dieldrin	ND	40	ug/kg
Endosulfan I	ND	40	ug/kg
Endosulfan II	ND	40	ug/kg
Endosulfan sulfate	ND	40	ug/kg
Endrin	ND	40	ug/kg
Endrin aldehyde	ND	40	ug/kg
Endrin ketone	ND	40	ug/kg
Heptachlor	ND	40	ug/kg
Heptachlor epoxide	ND	40	ug/kg
Methoxychlor	ND	77	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-6-S-2

GC Semivolatiles

Lot-Sample #...: F1K100102-028 **Work Order #...:** ENPHT1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 12:48 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 01:47
Dilution Factor: 20
% Moisture.....: 15 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	400	ug/kg
Aldrin	ND	40	ug/kg
alpha-BHC	ND	40	ug/kg
beta-BHC	ND	40	ug/kg
delta-BHC	ND	40	ug/kg
gamma-BHC (Lindane)	ND	40	ug/kg
alpha-Chlordane	ND	40	ug/kg
gamma-Chlordane	ND	40	ug/kg
4,4'-DDD	ND	40	ug/kg
4,4'-DDE	ND	40	ug/kg
4,4'-DDT	ND	40	ug/kg
Dieldrin	ND	40	ug/kg
Endosulfan I	ND	40	ug/kg
Endosulfan II	ND	40	ug/kg
Endosulfan sulfate	ND	40	ug/kg
Endrin	ND	40	ug/kg
Endrin aldehyde	ND	40	ug/kg
Endrin ketone	ND	40	ug/kg
Heptachlor	ND	40	ug/kg
Heptachlor epoxide	ND	40	ug/kg
Methoxychlor	ND	78	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-6-S-3

GC Semivolatiles

Lot-Sample #...: F1K100102-029 **Work Order #...:** ENPHV1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 12:57 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 02:07
Dilution Factor: 20
% Moisture.....: 18 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	410	ug/kg
Aldrin	ND	41	ug/kg
alpha-BHC	ND	41	ug/kg
beta-BHC	ND	41	ug/kg
delta-BHC	ND	41	ug/kg
gamma-BHC (Lindane)	ND	41	ug/kg
alpha-Chlordane	**590**	**41**	**ug/kg**
gamma-Chlordane	ND	41	ug/kg
4,4'-DDD	**500**	**41**	**ug/kg**
4,4'-DDE	ND	41	ug/kg
4,4'-DDT	ND	41	ug/kg
Dieldrin	ND	41	ug/kg
Endosulfan I	ND	41	ug/kg
Endosulfan II	ND	41	ug/kg
Endosulfan sulfate	ND	41	ug/kg
Endrin	ND	41	ug/kg
Endrin aldehyde	ND	41	ug/kg
Endrin ketone	ND	41	ug/kg
Heptachlor	ND	41	ug/kg
Heptachlor epoxide	ND	41	ug/kg
Methoxychlor	ND	80	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-6-S-4

GC Semivolatiles

Lot-Sample #...: F1K100102-030 **Work Order #...:** ENPHW1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 13:08 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 02:27
Dilution Factor: 20
% Moisture.....: 25 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	460	ug/kg
Aldrin	ND	46	ug/kg
alpha-BHC	ND	46	ug/kg
beta-BHC	ND	46	ug/kg
delta-BHC	ND	46	ug/kg
gamma-BHC (Lindane)	ND	46	ug/kg
alpha-Chlordane	**730**	**46**	**ug/kg**
gamma-Chlordane	ND	46	ug/kg
4,4'-DDD	**490**	**46**	**ug/kg**
4,4'-DDE	ND	46	ug/kg
4,4'-DDT	ND	46	ug/kg
Dieldrin	ND	46	ug/kg
Endosulfan I	ND	46	ug/kg
Endosulfan II	ND	46	ug/kg
Endosulfan sulfate	ND	46	ug/kg
Endrin	ND	46	ug/kg
Endrin aldehyde	ND	46	ug/kg
Endrin ketone	ND	46	ug/kg
Heptachlor	ND	46	ug/kg
Heptachlor epoxide	ND	46	ug/kg
Methoxychlor	ND	89	ug/kg
Toxaphene	ND	1800	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-6-S-5

GC Semivolatiles

Lot-Sample #...: F1K100102-031 **Work Order #...:** ENPHX1AA **Matrix.....:** SOLID
Date Sampled...: 11/09/01 14:05 **Date Received..:** 11/10/01
Prep Date.....: 11/10/01 **Analysis Date..:** 11/13/01
Prep Batch #...: 1314114 **Analysis Time..:** 02:48
Dilution Factor: 20
% Moisture.....: 7.9 **Method.....:** SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	370	ug/kg
Aldrin	ND	37	ug/kg
alpha-BHC	ND	37	ug/kg
beta-BHC	ND	37	ug/kg
delta-BHC	ND	37	ug/kg
gamma-BHC (Lindane)	ND	37	ug/kg
alpha-Chlordane	ND	37	ug/kg
gamma-Chlordane	ND	37	ug/kg
4,4'-DDD	ND	37	ug/kg
4,4'-DDE	ND	37	ug/kg
4,4'-DDT	ND	37	ug/kg
Dieldrin	ND	37	ug/kg
Endosulfan I	ND	37	ug/kg
Endosulfan II	ND	37	ug/kg
Endosulfan sulfate	ND	37	ug/kg
Endrin	ND	37	ug/kg
Endrin aldehyde	ND	37	ug/kg
Endrin ketone	ND	37	ug/kg
Heptachlor	ND	37	ug/kg
Heptachlor epoxide	ND	37	ug/kg
Methoxychlor	ND	72	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

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ANALYTICAL REPORT

Waste Characterization

Lot #: F1K130107

Rich Berggreen

STS Acquisitions Co.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

SEVERN TRENT LABORATORIES, INC.

John D. Powell
Project Manager

November 29, 2001

METHODS SUMMARY

F1K130107

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Organochlorine Pesticides	SW846 8081A	SW846 1311/3510
Organochlorine Pesticides	SW846 8081A	SW846 3550
Percent Moisture	MCAWW 160.3 MOD	MCAWW 160.3 MOD

References:

MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

F1K130107

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
ENR9M	001	P-7-S-1	11/12/01	08:06
ENR90	002	P-7-S-2	11/12/01	08:16
ENR91	003	P-7-S-3	11/12/01	08:23
ENR92	004	P-7-S-4	11/12/01	08:36
ENR93	005	P-7-S-5	11/12/01	08:51
ENR94	006	P-8-S-1	11/12/01	09:21
ENR95	007	P-8-S-2	11/12/01	09:32
ENR96	008	P-8-S-3	11/12/01	09:46
ENR97	009	P-8-S-4	11/12/01	10:04
ENR98	010	P-8-S-5	11/12/01	10:09
ENR99	011	P-9-S-1	11/12/01	11:01
ENTAA	012	P-9-S-2	11/12/01	11:15
ENTAC	013	P-9-S-3	11/12/01	11:26
ENTAD	014	P-9-S-4	11/12/01	11:37
ENTAE	015	P-9-S-5	11/12/01	11:47
ENTAF	016	P-10-S-1	11/12/01	12:50
ENTAG	017	P-10-S-2	11/12/01	12:57
ENTAH	018	P-10-S-3	11/12/01	13:08
ENTAJ	019	P-10-S-4	11/12/01	13:20
ENTAK	020	P-10A-S-1	11/12/01	13:50
ENTAM	021	P-10A-S-2	11/12/01	14:10

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-7-S-1

GC Semivolatiles

Lot-Sample #...: F1K130107-001 Work Order #...: ENR9M1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 08:06 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 19:01
Dilution Factor: 20
% Moisture.....: 21 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	430	ug/kg
Toxaphene	ND	1700	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

Endrin Aldehyde detected at ~~39~~ 49 ug/kg
All other pesticides are ND at ~~34~~ 43 ug/kg.

11-16-01

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-7-S-2

GC Semivolatiles

Lot-Sample #...: F1K130107-002 Work Order #...: ENR901AA Matrix.....: SOLID
Date Sampled...: 11/12/01 08:16 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 19:20
Dilution Factor: 20
% Moisture.....: 23 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	440	ug/kg
Aldrin	ND	44	ug/kg
alpha-BHC	ND	44	ug/kg
beta-BHC	ND	44	ug/kg
delta-BHC	ND	44	ug/kg
gamma-BHC (Lindane)	ND	44	ug/kg
alpha-Chlordane	ND	44	ug/kg
gamma-Chlordane	ND	44	ug/kg
4,4'-DDD	ND	44	ug/kg
4,4'-DDE	ND	44	ug/kg
4,4'-DDT	ND	44	ug/kg
Dieldrin	ND	44	ug/kg
Endosulfan I	ND	44	ug/kg
Endosulfan II	ND	44	ug/kg
Endosulfan sulfate	ND	44	ug/kg
Endrin	ND	44	ug/kg
Endrin aldehyde	ND	44	ug/kg
Endrin ketone	53	44	ug/kg
Heptachlor	ND	44	ug/kg
Heptachlor epoxide	ND	44	ug/kg
Methoxychlor	ND	85	ug/kg
Toxaphene	ND	1700	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-7-S-3

GC Semivolatiles

Lot-Sample #...: F1K130107-003 Work Order #...: ENR911AA Matrix.....: SOLID
Date Sampled...: 11/12/01 08:23 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 19:39
Dilution Factor: 20
% Moisture.....: 39 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	560	ug/kg
Aldrin	ND	56	ug/kg
alpha-BHC	ND	56	ug/kg
beta-BHC	ND	56	ug/kg
delta-BHC	ND	56	ug/kg
gamma-BHC (Lindane)	ND	56	ug/kg
alpha-Chlordane	ND	56	ug/kg
gamma-Chlordane	ND	56	ug/kg
4,4'-DDD	ND	56	ug/kg
4,4'-DDE	ND	56	ug/kg
4,4'-DDT	ND	56	ug/kg
Dieldrin	ND	56	ug/kg
Endosulfan I	ND	56	ug/kg
Endosulfan II	ND	56	ug/kg
Endosulfan sulfate	ND	56	ug/kg
Endrin	ND	56	ug/kg
Endrin aldehyde	ND	56	ug/kg
Endrin ketone	ND	56	ug/kg
Heptachlor	ND	56	ug/kg
Heptachlor epoxide	ND	56	ug/kg
Methoxychlor	ND	110	ug/kg
Toxaphene	ND	2200	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-7-S-4

GC Semivolatiles

Lot-Sample #...: F1K130107-004 Work Order #...: ENR921AA Matrix.....: SOLID
Date Sampled...: 11/12/01 08:36 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 19:59
Dilution Factor: 20
% Moisture.....: 22 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	430	ug/kg
Aldrin	ND	43	ug/kg
alpha-BHC	ND	43	ug/kg
beta-BHC	ND	43	ug/kg
delta-BHC	ND	43	ug/kg
gamma-BHC (Lindane)	ND	43	ug/kg
alpha-Chlordane	ND	43	ug/kg
gamma-Chlordane	ND	43	ug/kg
4,4'-DDD	ND	43	ug/kg
4,4'-DDE	ND	43	ug/kg
4,4'-DDT	ND	43	ug/kg
Dieldrin	ND	43	ug/kg
Endosulfan I	ND	43	ug/kg
Endosulfan II	ND	43	ug/kg
Endosulfan sulfate	ND	43	ug/kg
Endrin	ND	43	ug/kg
Endrin aldehyde	ND	43	ug/kg
Endrin ketone	ND	43	ug/kg
Heptachlor	ND	43	ug/kg
Heptachlor epoxide	ND	43	ug/kg
Methoxychlor	ND	84	ug/kg
Toxaphene	ND	1700	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-7-S-5

GC Semivolatiles

Lot-Sample #...: F1K130107-005 Work Order #...: ENR931AA Matrix.....: SOLID
Date Sampled...: 11/12/01 08:51 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 20:18
Dilution Factor: 20
% Moisture.....: 6.2 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	360	ug/kg
Aldrin	ND	36	ug/kg
alpha-BHC	ND	36	ug/kg
beta-BHC	ND	36	ug/kg
delta-BHC	ND	36	ug/kg
gamma-BHC (Lindane)	ND	36	ug/kg
alpha-Chlordane	ND	36	ug/kg
gamma-Chlordane	ND	36	ug/kg
4,4'-DDD	ND	36	ug/kg
4,4'-DDE	ND	36	ug/kg
4,4'-DDT	ND	36	ug/kg
Dieldrin	ND	36	ug/kg
Endosulfan I	ND	36	ug/kg
Endosulfan II	ND	36	ug/kg
Endosulfan sulfate	ND	36	ug/kg
Endrin	ND	36	ug/kg
Endrin aldehyde	ND	36	ug/kg
Endrin ketone	ND	36	ug/kg
Heptachlor	ND	36	ug/kg
Heptachlor epoxide	ND	36	ug/kg
Methoxychlor	ND	70	ug/kg
Toxaphene	ND	1400	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-8-S-1

GC Semivolatiles

Lot-Sample #...: F1K130107-006 Work Order #...: ENR941AA Matrix.....: SOLID
Date Sampled...: 11/12/01 09:21 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 20:37
Dilution Factor: 20
% Moisture.....: 13 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**9200**	**390**	**ug/kg**
Aldrin	ND	39	ug/kg
alpha-BHC	ND	39	ug/kg
beta-BHC	ND	39	ug/kg
delta-BHC	ND	39	ug/kg
gamma-BHC (Lindane)	ND	39	ug/kg
alpha-Chlordane	**480**	**39**	**ug/kg**
gamma-Chlordane	**820 E**	**39**	**ug/kg**
4,4'-DDD	ND	39	ug/kg
4,4'-DDE	ND	39	ug/kg
4,4'-DDT	**63**	**39**	**ug/kg**
Dieldrin	ND	39	ug/kg
Endosulfan I	ND	39	ug/kg
Endosulfan II	ND	39	ug/kg
Endosulfan sulfate	ND	39	ug/kg
Endrin	**87**	**39**	**ug/kg**
Endrin aldehyde	ND	39	ug/kg
Endrin ketone	ND	39	ug/kg
Heptachlor	**680**	**39**	**ug/kg**
Heptachlor epoxide	**110**	**39**	**ug/kg**
Methoxychlor	ND	76	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-8-S-2

GC Semivolatiles

Lot-Sample #...: F1K130107-007 Work Order #...: ENR951AA Matrix.....: SOLID
Date Sampled...: 11/12/01 09:32 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 20:57
Dilution Factor: 20
% Moisture.....: 13 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	390	ug/kg
Aldrin	ND	39	ug/kg
alpha-BHC	ND	39	ug/kg
beta-BHC	ND	39	ug/kg
delta-BHC	ND	39	ug/kg
gamma-BHC (Lindane)	ND	39	ug/kg
alpha-Chlordane	ND	39	ug/kg
gamma-Chlordane	ND	39	ug/kg
4,4'-DDD	ND	39	ug/kg
4,4'-DDE	ND	39	ug/kg
4,4'-DDT	ND	39	ug/kg
Dieldrin	ND	39	ug/kg
Endosulfan I	ND	39	ug/kg
Endosulfan II	ND	39	ug/kg
Endosulfan sulfate	ND	39	ug/kg
Endrin	ND	39	ug/kg
Endrin aldehyde	ND	39	ug/kg
Endrin ketone	ND	39	ug/kg
Heptachlor	ND	39	ug/kg
Heptachlor epoxide	ND	39	ug/kg
Methoxychlor	ND	75	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-8-S-3

GC Semivolatiles

Lot-Sample #...: F1K130107-008 Work Order #...: ENR961AA Matrix.....: SOLID
Date Sampled...: 11/12/01 09:46 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 21:16
Dilution Factor: 20
% Moisture.....: 31 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	490	ug/kg
Aldrin	ND	49	ug/kg
alpha-BHC	ND	49	ug/kg
beta-BHC	ND	49	ug/kg
delta-BHC	ND	49	ug/kg
gamma-BHC (Lindane)	ND	49	ug/kg
alpha-Chlordane	ND	49	ug/kg
gamma-Chlordane	ND	49	ug/kg
4,4'-DDD	ND	49	ug/kg
4,4'-DDE	ND	49	ug/kg
4,4'-DDT	ND	49	ug/kg
Dieldrin	ND	49	ug/kg
Endosulfan I	ND	49	ug/kg
Endosulfan II	ND	49	ug/kg
Endosulfan sulfate	ND	49	ug/kg
Endrin	ND	49	ug/kg
Endrin aldehyde	ND	49	ug/kg
Endrin ketone	ND	49	ug/kg
Heptachlor	ND	49	ug/kg
Heptachlor epoxide	ND	49	ug/kg
Methoxychlor	ND	96	ug/kg
Toxaphene	ND	1900	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-8-S-4

GC Semivolatiles

Lot-Sample #...: F1K130107-009 Work Order #...: ENR971AA Matrix.....: SOLID
Date Sampled...: 11/12/01 10:04 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 21:35
Dilution Factor: 20
% Moisture.....: 25 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	450	ug/kg
Aldrin	ND	45	ug/kg
alpha-BHC	ND	45	ug/kg
beta-BHC	ND	45	ug/kg
delta-BHC	ND	45	ug/kg
gamma-BHC (Lindane)	ND	45	ug/kg
alpha-Chlordane	ND	45	ug/kg
gamma-Chlordane	ND	45	ug/kg
4,4'-DDD	ND	45	ug/kg
4,4'-DDE	ND	45	ug/kg
4,4'-DDT	ND	45	ug/kg
Dieldrin	ND	45	ug/kg
Endosulfan I	ND	45	ug/kg
Endosulfan II	ND	45	ug/kg
Endosulfan sulfate	ND	45	ug/kg
Endrin	ND	45	ug/kg
Endrin aldehyde	ND	45	ug/kg
Endrin ketone	ND	45	ug/kg
Heptachlor	ND	45	ug/kg
Heptachlor epoxide	ND	45	ug/kg
Methoxychlor	ND	88	ug/kg
Toxaphene	ND	1800	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-8-S-5

GC Semivolatiles

Lot-Sample #...: F1K130107-010 Work Order #...: ENR981AA Matrix.....: SOLID
Date Sampled...: 11/12/01 10:09 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/14/01
Prep Batch #...: 1317226 Analysis Time..: 21:55
Dilution Factor: 20
% Moisture.....: 8.0 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	370	ug/kg
Aldrin	ND	37	ug/kg
alpha-BHC	ND	37	ug/kg
beta-BHC	ND	37	ug/kg
delta-BHC	ND	37	ug/kg
gamma-BHC (Lindane)	ND	37	ug/kg
alpha-Chlordane	ND	37	ug/kg
gamma-Chlordane	ND	37	ug/kg
4,4'-DDD	ND	37	ug/kg
4,4'-DDE	ND	37	ug/kg
4,4'-DDT	ND	37	ug/kg
Dieldrin	ND	37	ug/kg
Endosulfan I	ND	37	ug/kg
Endosulfan II	ND	37	ug/kg
Endosulfan sulfate	ND	37	ug/kg
Endrin	ND	37	ug/kg
Endrin aldehyde	ND	37	ug/kg
Endrin ketone	ND	37	ug/kg
Heptachlor	ND	37	ug/kg
Heptachlor epoxide	ND	37	ug/kg
Methoxychlor	ND	72	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-9-S-1

GC Semivolatiles

Lot-Sample #...: F1K130107-011 Work Order #...: ENR991AA Matrix.....: SOLID
Date Sampled...: 11/12/01 11:01 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 00:48
Dilution Factor: 20
% Moisture.....: 11 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	4800	380	ug/kg
Aldrin	ND	38	ug/kg
alpha-BHC	ND	38	ug/kg
beta-BHC	41	38	ug/kg
delta-BHC	ND	38	ug/kg
gamma-BHC (Lindane)	ND	38	ug/kg
alpha-Chlordane	660	38	ug/kg
gamma-Chlordane	760 E	38	ug/kg
4,4'-DDD	93	38	ug/kg
4,4'-DDE	ND	38	ug/kg
4,4'-DDT	51	38	ug/kg
Dieldrin	ND	38	ug/kg
Endosulfan I	ND	38	ug/kg
Endosulfan II	ND	38	ug/kg
Endosulfan sulfate	ND	38	ug/kg
Endrin	230	38	ug/kg
Endrin aldehyde	ND	38	ug/kg
Endrin ketone	ND	38	ug/kg
Heptachlor	410	38	ug/kg
Heptachlor epoxide	68	38	ug/kg
Methoxychlor	ND	74	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-9-S-2

GC Semivolatiles

Lot-Sample #...: F1K130107-012 Work Order #...: ENTAA1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 11:15 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 01:08
Dilution Factor: 20
% Moisture.....: 14 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	390	ug/kg
Aldrin	ND	39	ug/kg
alpha-BHC	ND	39	ug/kg
beta-BHC	ND	39	ug/kg
delta-BHC	ND	39	ug/kg
gamma-BHC (Lindane)	ND	39	ug/kg
alpha-Chlordane	ND	39	ug/kg
gamma-Chlordane	ND	39	ug/kg
4,4'-DDD	ND	39	ug/kg
4,4'-DDE	ND	39	ug/kg
4,4'-DDT	ND	39	ug/kg
Dieldrin	ND	39	ug/kg
Endosulfan I	ND	39	ug/kg
Endosulfan II	ND	39	ug/kg
Endosulfan sulfate	ND	39	ug/kg
Endrin	ND	39	ug/kg
Endrin aldehyde	ND	39	ug/kg
Endrin ketone	ND	39	ug/kg
Heptachlor	ND	39	ug/kg
Heptachlor epoxide	ND	39	ug/kg
Methoxychlor	ND	77	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-9-S-3

GC Semivolatiles

Lot-Sample #...: F1K130107-013 Work Order #...: ENTAC1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 11:26 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 01:27
Dilution Factor: 20
% Moisture.....: 17 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	410	ug/kg
Aldrin	ND	41	ug/kg
alpha-BHC	ND	41	ug/kg
beta-BHC	ND	41	ug/kg
delta-BHC	ND	41	ug/kg
gamma-BHC (Lindane)	ND	41	ug/kg
alpha-Chlordane	ND	41	ug/kg
gamma-Chlordane	ND	41	ug/kg
4,4'-DDD	ND	41	ug/kg
4,4'-DDE	ND	41	ug/kg
4,4'-DDT	ND	41	ug/kg
Dieldrin	ND	41	ug/kg
Endosulfan I	ND	41	ug/kg
Endosulfan II	ND	41	ug/kg
Endosulfan sulfate	ND	41	ug/kg
Endrin	ND	41	ug/kg
Endrin aldehyde	ND	41	ug/kg
Endrin ketone	ND	41	ug/kg
Heptachlor	ND	41	ug/kg
Heptachlor epoxide	ND	41	ug/kg
Methoxychlor	ND	79	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-9-S-4

GC Semivolatiles

Lot-Sample #...: F1K130107-014 Work Order #...: ENTAD1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 11:37 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 01:46
Dilution Factor: 20
% Moisture.....: 6.8 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	7900	360	ug/kg
Aldrin	ND	36	ug/kg
alpha-BHC	ND	36	ug/kg
beta-BHC	ND	36	ug/kg
delta-BHC	ND	36	ug/kg
gamma-BHC (Lindane)	1100 E	36	ug/kg
alpha-Chlordane	790 E	36	ug/kg
gamma-Chlordane	1100 E	36	ug/kg
4,4'-DDD	180	36	ug/kg
4,4'-DDE	64	36	ug/kg
4,4'-DDT	280	36	ug/kg
Dieldrin	ND	36	ug/kg
Endosulfan I	ND	36	ug/kg
Endosulfan II	ND	36	ug/kg
Endosulfan sulfate	ND	36	ug/kg
Endrin	52	36	ug/kg
Endrin aldehyde	ND	36	ug/kg
Endrin ketone	ND	36	ug/kg
Heptachlor	1100 E	36	ug/kg
Heptachlor epoxide	62	36	ug/kg
Methoxychlor	ND	71	ug/kg
Toxaphene	ND	1400	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-9-S-5

GC Semivolatiles

Lot-Sample #...: F1K130107-015 Work Order #...: ENTAE1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 11:47 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 02:06
Dilution Factor: 20
% Moisture.....: 3.8 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	350	ug/kg
Aldrin	ND	35	ug/kg
alpha-BHC	ND	35	ug/kg
beta-BHC	ND	35	ug/kg
delta-BHC	ND	35	ug/kg
gamma-BHC (Lindane)	ND	35	ug/kg
alpha-Chlordane	ND	35	ug/kg
gamma-Chlordane	ND	35	ug/kg
4,4'-DDD	ND	35	ug/kg
4,4'-DDE	ND	35	ug/kg
4,4'-DDT	ND	35	ug/kg
Dieldrin	ND	35	ug/kg
Endosulfan I	ND	35	ug/kg
Endosulfan II	ND	35	ug/kg
Endosulfan sulfate	ND	35	ug/kg
Endrin	ND	35	ug/kg
Endrin aldehyde	ND	35	ug/kg
Endrin ketone	ND	35	ug/kg
Heptachlor	ND	35	ug/kg
Heptachlor epoxide	ND	35	ug/kg
Methoxychlor	ND	69	ug/kg
Toxaphene	ND	1400	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10-S-1

GC Semivolatiles

Lot-Sample #...: F1K130107-016 Work Order #...: ENTAF1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 12:50 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 02:25
Dilution Factor: 20
% Moisture.....: 20 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**1600**	**420**	**ug/kg**
Aldrin	ND	42	ug/kg
alpha-BHC	ND	42	ug/kg
beta-BHC	ND	42	ug/kg
delta-BHC	ND	42	ug/kg
gamma-BHC (Lindane)	ND	42	ug/kg
alpha-Chlordane	**110**	**42**	**ug/kg**
gamma-Chlordane	**210**	**42**	**ug/kg**
4,4'-DDD	ND	42	ug/kg
4,4'-DDE	ND	42	ug/kg
4,4'-DDT	ND	42	ug/kg
Dieldrin	ND	42	ug/kg
Endosulfan I	ND	42	ug/kg
Endosulfan II	ND	42	ug/kg
Endosulfan sulfate	ND	42	ug/kg
Endrin	**44**	**42**	**ug/kg**
Endrin aldehyde	ND	42	ug/kg
Endrin ketone	ND	42	ug/kg
Heptachlor	**220**	**42**	**ug/kg**
Heptachlor epoxide	**49**	**42**	**ug/kg**
Methoxychlor	ND	82	ug/kg
Toxaphene	ND	1700	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10-S-2

GC Semivolatiles

Lot-Sample #...: F1K130107-017 Work Order #...: ENTAG1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 12:57 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 02:44
Dilution Factor: 20
% Moisture.....: 16 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	400	ug/kg
Aldrin	ND	40	ug/kg
alpha-BHC	ND	40	ug/kg
beta-BHC	ND	40	ug/kg
delta-BHC	ND	40	ug/kg
gamma-BHC (Lindane)	ND	40	ug/kg
alpha-Chlordane	ND	40	ug/kg
gamma-Chlordane	ND	40	ug/kg
4,4'-DDD	ND	40	ug/kg
4,4'-DDE	ND	40	ug/kg
4,4'-DDT	ND	40	ug/kg
Dieldrin	ND	40	ug/kg
Endosulfan I	ND	40	ug/kg
Endosulfan II	ND	40	ug/kg
Endosulfan sulfate	ND	40	ug/kg
Endrin	ND	40	ug/kg
Endrin aldehyde	ND	40	ug/kg
Endrin ketone	ND	40	ug/kg
Heptachlor	ND	40	ug/kg
Heptachlor epoxide	ND	40	ug/kg
Methoxychlor	ND	79	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10-S-3

GC Semivolatiles

Lot-Sample #...: F1K130107-018 Work Order #...: ENTAH1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 13:08 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 03:04
Dilution Factor: 20
% Moisture.....: 11 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	22000	380	ug/kg
Aldrin	180	38	ug/kg
alpha-BHC	ND	38	ug/kg
beta-BHC	ND	38	ug/kg
delta-BHC	48	38	ug/kg
gamma-BHC (Lindane)	ND	38	ug/kg
alpha-Chlordane	760 E	38	ug/kg
gamma-Chlordane	2800 E	38	ug/kg
4,4'-DDD	ND	38	ug/kg
4,4'-DDE	97	38	ug/kg
4,4'-DDT	98	38	ug/kg
Dieldrin	ND	38	ug/kg
Endosulfan I	ND	38	ug/kg
Endosulfan II	ND	38	ug/kg
Endosulfan sulfate	ND	38	ug/kg
Endrin	160	38	ug/kg
Endrin aldehyde	ND	38	ug/kg
Endrin ketone	ND	38	ug/kg
Heptachlor	4100 E	38	ug/kg
Heptachlor epoxide	290	38	ug/kg
Methoxychlor	ND	74	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10-S-4

GC Semivolatiles

Lot-Sample #...: F1K130107-019 Work Order #...: ENTAJ1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 13:20 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 03:23
Dilution Factor: 20
% Moisture.....: 15 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**9700**	**400**	**ug/kg**
Aldrin	**75**	**40**	**ug/kg**
alpha-BHC	ND	40	ug/kg
beta-BHC	ND	40	ug/kg
delta-BHC	ND	40	ug/kg
gamma-BHC (Lindane)	ND	40	ug/kg
alpha-Chlordane	**400**	**40**	**ug/kg**
gamma-Chlordane	**1300 E**	**40**	**ug/kg**
4,4'-DDD	ND	40	ug/kg
4,4'-DDE	**44**	**40**	**ug/kg**
4,4'-DDT	ND	40	ug/kg
Dieldrin	ND	40	ug/kg
Endosulfan I	ND	40	ug/kg
Endosulfan II	ND	40	ug/kg
Endosulfan sulfate	ND	40	ug/kg
Endrin	**74**	**40**	**ug/kg**
Endrin aldehyde	ND	40	ug/kg
Endrin ketone	ND	40	ug/kg
Heptachlor	**1700 E**	**40**	**ug/kg**
Heptachlor epoxide	**120**	**40**	**ug/kg**
Methoxychlor	ND	78	ug/kg
Toxaphene	ND	1600	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10A-S-1

GC Semivolatiles

Lot-Sample #...: F1K130107-020 Work Order #...: ENTAK1AA Matrix.....: SOLID
Date Sampled...: 11/12/01 13:50 Date Received..: 11/13/01
Prep Date.....: 11/13/01 Analysis Date..: 11/15/01
Prep Batch #...: 1317226 Analysis Time..: 03:42
Dilution Factor: 20
% Moisture.....: 8.4 Method.....: SW846 8081A

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	25000	370	ug/kg
Aldrin	ND	37	ug/kg
alpha-BHC	ND	37	ug/kg
beta-BHC	ND	37	ug/kg
delta-BHC	ND	37	ug/kg
gamma-BHC (Lindane)	ND	37	ug/kg
alpha-Chlordane	2400 E	37	ug/kg
gamma-Chlordane	3000 E	37	ug/kg
4,4'-DDD	380	37	ug/kg
4,4'-DDE	57	37	ug/kg
4,4'-DDT	80	37	ug/kg
Dieldrin	71	37	ug/kg
Endosulfan I	ND	37	ug/kg
Endosulfan II	ND	37	ug/kg
Endosulfan sulfate	ND	37	ug/kg
Endrin	220	37	ug/kg
Endrin aldehyde	ND	37	ug/kg
Endrin ketone	ND	37	ug/kg
Heptachlor	4100 E	37	ug/kg
Heptachlor epoxide	400	37	ug/kg
Methoxychlor	ND	72	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

E Estimated result. Result concentration exceeds the calibration range.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10A-S-2

GC Semivolatiles

Lot-Sample #...:	F1K130107-021	Work Order #...:	ENTAM1AA	Matrix.....:	SOLID
Date Sampled...:	11/12/01 14:10	Date Received..:	11/13/01		
Prep Date.....:	11/13/01	Analysis Date..:	11/15/01		
Prep Batch #...:	1317238	Analysis Time..:	04:02		
Dilution Factor:	20				
% Moisture.....:	7.9	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	370	ug/kg
Toxaphene	ND	1500	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	0.0 DIL	(26 - 129)
Decachlorobiphenyl	0.0 DIL	(56 - 126)

NOTE(S):

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

All other pesticides not detected at 37 µg/kg.

AB 11-16-01

METHOD BLANK REPORT

GC Semivolatiles

Client Lot #...: F1K130107
MB Lot-Sample #: F1K130000-226
Work Order #...: ENTML1AA
Matrix.....: SOLID
Prep Date.....: 11/13/01
Analysis Time..: 17:24
Analysis Date..: 11/14/01
Prep Batch #...: 1317226
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Chlordane (technical)	ND	17	ug/kg	SW846 8081A
gamma-BHC (Lindane)	ND	1.7	ug/kg	SW846 8081A
Heptachlor	ND	1.7	ug/kg	SW846 8081A
Aldrin	ND	1.7	ug/kg	SW846 8081A
Dieldrin	ND	1.7	ug/kg	SW846 8081A
Endrin	ND	1.7	ug/kg	SW846 8081A
4,4'-DDT	ND	1.7	ug/kg	SW846 8081A
alpha-BHC	ND	1.7	ug/kg	SW846 8081A
beta-BHC	ND	1.7	ug/kg	SW846 8081A
delta-BHC	ND	1.7	ug/kg	SW846 8081A
alpha-Chlordane	ND	1.7	ug/kg	SW846 8081A
gamma-Chlordane	ND	1.7	ug/kg	SW846 8081A
4,4'-DDD	ND	1.7	ug/kg	SW846 8081A
4,4'-DDE	ND	1.7	ug/kg	SW846 8081A
Endosulfan I	ND	1.7	ug/kg	SW846 8081A
Endosulfan II	ND	1.7	ug/kg	SW846 8081A
Endosulfan sulfate	ND	1.7	ug/kg	SW846 8081A
Endrin aldehyde	ND	1.7	ug/kg	SW846 8081A
Endrin ketone	ND	1.7	ug/kg	SW846 8081A
Heptachlor epoxide	ND	1.7	ug/kg	SW846 8081A
Methoxychlor	ND	3.3	ug/kg	SW846 8081A
Toxaphene	ND	67	ug/kg	SW846 8081A

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	92	(26 - 129)
Decachlorobiphenyl	109	(56 - 126)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

TCLP

SEVERN
TRENT
SERVICES

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

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ANALYTICAL REPORT

Waste Characterization

Lot #: F1K100102

Rich Berggreen

STS Acquisitions Co.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

SEVERN TRENT LABORATORIES, INC.

John D. Powell
Project Manager

November 29, 2001

METHODS SUMMARY

F1K100102

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Organochlorine Pesticides	SW846 8081A	SW846 1311/3510
Organochlorine Pesticides	SW846 8081A	SW846 3550
Percent Moisture	MCAWW 160.3 MOD	MCAWW 160.3 MOD

References:

MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

F1K100102

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
ENPGD	001	P-1-S-1	11/08/01	09:00
ENPGH	002	P-1-S-2	11/08/01	09:30
ENPGM	003	P-1-S-3	11/08/01	09:42
ENPGN	004	P-1-S-4	11/08/01	09:57
ENPGP	005	P-1A-S-1	11/08/01	10:57
ENPGQ	006	P-1A-S-2	11/08/01	12:29
ENPGR	007	P-2-S-1	11/08/01	11:27
ENPGT	008	P-2-S-2	11/08/01	12:00
ENPG0	009	P-2-S-3	11/08/01	13:47
ENPG2	010	P-2-S-4	11/08/01	14:00
ENPG4	011	P-2-S-5	11/08/01	14:12
ENPG6	012	P-3-S-1	11/08/01	14:58
ENPG7	013	P-3-S-2	11/08/01	15:00
ENPG8	014	P-3-S-3	11/08/01	08:49
ENPG9	015	P-3-S-4	11/08/01	09:09
ENPHA	016	P-3-S-5	11/08/01	15:35
ENPHC	017	P-4-S-1	11/09/01	08:40
ENPHD	018	P-4-S-2	11/09/01	08:49
ENPHE	019	P-4-S-3	11/09/01	08:56
ENPHF	020	P-4-S-4	11/09/01	09:09
ENPHH	021	P-4-S-5	11/09/01	09:22
ENPHJ	022	P-5-S-1	11/09/01	10:14
ENPHK	023	P-5-S-2	11/09/01	10:22
ENPHL	024	P-5-S-3	11/09/01	10:30
ENPHP	025	P-5-S-4	11/09/01	10:44
ENPHQ	026	P-5-S-5	11/09/01	11:16
ENPHR	027	P-6-S-1	11/09/01	12:41
ENPHT	028	P-6-S-2	11/09/01	12:48
ENPHV	029	P-6-S-3	11/09/01	12:57
ENPHW	030	P-6-S-4	11/09/01	13:08
ENPHX	031	P-6-S-5	11/09/01	14:05

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1-S-1

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-001	Work Order #...:	ENPGD1AC	Matrix.....:	SOLID
Date Sampled...:	11/08/01 09:00	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	06:33
Dilution Factor:	1				
% Moisture.....:	13	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	3.2 J	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	62	(22 - 142)
Decachlorobiphenyl	72	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1-S-2

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-002	Work Order #...:	ENPGH1AC	Matrix.....:	SOLID
Date Sampled...:	11/08/01 09:30	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	08:29
Dilution Factor:	1				
% Moisture.....:	16	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**1.6 J**	**5.0**	**ug/L**
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	69	(22 - 142)
Decachlorobiphenyl	85	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1-S-3

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-003	Work Order #...:	ENPGM1AC	Matrix.....:	SOLID
Date Sampled...:	11/08/01 09:42	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	08:49
Dilution Factor:	1				
% Moisture.....:	14	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**1.7 J**	**5.0**	**ug/L**
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	56	(22 - 142)
Decachlorobiphenyl	74	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-1-S-4

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-004	Work Order #...:	ENPGN1AC	Matrix.....:	SOLID
Date Sampled...:	11/08/01 09:57	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	09:08
Dilution Factor:	1				
% Moisture.....:	14	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**3.6 J**	**5.0**	**ug/L**
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	70	(22 - 142)
Decachlorobiphenyl	63	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-2-S-1

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-007	Work Order #...:	ENPGR1AC	Matrix.....:	SOLID
Date Sampled...:	11/08/01 11:27	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	12:52
Dilution Factor:	1				
% Moisture.....:	9.3	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	19	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	3.6	0.50	ug/L
Heptachlor	1.3	0.50	ug/L
Heptachlor epoxide	2.3	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	62	(22 - 142)
Decachlorobiphenyl	89	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-2-S-2

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-008	Work Order #...:	ENPGT1AC	Matrix.....:	SOLID
Date Sampled...:	11/08/01 12:00	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	13:11
Dilution Factor:	1				
% Moisture.....:	14	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	64	(22 - 142)
Decachlorobiphenyl	60	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-3-S-3

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-014	Work Order #...:	ENPG81AC	Matrix.....:	SOLID
Date Sampled...:	11/08/01 08:49	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	15:08
Dilution Factor:	1				
% Moisture.....:	6.8	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	70	(22 - 142)
Decachlorobiphenyl	64	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-3-S-5

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-016	Work Order #...:	ENPHA1AC	Matrix.....:	SOLID
Date Sampled...:	11/08/01 15:35	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	15:46
Dilution Factor:	1				
% Moisture.....:	7.1	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	70	(22 - 142)
Decachlorobiphenyl	66	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-4-S-1

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-017	Work Order #...:	ENPHC1AC	Matrix.....:	SOLID
Date Sampled...:	11/09/01 08:40	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131605	Prep Batch #...:	1319347	Analysis Time..:	16:06
Dilution Factor:	1				
% Moisture.....:	12	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	74	(22 - 142)
Decachlorobiphenyl	67	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-5-S-1

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-022	Work Order #...:	ENPHJ1AC	Matrix.....:	SOLID
Date Sampled...:	11/09/01 10:14	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131606	Prep Batch #...:	1319359	Analysis Time..:	17:23
Dilution Factor:	1				
% Moisture.....:	16	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**1.8 J**	**5.0**	**ug/L**
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	67	(22 - 142)
Decachlorobiphenyl	90	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-5-S-3

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-024	Work Order #...:	ENPHL1AC	Matrix.....:	SOLID
Date Sampled...:	11/09/01 10:30	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131606	Prep Batch #...:	1319359	Analysis Time..:	18:02
Dilution Factor:	1				
% Moisture.....:	18	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	70	(22 - 142)
Decachlorobiphenyl	66	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-5-S-4

TCLP GC Semivolatiles

Lot-Sample #...:	F1K100102-025	Work Order #...:	ENPHP1AC	Matrix.....:	SOLID
Date Sampled...:	11/09/01 10:44	Date Received..:	11/10/01		
Leach Date.....:	11/12/01	Prep Date.....:	11/15/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131606	Prep Batch #...:	1319359	Analysis Time..:	18:21
Dilution Factor:	1				
% Moisture.....:	7.6	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	74	(22 - 142)
Decachlorobiphenyl	67	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

METHOD BLANK REPORT

GC Semivolatiles

Client Lot #...: F1K100102 **Work Order #...:** EN2HQ1AA **Matrix.....:** SOLID
MB Lot-Sample #: F1K150000-347

Prep Date.....: 11/15/01 **Analysis Time..:** 04:37

Analysis Date..: 11/18/01 **Prep Batch #...:** 1319347
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
gamma-BHC (Lindane)	ND	0.50	ug/L	SW846 8081A
Chlordane (technical)	ND	5.0	ug/L	SW846 8081A
Endrin	ND	0.50	ug/L	SW846 8081A
Heptachlor	ND	0.50	ug/L	SW846 8081A
Heptachlor epoxide	ND	0.50	ug/L	SW846 8081A
Methoxychlor	ND	1.0	ug/L	SW846 8081A
Toxaphene	ND	20	ug/L	SW846 8081A

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	64	(22 - 142)
Decachlorobiphenyl	52	(10 - 162)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

GC Semivolatiles

Client Lot #...: F1K100102 Work Order #...: EN2MQ1AA Matrix.....: SOLID
MB Lot-Sample #: F1K150000-359
Prep Date.....: 11/15/01 Analysis Time..: 05:16
Analysis Date..: 11/18/01 Prep Batch #...: 1319359
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
gamma-BHC (Lindane)	ND	0.50	ug/L	SW846 8081A
Chlordane (technical)	ND	5.0	ug/L	SW846 8081A
Endrin	ND	0.50	ug/L	SW846 8081A
Heptachlor	ND	0.50	ug/L	SW846 8081A
Heptachlor epoxide	ND	0.50	ug/L	SW846 8081A
Methoxychlor	ND	1.0	ug/L	SW846 8081A
Toxaphene	ND	20	ug/L	SW846 8081A

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	64	(22 - 142)
Decachlorobiphenyl	44	(10 - 162)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

SEVERN
TRENT
SERVICES

STL St. Louis
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ANALYTICAL REPORT

Waste Characterization

Lot #: F1K130107

Rich Berggreen

STS Acquisitions Co.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

SEVERN TRENT LABORATORIES, INC.

John D. Powell
Project Manager

November 29, 2001

METHODS SUMMARY

F1K130107

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Organochlorine Pesticides	SW846 8081A	SW846 1311/3510
Organochlorine Pesticides	SW846 8081A	SW846 3550
Percent Moisture	MCAWW 160.3 MOD	MCAWW 160.3 MOD

References:

MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

F1K130107

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
ENR9M	001	P-7-S-1	11/12/01	08:06
ENR90	002	P-7-S-2	11/12/01	08:16
ENR91	003	P-7-S-3	11/12/01	08:23
ENR92	004	P-7-S-4	11/12/01	08:36
ENR93	005	P-7-S-5	11/12/01	08:51
ENR94	006	P-8-S-1	11/12/01	09:21
ENR95	007	P-8-S-2	11/12/01	09:32
ENR96	008	P-8-S-3	11/12/01	09:46
ENR97	009	P-8-S-4	11/12/01	10:04
ENR98	010	P-8-S-5	11/12/01	10:09
ENR99	011	P-9-S-1	11/12/01	11:01
ENTAA	012	P-9-S-2	11/12/01	11:15
ENTAC	013	P-9-S-3	11/12/01	11:26
ENTAD	014	P-9-S-4	11/12/01	11:37
ENTAE	015	P-9-S-5	11/12/01	11:47
ENTAF	016	P-10-S-1	11/12/01	12:50
ENTAG	017	P-10-S-2	11/12/01	12:57
ENTAH	018	P-10-S-3	11/12/01	13:08
ENTAJ	019	P-10-S-4	11/12/01	13:20
ENTAK	020	P-10A-S-1	11/12/01	13:50
ENTAM	021	P-10A-S-2	11/12/01	14:10

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-8-S-1

TCLP GC Semivolatiles

Lot-Sample #...:	F1K130107-006	Work Order #...:	ENR941AC	Matrix.....:	SOLID
Date Sampled...:	11/12/01 09:21	Date Received..:	11/13/01		
Leach Date.....:	11/13/01	Prep Date.....:	11/16/01	Analysis Date..:	11/17/01
Leach Batch #..:	P131706	Prep Batch #...:	1320366	Analysis Time..:	20:32
Dilution Factor:	1				
% Moisture.....:	13	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**1.2 J**	**5.0**	**ug/L**
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	82	(22 - 142)
Decachlorobiphenyl	69	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

J Estimated result. Result is less than RL.

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-9-S-1

TCLP GC Semivolatiles

Lot-Sample #...:	F1K130107-011	Work Order #...:	ENR991AC	Matrix.....:	SOLID
Date Sampled...:	11/12/01 11:01	Date Received..:	11/13/01		
Leach Date.....:	11/13/01	Prep Date.....:	11/16/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131706	Prep Batch #...:	1320366	Analysis Time..:	01:23
Dilution Factor:	1				
% Moisture.....:	11	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	69	(22 - 142)
Decachlorobiphenyl	68	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-9-S-4

TCLP GC Semivolatiles

Lot-Sample #...:	F1K130107-014	Work Order #...:	ENTAD1AC	Matrix.....:	SOLID
Date Sampled...:	11/12/01 11:37	Date Received..:	11/13/01		
Leach Date.....:	11/13/01	Prep Date.....:	11/16/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131706	Prep Batch #...:	1320366	Analysis Time..:	02:21
Dilution Factor:	1				
% Moisture.....:	6.8	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	56	(22 - 142)
Decachlorobiphenyl	54	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10-S-1

TCLP GC Semivolatiles

Lot-Sample #...:	F1K130107-016	Work Order #...:	ENTAF1AC	Matrix.....:	SOLID
Date Sampled...:	11/12/01 12:50	Date Received..:	11/13/01		
Leach Date.....:	11/13/01	Prep Date.....:	11/16/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131706	Prep Batch #...:	1320366	Analysis Time..:	03:00
Dilution Factor:	1				
% Moisture.....:	20	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	78	(22 - 142)
Decachlorobiphenyl	70	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10-S-3

TCLP GC Semivolatiles

Lot-Sample #...:	F1K130107-018	Work Order #...:	ENTAH1AC	Matrix.....:	SOLID
Date Sampled...:	11/12/01 13:08	Date Received..:	11/13/01		
Leach Date.....:	11/13/01	Prep Date.....:	11/16/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131706	Prep Batch #...:	1320366	Analysis Time..:	03:39
Dilution Factor:	1				
% Moisture.....:	11	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	67	(22 - 142)
Decachlorobiphenyl	49	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10-S-4

TCLP GC Semivolatiles

Lot-Sample #...:	F1K130107-019	Work Order #...:	ENTAJ1AC	Matrix.....:	SOLID
Date Sampled...:	11/12/01 13:20	Date Received..:	11/13/01		
Leach Date.....:	11/13/01	Prep Date.....:	11/16/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131706	Prep Batch #...:	1320366	Analysis Time..:	03:58
Dilution Factor:	1				
% Moisture.....:	15	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	ND	5.0	ug/L
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	ND	0.50	ug/L
Heptachlor epoxide	ND	0.50	ug/L
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	72	(22 - 142)
Decachlorobiphenyl	70	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

STS ACQUISITIONS CO. dba STS CONS., LTD.

Client Sample ID: P-10A-S-1

TCLP GC Semivolatiles

Lot-Sample #...:	F1K130107-020	Work Order #...:	ENTAK1AC	Matrix.....:	SOLID
Date Sampled...:	11/12/01 13:50	Date Received..:	11/13/01		
Leach Date.....:	11/13/01	Prep Date.....:	11/16/01	Analysis Date..:	11/18/01
Leach Batch #..:	P131706	Prep Batch #...:	1320366	Analysis Time..:	04:18
Dilution Factor:	1				
% Moisture.....:	8.4	Method.....:	SW846 8081A		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chlordane (technical)	**4.2 J**	**5.0**	**ug/L**
gamma-BHC (Lindane)	ND	0.50	ug/L
Endrin	ND	0.50	ug/L
Heptachlor	**0.53**	**0.50**	**ug/L**
Heptachlor epoxide	**0.64**	**0.50**	**ug/L**
Methoxychlor	ND	1.0	ug/L
Toxaphene	ND	20	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	70	(22 - 142)
Decachlorobiphenyl	64	(10 - 162)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

J Estimated result. Result is less than RL.

METHOD BLANK REPORT

GC Semivolatiles

Client Lot #...: F1K130107
MB Lot-Sample #: F1K160000-366
Work Order #...: EN5GD1AA
Matrix.....: SOLID
Prep Date.....: 11/16/01
Analysis Time..: 15:22
Analysis Date..: 11/17/01
Prep Batch #...: 1320366
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
gamma-BHC (Lindane)	ND	0.50	ug/L	SW846 8081A
Chlordane (technical)	ND	5.0	ug/L	SW846 8081A
Endrin	ND	0.50	ug/L	SW846 8081A
Heptachlor	ND	0.50	ug/L	SW846 8081A
Heptachlor epoxide	ND	0.50	ug/L	SW846 8081A
Methoxychlor	ND	1.0	ug/L	SW846 8081A
Toxaphene	ND	20	ug/L	SW846 8081A

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	83	(22 - 142)
Decachlorobiphenyl	76	(10 - 162)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Attachment D

Groundwater Analytical Data

GRACE ANALYTICAL LAB, INC.
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CHLOROPHENOXY ACID HERBICIDES ANALYSIS DATA SHEET

STUDY NAME: STS / 25585XG, GMO
GAL PROJECT NO.: G011127B
LAB SAMPLE I.D.: 03099-4
FIELD SAMPLE I.D.: S #2

US EPA METHOD: 8151A
DATE RECEIVED: 11-27-01
FILE REF. NO: 2H010118
DATE ANALYZED: 12-03-01

CAS #	COMPOUND	CONCENTRATION (µg/L)
94-75-7	2,4-Dichlorophenoxyacetic acid	1.0 U
94-82-6	4-(2,4-Dichlorophenoxy)-butaonic acid	1.0 U
75-99-0	Dalapon	10.0 U
1918-00-9	Dicamba	1.0 U
120-36-5	Dichloroprop	1.0 U
88-85-7	Dinoseb	1.0 U
94-74-6	MCPA	500 U
93-65-2	MCPP	500 U
93-76-5	(2,4,5-Trichlorophenoxy)-acetic acid	1.0 U
93-72-1	2-(2,4,5-Trichlorophenoxy)-propanoic acid	0.05 U

CODES: U - Compound was analyzed for, but not detected. The value reported is the method detection limit.

Analysis Certified By: _____ Laboratory Director

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PESTICIDES AND PCBS ANALYSIS DATA SHEET

STUDY NAME: STS / 255585XG, GMO
GAL JOB NO.: G011127B
LAB SAMPLE I.D. NO: 03099-5
FIELD SAMPLE I.D. NO: S #2

US EPA METHOD: 8081
DATE RECEIVED: 11/27/01
FILE REF. NO: 2P010930
DATE ANALYZED: 12/03/01

	CAS #	Compound	Concentration (µg/L)
1	319-84-6	α-BHC	0.02 U
2	319-85-7	β-BHC	0.02 U
3	58-89-9	γ-BHC	0.02 U
4	319-86-8	δ-BHC	0.02 U
5	76-44-8	Heptachlor	0.03 U
6	309-00-2	Aldrin	0.03 U
7	1024-57-3	Heptachlor Epoxide	0.01 U
8	959-98-8	Endosulfan I	0.01 U
9	72-55-9	4,4'-DDE	0.02 U
10	60-57-1	Dieldrin	0.01 U
11	72-20-8	Endrin	0.01 U
12	33213-65-9	Endosulfan II	0.01 U
13	72-54-8	4,4'-DDD	0.04 U
14	7421-93-4	Endrin Aldehyde	0.05 U
15	1031-07-8	Endosulfan Sulfate	0.02 U
16	50-29-3	4,4'-DDT	0.02 U
17	72-43-5	Methoxychlor	0.02 U
18	57-74-9	Chlordane	0.20 U
19	8001-35-2	Toxaphene	1.00 U
20	12674-11-2	Aroclor 1016	0.20 U
21	11104-28-2	Aroclor 1221	0.20 U
22	11141-16-5	Aroclor 1232	0.20 U
23	53469-21-9	Aroclor 1242	0.20 U
24	12672-29-6	Aroclor 1248	0.20 U
25	11097-69-1	Aroclor 1254	0.20 U
26	11096-82-5	Aroclor 1260	0.20 U

CODE: U - Compound was analyzed for, but not detected. The value reported is the method detection limit.

Analysis Certified By: _____ Laboratory Director

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SEMIVOLATILES ORGANIC ANALYSIS DATA SHEET

STUDY NAME: STS / 255585XG, GMO
GAL JOB NO.: G011127B
LAB SAMPLE I.D. NO: 03099-6
FIELD SAMPLE I.D. NO: S #2

US EPA METHOD: 8270C
DATE RECEIVED: 11/27/01
FILE REF. NO: AB01598
DATE ANALYZED: 11/29/01

	CAS #	Compound	Concentration (µg/L)
1	108 - 95 - 2	PHENOL	2.5 U
2	111 - 44 - 4	BIS (2-CHLOROETHYL) ETHER	2.5 U
3	95 - 57 - 8	2-CHLOROPHENOL	2.0 U
4	541 - 73 - 1	1, 3 - DICHLOROBENZENE	2.0 U
5	106 - 46 - 7	1, 4 - DICHLOROBENZENE	2.0 U
6	100 - 51 - 6	BENZYL ALCOHOL	2.5 U
7	95 - 50 - 1	1, 2 - DICHLOROBENZENE	2.0 U
8	39638 - 32 - 9	BIS (2-CHLOROISOPROPYL) ETHER	2.5 U
9	95 - 48 - 7	2 - METHYLPHENOL	2.5 U
10	67 - 72 - 1	HEXACHLOROETHANE	2.0 U
11	621 - 64 - 7	N - NITROSODIPROPYLAMINE	2.5 U
12	106 - 44 - 5	4 - METHYPHENOL	2.5 U
13	98 - 95 - 3	NITROBENZENE	2.5 U
14	78 - 59 - 1	ISOPHORONE	2.0 U
15	88 - 75 - 5	2 - NITROPHENOL	2.5 U
16	105 - 67 - 9	2, 4 - DIMETHYLPHENOL	2.5 U
17	111 - 91 - 1	BIS (2 - CHLOROETHOXY) METHANE	2.5 U
18	120 - 83 - 2	2, 4 - DICHLOROPHENOL	2.5 U
19	120 - 82 - 1	1, 2, 4 - TRICHLOROBENZENE	2.0 U
20	91 - 20 - 3	NAPHTHALENE	2.0 U
21	106 - 47 - 8	4 - CHLOROANILINE	2.5 U
22	87 - 68 - 3	HEXACHLOROBUTADIENE	3.5 U
23	65 - 85 - 0	BENZOIC ACID	30.0 U
24	91 - 57 - 6	2 - METHYLNAPHTHALENE	2.0 U
25	59 - 50 - 7	4 - CHLORO - 3 - CRESOL	2.5 U
26	77 - 47 - 4	HEXACHLOROCYCLOPENTADIENE	2.5 U
27	88 - 06 - 2	2, 4, 6 - TRICHLOROPHENOL	2.5 U
28	95 - 95 - 4	2, 4, 5 - TRICHLOROPHENOL	2.5 U
29	91 - 58 - 7	2 - CHLORONAPHTHALENE	2.0 U
30	99 - 09 - 2	3 - NITROANILINE	33.0 U
31	131 - 11 - 3	DIMETHYL PHTHALATE	2.0 U
32	208 - 96 - 8	ACENAPHTHYLENE	2.0 U
33	606 - 20 - 2	2, 6 - DINITROTOLUENE	2.0 U
34	121 - 14 - 2	2, 4 - DINITROTOLUENE	2.0 U
35	83 - 32 - 9	ACENAPHTHENE	2.0 U
36	132 - 64 - 9	DIBENZOFURAN	2.0 U
37	51 - 28 - 5	2, 4 - DINITROPHENOL	30.0 U

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STUDY NAME: STS / 255585XG, GMO
GAL JOB NO.: G011127B
LAB SAMPLE I.D. NO: 03099-6
FIELD SAMPLE I.D. NO: S #2

US EPA METHOD: 8270C
DATE RECEIVED: 11/27/01
FILE REF. NO: AB01598
DATE ANALYZED: 11/29/01

	CAS #	Compound	Concentration (µg/L)
38	88 - 74 - 4	2 - NITROANILINE	30.0 U
39	100 - 02 - 7	4 - NITROPHENOL	30.0 U
40	84 - 66 - 2	DIETHYL PHTHALATE	2.0 U
41	7005 - 72 - 3	4 - CHLOROPHENYLPHENYL EHTER	2.5 U
42	86 - 73 - 7	FLUORENE	2.0 U
43	100 - 01 - 6	4 - NITROANILINE	30.0 U
44	86 - 30 - 6 122 - 39 - 4	N - NITROSODIPHENYLAMINE* DIPHENYLAMINE*	2.5 U
45	534 - 52 - 1	4, 6 - DINITRO - 2 - METHYLPHENOL	30.0 U
46	101 - 55 - 3	4 - BROMOPHENYLPHENYL ETHER	2.5 U
47	118 - 74 - 1	HEXACHLOROBENZENE	2.0 U
48	87 - 86 - 5	PENTACHLOROPHENOL	30.0 U
49	85 - 01 - 8	PHENANTHRENE	2.0 U
50	120 - 12 - 7	ANTHRACENE	2.0 U
51	84 - 74 - 2	DI - N - BUTYL PHTHALATE	2.5 U
52	206 - 44 - 0	FLUORANTHENE	2.0 U
53	129 - 00 - 0	PYRENE	2.0 U
54	85 - 68 - 7	BUTYLBENZYL PHTHALATE	2.5 U
55	56 - 55 - 3	BENZO (A) ANTHRACENE	2.0 U
56	218 - 01 - 9	CHRYSENE	2.0 U
57	91 - 94 - 1	3, 3' - DICHLOROBENZIDINE	50.0 U
58	117 - 81 - 7	BIS (2 - ETHYLHEXYL) PHTHALATE	2.0 U
59	117 - 84 - 0	DI - N - OCTYL PHTHALATE	2.5 U
60	205 - 99 - 2	BENZO (B) FLUORANTHENE	2.5 U
61	207 - 08 - 9	BENZO (K) FLUORANTHENE	2.5 U
62	50 - 32 - 8	BENZO (A) PYRENE	2.0 U
63	193 - 39 - 5	INDENO (1,2,3-C,D) PYRENE	3.5 U
64	53 - 70 - 3	DIBENZO (A, H) ANTHRACENE	2.5 U
65	191 - 24 - 2	BENZO (G,H,I) PERYLENE	3.5 U

CODE: U - Compound was analyzed for but not detected. The value reported is the method detection limit.
* - These two parameters are reported as a total.

Analysis Certified By: _____ Laboratory Director

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VOLATILES ORGANIC ANALYSIS DATA SHEET

STUDY NAME: STS / 255585XG, GMO
GAL JOB NO.: G011127B
LAB SAMPLE I.D. NO.: 03099-1
FIELD SAMPLE I.D. NO.: S #2

US EPA METHOD: 8260B
DATE RECEIVED: 11/27/01
FILE REF. NO: V012134
DATE ANALYZED: 11/27/01

	CAS #	Compound	Concentration (µg/L)
1	74 - 87 - 3	Chloromethane	10 U
2	75 - 01 - 4	Vinyl Chloride	3 U
3	74 - 83 - 9	Bromomethane	10 U
4	75 - 00 - 3	Chloroethane	1.5 U
5	67 - 64 - 1	Acetone	10 U
6	75 - 35 - 4	1,1-Dichloroethene	2.7 U
7	75 - 09 - 2	Methylene Chloride	5 U
8	75 - 15 - 0	Carbon Disulfide	3 U
9	156 - 60 - 5	Trans-1,2-Dichloroethene	1.5 U
10	75 - 34 - 3	1,1-Dichloroethane	1.5 U
11	108 - 05 - 4	Vinyl Acetate	15 U
12	78 - 93 - 3	2-Butanone	10 U
13	156 - 59 - 2	Cis-1,2-Dichloroethene	1.5 U
14	67 - 66 - 3	Chloroform	3.5
15	107 - 06 - 2	1,2-Dichloroethane	1.6 U
16	71 - 55 - 6	1,1,1-Trichloroethane	2 U
17	56 - 23 - 5	Carbon Tetrachloride	2.3 U
18	71 - 43 - 2	Benzene	1.5 U
19	78 - 87 - 5	1,2-Dichloropropane	1.5 U
20	79 - 01 - 6	Trichloroethene	1.5 U
21	75 - 27 - 4	Bromodichloromethane	1.5 U
22	110 - 75 - 8	2-Chloroethylvinyl Ether	6.9 U
23	10061 - 01 - 5	Cis-1,3-Dichloropropene	2 U
24	108 - 10 - 1	4-Methyl-2-Pentanone	10 U
25	10061 - 02 - 6	Trans-1,3-Dichloropropene	2 U
26	79 - 00 - 5	1,1,2-Trichloroethane	1.5 U
27	108 - 88 - 3	Toluene	1.5 U
28	124 - 48 - 1	Dibromochloromethane	1.5 U
29	591 - 78 - 6	2-Hexanone	10 U
30	127 - 18 - 4	Tetrachloroethene	1.5 U
31	108 - 90 - 7	Chlorobenzene	1.5 U
32	100 - 41 - 4	EthylBenzene	1.5 U
33	75 - 25 - 2	Bromoform	1.5 U
34	100 - 42 - 5	Styrene	1 U
35	108 - 38 - 3	Xylenes (total)	3.2 U
36	79 - 34 - 5	1,1,2,2-Tetrachloroethane	1.5 U

CODE: U - Compound was analyzed for but not detected. The value reported is the method detection limit.

Analysis Certified By: _____ Laboratory Director

GRACE ANALYTICAL LAB, INC.
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METALS ANALYSIS DATA

CLIENT PROJECT NO: 25585XG/GMO
CLIENT: STS Consultants LTD.
750 Corporate Woods Parkway, Vernon Hills, IL 60063
GAL JOB NO.: G011127B
MATRIX: Water

US EPA METHOD: 6010B/7000
DATE SAMPLED: 11/27/01
DATE RECEIVED: 11/27/01
DATE REPORTED: 12/06/01

FIELD SAMPLE ID: S #2
GAL SAMPLE ID: 03099

ELEMENT	RESULT (mg/L)	UNITS	MDL*	DATE ANALYZED	File Ref. No
Sb	0.0043	mg/L	0.002	11/30/01	AA01283
As	0.0034	mg/L	0.002	11/29/01	AA01280
Be	< MDL	mg/L	0.01	12/03/01	AA01284
Cd	< MDL	mg/L	0.0002	12/04/01	AA01285
Cr	< MDL	mg/L	0.002	11/29/01	AA01281
Cr^{+6}	< RL**	mg/L	0.05**	11/29/01	G011127B_CR+6_Water
Cu	< MDL	mg/L	0.01	11/29/01	01488
Fe	0.218	mg/L	0.02	11/30/01	01489
Pb	0.0014	mg/L	0.001	11/29/01	AA01278
Hg	< MDL	mg/L	0.004	11/30/01	AEA/01110620-01
Ni	< MDL	mg/L	0.03	11/29/01	01487
Se	< MDL	mg/L	0.002	11/28/01	AA01278
Ag	< MDL	mg/L	0.01	11/28/01	01482
Tl	< MDL	mg/L	0.002	11/30/01	AA01282
Zn	0.0143	mg/L	0.005	11/29/01	01486

* METHOD DETECTION LIMIT
** REPORT LIMIT

FOG and Cyanide Results

ELEMENT	RESULT (mg/L)	UNITS	MDL*	DATE ANALYZED	US EPA Method
Cyanide	<RL	0.05	mg/L	12/4/01	M4500/E335.2
FOG	<RL	5.00	mg/L	12/4/01	E1664

* METHOD DETECTION LIMIT

Analysis Certified By: _____ Laboratory Director
Reported By: AK

Environmental, Inc.
Midwest Laboratory
an Allegheny Technologies Co.
700 Landwehr Road • Northbrook, IL 60062-2310
ph. (847) 564-0700 • fax (847) 564-4517

LABORATORY REPORT NO.: 8100-6348
DATE: 01-31-2002
SAMPLES RECEIVED: 01-18-2002
PURCHASE ORDER No.: G020117B/GMQ

Grace Analytical Lab
5300-B McDermott Drive
Berkeley, IL 60163

Below are the results of the analyses for gross alpha and gross beta on one water sample collected January 17, 2002.

Sample Description	Lab Code	Concentration (pCi/L) Gross α	Gross β
3/03476	SPW-313	3.9±3.1[a]	49.8±5.0

[a] = elevated error is due to high residue content.
The error given is the probable counting error at 95% confidence level.

Sincerely,

Rimma Amromin
Project Coordinator

APPROVED BY

Bronia Grob, M. S.
Lab Manager

SAMPLES RETAINED THIRTY DAYS AFTER ANALYSIS

TEACHERS' RETIREMENT SYSTEM - GMO SITE

TRANSPORTATION AND LOGISTICS PLAN

APPENDIX 1

Title: Transportation and Logistics Plan

Revision Number: 0

Date: Replaces: New

APPENDIX 1

TRANSPORTATION AND LOGISTICS PLAN

Material exceeding 7.1 pCi/g will be directly loaded into intermodal containers for shipment via rail to the Envirocare of Utah low-level radioactive material waste disposal facility in Clive, Utah. Small quantities may be stored in Supersacks temporarily staged on-site until such time as adequate material is accumulated to fill a container. Empty containers will be prepared by installing a plastic liner inside the container. Empty containers will be staged and lined on Site. Containers will remain on their trailer chassises during their time on Site.

A jockey truck will be used on Site to bring the lined, empty containers to the excavation area. Every attempt will be made to keep the container and trailer on an existing asphalt surface at the edge of the excavation to minimize the potential for cross-contaminating the Site.

After the container is loaded with approximately 22.4 tons of material exceeding 7.1 pCi/g, the HP will survey the container, the container lid will be closed, and the container will be moved to the loaded container staging area. At the staging area, the lid of the container will be secured with chains or straps inherent to the container.

Preparing, loading and sealing containers will be performed in accordance with, the HASP, Attachment 3 to the Removal Action Work Plan.

Loaded containers with their shipping papers will be staged on Site. They will be transported to the railhead in Blue Island, IL at night, after evening rush hour traffic has abated. Shipping hours are anticipated to be between 8:00 p.m. and 3:00 a.m. Horns and back up alarms will not be used on Site between these hours to minimize disturbances to the local residents.

The intermodal transport crew will consist of a jockey driver with a yard tractor, one to two over-the road transport drivers, two laborers and an HP.

Transport drivers will deliver empty intermodal containers on chassises to the Site. At the Site, the two laborers will line the empty containers. The jockey driver will bring the lined empty container into position for loading. After loading, the HP will survey the container for release, and then the jockey driver will stage the container for shipping. Later that night, transport drivers will bring the loaded containers to the railyard for eventual shipping to Envirocare of Utah.

TEACHERS' RETIREMENT SYSTEM -- GMO SITE
PERMITTING AND ACCESS REQUIREMENTS PLAN
APPENDIX 2

Title: Permitting and Access Requirements Plan

Revision Number: 0

Date:

Replaces: New

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PERMITTING AND ACCESS REQUIREMENTS PLAN

1.0 PURPOSE

The Permitting and Access Requirements Plan (Plan) describes the permits and access agreements required prior to implementation of excavation activities at the GMO site (Site). This Plan describes the procedures and estimated time frames for acquiring the required permits, and the procedures and methods to be implemented to ensure compliance with the permitting requirements.

The Plan includes the procedures to be used by Teachers' Retirement System of the State of Illinois (TRS) and their contractors to ensure that buried underground utilities are not damaged during excavation activities. The Plan describes corrective measures to be taken in the event that such damage inadvertently occurs.

2.0 GUIDANCE

The following documents were reviewed in preparation of this Plan:

- Summary of Radiological Survey Time-Life property, dated May 2000, prepared by B. Koh & Associates, Inc.
- Zoning Ordinance of the City of Chicago, Illinois prepared by the City of Chicago.

3.0 IMPLEMENTATION

STS Consultants, Ltd. (STS) on behalf of TRS, will be responsible for assuring compliance with the Plan during the course of the excavation activities at the Site. The Site, situated in an urban area surrounded by commercial and residential buildings, is presently undeveloped and has been used intermittently as a parking lot in recent years.

3.1 PERMITTING AND SUBSTANTIVE REQUIREMENTS

Performance of the Removal Action Work Plan (Work Plan) will necessitate the issuance of various federal permits, licenses, and other formal consents. Under Superfund, the Respondents are exempt from obtaining federal, state or local permits for on-site work, although on-site work must comply with the substantive requirements of such permits. All applicable permits and authorizations are required for off-site activities. Some permits, such as those issued by the Department of Transportation to commercial carriers to transport the excavated soils, debris and drummed liquids over public streets, will not be sought by TRS, but by Kerr-McGee or its contractors. Kerr-McGee will contract only with transportation companies qualified and licensed to carry such materials, and will advise them of traffic routes approved by the Chicago Police Department.

General permits include those required for the disposal of the excavated materials at the Envirocare of Utah, Inc. facility. Permits specific to potential work at the Site include those required for replacement of sidewalks, service walks, driveways and streets.

A list of the known licenses, permits, and other formal consents expected to be necessary for excavation activities undertaken on the Site is attached as Table 1. Those permits and other formal consents are discussed generally in the following sections.

A list of local substantive requirements related to the excavation activities is attached as Table 2.

3.1.1 General Permits

The general permits or other formal consents are applicable to excavation activities conducted within the Site.

Unilateral Administrative Order. While not a "permit," nevertheless, the Unilateral Administrative Order (UAO) issued by the Region V office of the United States Environmental Protection Agency (USEPA) is the primary document directing the excavation activities at the Site. The Work Plan and its subparts: the Transportation and Logistics Plan, the Permitting and Access Requirements Plan, the Traffic Control Plan, the Emergency Contingency Plan, the Verification Sampling Plan, the Site Security Plan, the Site Training Guidelines, the Air Monitoring Plan, the Field Sampling Plan, and the Dust Control Plan will guide all activities undertaken during excavation activities. Supplementary to the Work Plan are the Construction Quality Assurance Plan (CQA Plan), Quality Assurance Project Plan (QAPP), and the Health and Safety Plan.

Once approved by the USEPA, compliance with the requirements contained in these documents will be ensured by strict implementation of applicable quality assurance/quality control requirements by TRS, STS, Kerr-McGee, and their contractors.

Permit from Envirocare of Utah, Inc. Kerr-McGee has contracted for the disposal of the excavated materials removed from the Site at a permanent disposal facility licensed to accept and permanently dispose of radiologically-impacted material.

3.1.2 Specific Permits

Permits from the City of Chicago. STS or Kerr-McGee will obtain appropriate approvals from the City of Chicago Police Department for any temporary street closings or detours necessitated by the excavation activities and for proposed truck traffic routes for the transportation of contaminated materials excavated from Site to the disposal facility.

3.1.3 Substantive Requirements

Requirements from Cook County. STS will comply with the substantive requirements of applicable and lawful ordinances of the Zoning Enforcement Division of the Cook County Building Department for control of erosion and storm water drainage within the Site.

Requirements from the City of Chicago. STS will comply with the substantive requirements of applicable and lawful ordinances enacted by the City of Chicago for control of erosion and storm water drainage within and around the Site.

3.1.4 Maintenance of Permit Documentation

A file of general permits required for excavation activities undertaken in connection with the Site will be maintained by STS. All required general and specific permits will be obtained prior to the commencement of excavation activities at the Site.

STS will provide to authorized personnel access to records and documentation in its possession related to the Site. Authorized personnel may include USEPA employees, contractors, agents, consultants, designees, and representatives; and employees and agents of the City of Chicago and Cook County.

STS will preserve all documents and information relating to the excavation work for ten years after the USEPA provides notice pursuant to paragraph V.5 of the UAO.

3.2 ACCESS REQUIREMENTS

Subject to weather and related conditions, and upon receipt of all necessary permits, licenses, authorizations, or other consents described above, and after the Work Plan is approved by the USEPA, STS will begin activities at the Site.

Prior to the start of excavation activities, STS will survey the property and will prepare a brief plan including a layout drawing depicting the condition and location of existing asphalt, concrete, parking bumpers, buildings, and any vegetation or landscape within the Site or around the Site and access routes. This survey will include sufficient photographs to show all affected areas and any key features of the Site. Pre-work photographs/videotapes will be retained.

3.3 PROTECTION OF UNDERGROUND UTILITIES

STS will contact the Chicago Utility Alert Network (DIGGER) at 312-744-7000, and will meet with the City of Chicago to determine the location of all underground utilities within the Site prior to beginning excavation activities. DIGGER will notify representatives from the local gas company, electric company, telephone and telecommunications companies, and the cable television companies.

In the event inadvertent damage to buried underground utilities occurs, STS and its contractors will contact the appropriate utility company and ensure coordination of prompt corrective measures or repairs.

TABLE 1
LIST OF PERMITTING REQUIREMENTS
FOR EXCAVATION PHASE
ACTIVITIES AT THE GMO SITE

Type of Permit or Other Formal Consent Required	Issuing Agency or Approving Entity	Estimated Time Frame to Acquire Permit or Consent	Procedure Required to Attain Permit or Consent	Procedures/Methods to be Implemented to Ensure Compliance
UAO directing to commencement of Excavation activities	USEPA	Issued 1996	Federal Directive	• Familiarization of all project personnel with the Removal Action Work Plan, Quality Assurance Project Plan, Field Sampling Plan, Construction Quality Assurance Plan, Health & Safely Plan. Emergency Contingency Plan and all appendices thereto including this Permitting and Access Requirements Plan • implementation of QA/QC procedures to verify Compliance • Frequent communications with USEPA officials in the form of formal written status reports, informal status meetings and telephone calls
Permission to dispose of radiologically-impacted material	Envirocare of Utah, Inc. disposal facility	Permission received	Submission of application to Envirocare	Verification of materials shipped to Envirocare prior to shipment by KMCC and upon receipt at disposal facility in Utah by Envirocare
• Approval of truck routes for transporting soils from GMO site • Approve of any temporary closings of streets or alleys necessitated by excavation and restoration activities at the GMO Site	Police Department for the City of Chicago and the City of Chicago Department of Transportation	3 days	Submit proposed traffic plan to Police Department, City of Chicago	• Meet with City of Chicago Police Department to present proposed traffic plan • Revise traffic plan as required for Police Department approval • Inform Contractor and its drivers of the approved routes and ensure compliance by frequent mobile inspections

TABLE 2
LIST OF LOCAL SUBSTANTIVE REQUIREMENTS
FOR EXCAVATION PHASE
ACTIVITIES AT THE GMO SITE

Requirement	Government Agency/Authority	Methods to be Implemented to Satisfy Requirements
Resurfacing, repair, replacement or excavation and restoration of any existing sidewalks, service walks or drive approaches in excess of 50 square feet in area, if any, outside GMO Site	Zoning Administrator for the City of Chicago and City of Chicago Department of Transportation	• Preparation of excavation plans for each area • Communication with City DOT during course of excavation and restoration activities • City oversight during restoration actives • Inspection by City Engineer prior to placement of any portland cement, concrete, or bituminous concrete • Bond providing surety
Control of erosion and storm water drainage on GMO Site	Zoning Administrator for the City of Chicago, DOT Construction Compliance Division and City of Chicago Environmental Control Examiner	• Comply with the substantive requirements of the City of Chicago Pollution Control Ordinance
Plans for fencing Site during excavation activities and plans for construction of temporary driveways.	Zoning Administrator for the City of Chicago, DOT Construction Compliance Division, and City of Chicago Environmental Control Examiner	• Preparation of fencing and driveway plans. • Communication with City DOT during course of excavation and restoration activities • City oversight during construction • Inspection by City Engineer

TEACHERS' RETIREMENT SYSTEM - GMO SITE

TRAFFIC CONTROL PLAN

APPENDIX 3

Title: Traffic Control Plan

Revision Number: 0

Date: Replaces: New

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TRAFFIC CONTROL PLAN

1.0 PURPOSE

The Traffic Control Plan (Plan) describes procedures Teachers' Retirement System of the State of Illinois (TRS), Kerr-McGee Chemical Company, LLC (Kerr-McGee0 and their contractors will follow to protect vehicles and pedestrians at the GMO site (Site) and to protect workers from traffic accidents if work is required on or near roads or sidewalks during implementation of the excavation activities.

2.0 GUIDANCE

Guidance in developing this Plan was obtained from the Standard Specifications for Road and Bridge Construction compiled by the Illinois Department of Transportation (IDOTSPECS); the Highway Standards compiled by the Bureau of Design of the Illinois Department of Transportation (ILHWSTDS); the Standard Design Typical Application of Traffic Control Devices for Day Labor Construction on Rural Local Highways (BLR Standard 17) and the Standard Design Typical Application of Traffic Control Devices for Contract Construction on Rural Local Highways (BLR Standard 21-2) compiled by the Bureau of Local Roads of the Illinois Department of Transportation; the Standard Specification for Traffic Control Items adopted by the Illinois Department of Transportation, as amended; and the Illinois Manual on Uniform Traffic Control Devices, as amended.

3.0 PRODUCTS

Traffic control materials must conform to the following:

- IDOTSPECS, Section 784
- ILHWSTDS, Section F
- TIDOT Specifications (Standard Specification for Traffic Control Items)

- Section 02010 - Demolition and Debris Removal
- Section 02200 - Contaminated Material Loadout and Earthwork
- Appendix 3 of the Work Plan

4.0 SUBMITTALS

A. STS Consultants, on behalf of TRS, or Kerr-McGee shall develop, and update a traffic control schedule of street and sidewalk closings, partial closings and detours. The traffic control schedule and a route map will be submitted to the appropriate City agencies for approval.

B. Copies of these submittals will be provided to the STS Project Manager and placed in project files. These files will be maintained at the project site and STS's Vernon Hills, Illinois office.

5.0 EXECUTION

During excavation activities, trucks carrying excavated materials will be traveling between the Site and the rail terminal. A summary of the criteria which will be used to select the route is provided below.

- Adequate to support the loads. The selected route must be capable of supporting the trucks. Routes with small, light traffic bridges and surfaces of other than asphalt or concrete in good repair will be avoided where possible.
- Ease of travel. The route selected should minimize the number of stops and turns, and the streets should be sufficiently wide for two trucks to pass where other vehicles are parked on both sides of the street.
- Minimum other traffic. Major traffic routes should be avoided. The more traffic the greater the potential for an accident to occur. Also, minor traffic routes generally have lower speed limits than major routes.

- Lowest population density. Routes which pass hospitals, schools or other places with high concentrations of people should be avoided where possible.

As a part of the Work Plan, STS and its contractors or Kerr-Mcgee will prepare a Traffic Routing Plan. The plan will contain schedules for vehicular traffic control, pedestrian traffic control, and traffic control for the contractors' equipment. This plan will describe truck routes for transporting soils to the loading area from the Site. The plan will indicate any temporary traffic restrictions required for the remediation of the Site, and the dates and times when these restrictions will be effected. The Project Manager or his representative will deliver the plan to the Police Department, and discuss the plan with a Department Representative.

STS will be responsible for keeping the work areas open to pedestrian and vehicular traffic to the extent practical and should provide safe passage of such traffic and continuous access for emergency vehicles.

STS and its contractors will prepare a plan for pedestrian and vehicular traffic control to be compatible with excavation procedures employed at the Site. The proposed excavation sequencing will be incorporated to form continuous traffic control schedules. Descriptions of proposed procedures for pedestrian and vehicular traffic routing and protection will be included in the immediate traffic area and the surrounding area during operational and non-operational hours.

Traffic control will be provided for work in and adjacent to streets, alleys and highways, as appropriate. For streets or alleys along or in which excavation activities are taking place, and for areas where contractors' vehicles are entering or leaving streets or alleys, warning lights will be installed or flaggers stationed informing traffic of excavation activities ahead.

Barricade and warning sign arrangements will conform, at a minimum, to the ILHWSTDS requirements of 2305-6 and 2303-7 and BLR Standard 17 for excavation activities that are completed in a single day or that are longer in duration.

More extensive warnings, markings and controls will be set up in areas having special local conditions such as:

- high daily or hourly traffic volumes,
- unusual turning patterns,
- moderate to high pedestrian traffic,
- police, fire, ambulance, civil defense or other emergency services, and
- public works facilities.

With respect to the contractors' equipment, all such equipment and vehicles will be operated in accordance with applicable traffic laws and safety regulations. The equipment will have, at a minimum, appropriate warning lights and audible warning devices. Where the equipment enters or leaves public roadways, warning signs and barricades will be set up. In moderate and high vehicular traffic volume areas, flagpersons to control traffic and aid travel of contractors' equipment will be provided.

STS and Kerr-McGee will inform their contractors and the contractors' drivers of the approved routes. The Quality Assurance Supervisor will monitor construction traffic to assure that the traffic is constrained to the prescribed routes.

TEACHERS' RETIREMENT SYSTEM - GMO SITE

EMERGENCY CONTINGENCY PLAN

APPENDIX 4

Title: Emergency Contingency Plan

Revision Number: 0

Date: Replaces: New

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1.0 SCOPE OF PLAN

The purpose of the Emergency Contingency Plan (ECP) is to provide guidance and direction in the event of an unanticipated exposure of an individual to hazardous substances or hazardous conditions related to the excavation and restoration activities at the GMO site (Site).

Personnel assigned to this project will be required to review thoroughly the contents of this ECP and to strictly adhere to the policies and procedures provided herein.

2.0 EMERGENCY AND EVACUATION PLAN

2.1 EMERGENCY COORDINATION

The Field Team Leader will coordinate emergency response at the Site. In the event of an emergency, the Field Team Leader will immediately notify the STS Project Manager. The STS Project Manager will be responsible for notifying the proper response agencies listed in Figure 1, Emergency Phone Numbers. Emergency response procedures, instructions for emergency response to injuries, and evacuation plans will be reviewed at safety briefings.

2.2 EMERGENCY SERVICES CONTACTS

Before field activities commence, the Field Team Leader will inform the appropriate emergency contacts about the nature and duration of work expected at the Site and the type of contaminants and possible health or safety effects or emergencies involving these contaminants.

All hospital treatment should be provided via the 911 Emergency Medical System, with the Chicago Fire Department providing ambulance service. Emergency services can be provided by Northwestern Memorial Hospital located within one-half mile of the Site. The location and possible route to the hospital from the Site, including narrative directions, are shown on Figure 2.

The emergency telephone numbers listed in Figure 1 will be distributed to the Field Team Leader. Emergency numbers will be reviewed every three months by the STS Project Manager and revised, as necessary. The STS Project Manager will date and sign new revisions. The Field Team Leader will record the date of the revised telephone number list in his daily log book. Upon revision, the figure will be submitted to the U.S. EPA, and the City.

2.3 IMPLEMENTATION

The Field Team Leader will implement the emergency action procedures whenever conditions at the Site warrant such action. The Field Team Leader will be responsible for coordinating the evacuation, emergency treatment, and emergency transport of site personnel, as necessary, and informing the appropriate coordinating management staff. The following conditions may require implementation of emergency action procedures:

- Fire or explosion on-site.
- Serious personal injury.
- Release of radioactivity exceeding one Annual Limit of Intake (ALI) as defined in 32 IAC 340.1220 in a 24-hour period.
- Release of hazardous materials, including gases or vapors, at elevated levels.
- Unsafe working conditions, such as inclement weather (tornado, hail, etc.).

2.4 FIRE OR EXPLOSION

If fire or explosion takes place, emergency steps shall include: 1) evacuation of work area; and 2) notification of local fire department and other appropriate emergency response groups listed on Figure 1, as necessary (e.g., if a spill occurs, the emergency spill hotline will be notified).

2.5 PERSONAL INJURY

Actions to be taken in the event of personal injury are described in the Health and Safety Plan, Section 4.3.4, Emergency Medical Treatment.

2.6 EVACUATION PLAN

All project personnel will evacuate the area under the direction of the Field Team Leader. Evacuation from the affected area will be initiated by sounding an alarm, such as an air-horn, megaphone, or other form of notification.

A coordinated evacuation will be conducted with all project personnel using the most direct upwind route, avoiding the point of emergency.

All project personnel involved in the evacuation will immediately move to the Decontamination/Transition area and will remain there awaiting further instructions from the Field Team Leader.

Personal Protective Equipment will be used at all times by the project personnel during the evacuation procedures.

2.7 ACCIDENT AND INCIDENT REPORTING

All accidents, injuries, and incidents shall be reported to the Field Team Leader. An Accident/Injury Form will be completed by the Field Team Leader, as described in the HASP, Section 4.4, Accident and Incident Reporting.

FIGURE 1 EMERGENCY PHONE NUMBERS

Police Department	911
Fire Department	911
Ambulance	911
Hospital Address Phone	Northwestern Memorial Hospital 250 E. Superior (312) 908-2000 (Ask for ER)
Poison Control Center	(800) 732-2200
Illinois Department of Nuclear Safety (IDNS) Emergency Number	(217) 785-0600 (24 hour Radiologic Assistance)
STS Project Coordinator Richard G. Berggreen	847-279-2500 (work) 847-417-7504 (mobile)
STS Project Manager Julie Apolinario	847-279-2500 (work)
STS Field Team Leader Dumas Guerrier	847-344-6379 (mobile)

SECONDARY EMERGENCY NUMBERS

The STS Project Manager will evaluate when these agencies should be notified.

National Response Hotline	(800) 424-8802
Illinois Emergency Management Agency	(217) 782-7860
Illinois Environmental Protection Agency Emergency Response Duty Officer	(217) 782-7860 or (217) 782-3657, IEPA ERU during normal working hours.
U.S. EPA Region V 24-hours Emergency Number	(312) 353-2318

TEACHERS' RETIREMENT SYSTEM - GMO SITE

VERIFICATION SAMPLING PLAN

APPENDIX 5

Title: Verification Sampling Plan

Revision Number: 0

Date: Replaces: New

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1.0 INTRODUCTION

1.1 PURPOSE

This Verification Sampling Plan (Plan) describes the sampling activities and analytical methods that will be used by the Teachers' Retirement System of the State of Illinois (TRS) to demonstrate the GMO (Site) meets the cleanup criteria. By following the protocol included in this plan, TRS can give the U.S. EPA reasonable assurance the Site meets the cleanup criteria described in Section V.2.d of the Unilateral Administrative Order (UAO).

1.2 SCOPE

The verification survey will be conducted as excavation activities are completed at a Site. The purpose is to demonstrate the soils have been excavated to meet the cleanup criteria described in the UAO. Averaging over areas up to 100 square meters is allowed, but only after reasonable efforts have been made to achieve levels As Low As Reasonably Achievable (ALARA). (Reference SOP-LLII 223 "Verification Survey Procedure").

1.3 CONTAMINANTS OF CONCERN

The verification program includes testing for specific constituents which are indicative of the contaminants of concern. Constituents of concern that may be encountered on the Site are the entire U-238 and Th-232 decay series; however, measurements will only be made for total radium (Ra-226 and Ra-228).

1.4 REFERENCES

The following references have been used in developing this Plan:

- Administrative Order by Consent, U.S. EPA, 1996;
- 32 IAC 332.150(b) - Soil Radioactivity and Exposure Rate Criteria;

- DOE Order 5480.11 and 10 CFR 20 - Surface Contamination and Exposures (ALARA); and
- NUREG/CR 5849 "Manual for Conducting Radiological Surveys in Support of License Termination" Draft June 92.

Standard Operating Procedures (SOPs) used during the verification sampling are included in the Quality Assurance Project Plan (QAPP), Standard Operating Procedures (SOPS) - Appendix B.

2.0 EXCAVATION CONTROL

2.1 GAMMA SURVEY

A gamma survey will be done after the excavation is thought to be complete. The survey will comprise verification testing of the excavation.

Gamma measurements will be made over the entirety of the excavation. The procedure and instrumentation used will be 2 x 2 NaI detectors. This procedure provides a gamma measurement survey over an area of approximately one-square-meter. The gamma measurements will be collected over the entire area of the excavation to determine the concentration of radium remaining. STS, on behalf of TRS, will use appropriate correlations established by the U.S. EPA or independently by TRS to relate the survey measurements to total radium.

If the gamma survey indicates areas where the measured radium concentration exceeds the cleanup criteria of 5 pCi/g radium (Ra-226 and Ra-228) above background, additional material will be removed until the measured radium concentration is less than 5 pCi/g above background. Exceptions may be made to this operational criterion with U.S. EPA concurrence.

In addition to the gamma survey, STS will obtain samples for laboratory testing to measure the total radium concentration of soils. Such testing may be used to resolve ambiguous gamma survey measurements, to establish or verify gamma/radium correlations, or to provide additional data to verify that the cleanup criteria have been met at the excavation. At least one composite soil sample will be taken for laboratory analysis from each excavation. The samples will be taken in accordance with the soil sampling procedure in SOP-214, and tested for radium (Ra-226 and Ra-228). Apparently clean material below the radiologically-impacted soil may be excavated to facilitate verification. This material will require sampling as overburden if it is to be managed as clean soil for backfill.

2.1.1 Gamma Survey Procedure

The gamma survey will be performed according to the Gamma Survey Standard Operating Procedure (Document Number SOP-210) included in the QAPP.

2.1.2 Documentation

The Verification Gamma Survey drawing described above will be used to document the readings obtained during the gamma survey. The drawing also will contain information pertaining to background gamma radiation levels and instrument calibration.

2.1.3 Quality Control

The gamma survey will be performed by trained individuals who have sufficient skill to obtain accurate and consistent information. All information obtained during gamma surveys will be reviewed by the Field Team Leader for accuracy and consistency.

All field equipment will be calibrated either in accordance with NUREG/CR 5849 "Manual for Conducting Radiological Surveys in Support of License Termination" Draft June 1992 or with industry-recognized protocols. Instrument response background and check source tests will be performed and recorded daily to ensure instrument operations are within the established acceptable range.

At least 5 percent of the survey area will be resurveyed. Readings from the initial survey will be compared to those readings obtained during the quality control (QC) survey to identify instrument malfunctions or reading/document errors.

3.0 DECONTAMINATION

All discarded materials, waste materials, and otter field equipment and supplies shall be handled in such a way to prevent the potential spread of contamination during excavation and restoration activities. Discarded items that have contacted contaminated materials will be containerized and stored for disposal at the approved disposal facility. Non-contaminated items to be discarded will be collected for disposal as non-hazardous waste. Personnel and sampling equipment decontamination are described in the Decontamination Procedure included as SOP LL11 347 of Appendix B.

TEACHERS' RETIREMENT SYSTEM - GMO SITE

SITE SECURITY PLAN

APPENDIX 6

Title: Site Security Plan

Revision Number: 0

Date: Replaces: New

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1.0 PURPOSE 1

2.0 IMPLEMENTATION 1

SITE SECURITY PLAN

1.0 PURPOSE

The Site Security Plan (Plan) describes procedures TRS and its contractors will follow to control access to the GMO site (Site) during the excavation activities. It is important that access by unauthorized personnel to the Site during operational and non-operational hours be prevented because of hazards created by open excavations, moving contractors' equipment, and traffic.

2.0 IMPLEMENTATION

Site security will be directed by STS Consultants, Ltd. (STS) on behalf of TRS. The entire perimeter of the Site will be fenced. Access gates will be closed when not in use. Only authorized personnel will be permitted on site. Appropriate temporary fencing, barricades, and signs will provide security during non-operational hours.

During operational hours, STS, its contractors and subcontractors, and their representatives will have access to the Site to implement the excavation activities. Kerr-McGee and their contractors and subcontractors will have access to implement health physics and transportation activities. Access restrictions to the construction areas will be described, as will the various signs and barricades that will delineate these areas. This same information will be disseminated during the meeting that will be held at the beginning of the project (see Appendix 2 - Permitting and Access Plan) to discuss utilities that may enter the site.

All visitors desiring access to the Site will be required to register with the Project Manager or his designee before proceeding to the Site. The Project Manager or his designee will provide necessary orientation and training, provide radiation monitors as appropriate, and escort the visitors to the Site. While on the Site, the visitors will be required to observe all health and safety requirements, and follow all instructions given by the Field Team Leader.

The Site may be inspected by various state and federal regulatory officials, as well as local City or County officials.

Regulatory and governmental officials who visit the Site regularly will receive appropriate training. When visiting the Site, they will receive permanent badges and radiation monitors, and will register with the Field Team Leader before entering the exclusion zone. Ordinarily, these persons will not be escorted. They will be required to comply with all instructions of the Field Team Leader and observe all Health and Safety rules.

During non-operational hours, appropriate barricades, beacons, radiation warning signs, and temporary fencing, as appropriate, will be placed to prevent unauthorized entry into an exclusion zone. Exclusion zones will be surrounded by "rad rope" at all times until determined to meet the cleanup criteria by USEPA. Signs will be placed on the site perimeter fencing identifying the Site as a construction area and prohibiting unauthorized entry. The warning signs will be installed at maximum 100 foot intervals on the perimeter fence. The warning signs will read as follows:

Undergoing Environmental Remediation
For further information contact:
(Need contact name and phone number)
Your call will be returned during normal business hours.
Please leave your name and telephone number after the recorded message

Contaminated equipment will be left on-site within the exclusion zone. Keys will be removed during non-operational hours.

A guard or security service may be used during non-operational hours to periodically check the area.

TEACHERS' RETIREMENT SYSTEM - GMO SITE

PROJECT TRAINING PLAN

APPENDIX 7

Title: Project Training Plan

Revision Number: 0

Date: Replaces: New

PROJECT TRAINING PLAN

All workers who regularly participate in site activities shall be required to attend Site Specific Training. The training session will consist of two sections. The first section will consist of a detailed review of the Site Health and Safety Plan. The second section will be dedicated to basic radiation safety training.

The Health and Safety Plan can be found as Attachment 3 of this Work Plan. The outline for basic radiation safety training is enclosed in this section.

It is estimated that training will take four hours to complete and will take place prior to any onsite remedial activities.

Visitors to the site who do not regularly participate in site activities shall be escorted at all times by the project manager or his designee. Visitors will not be required to attend Site Safety Training, but they will receive a safety briefing prior to site entry.

Instructor: _____ Date: _____

BASIC RADIATION SAFETY TRAINING

I. Introduction and Site History
II. What is Radiation?
III. Background Radiation
IV. Types of Radiation
   a. Alpha
   b. Beta
   c. Gamma
   d. X-ray
   e. Neutron
V. Units of Radiation
   a. Activity (Ci,Bq)
   b. Exposure (Sv, rad, etc.)
   c. Common Sources of Radiation
VI. ALARA Principles
   a. Time
   b. Distance
   c. Shielding
VII. Biological Effects
   a. Non-stochastic (acute)
   b. Stochastic (chronic)
   c. Teratogenic
VIII. Exposure vs. Contamination (Fixed, Loose, and Airborne)
IX. External and Internal Exposure to Radiation
X. Dose Limits
XI. Safe Work Habits
   a. Exclusion Zones, Postings, and Signs
   b. No Eating, Drinking, or Smoking
   c. Hygiene
   d. Frisking
   e. Dust control
XII. Site Radiation Monitoring
   a. Gamma Surveys
   b. Removable Contamination
   c. Air Monitoring
   d. Personnel Film Badges
XIII. Frisking Procedures
XIV. Site Specific Details and Instructions

TRAINING ATTENDANCE SHEET

Title: Basic Radiation Safety
Date:
Instructor:
Format: Lecture

Print Name	Signature

TEACHERS RETIREMENT SYSTEM - GMO SITE

AIR MONITORING PLAN

APPENDIX 8

Title: Air Monitoring Plan

Revision Number: 0

Date:

Replaces: New

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- 3.3 DUST EMISSIONS 4
- 3.4 AIR MONITORING 4

4.0 IMPLEMENTATION 6
- 4.1 AMBIENT AIR PARTICULATE SAMPLING 6
  - 4.1.1 Locations of Monitors 6
  - 4.1.2 Sampling Procedure 6
  - 4.1.3 Action Guide Levels 7

TABLES

TABLE 1 Derived Air Concentrations (DACs) and Effluent Air Concentrations of Selected Radionuclides in the Uranium and Thorium Series 8

1.0 INTRODUCTION

The Air Monitoring Plan provides for: 1) measuring the concentration of radioactive airborne dust that could be generated and emitted into the atmosphere as a result of the excavation, construction and earth-moving activities planned at the GMO site (Site); and 2) complying with applicable regulatory requirements for monitoring radiological air quality. The Air Monitoring Program will provide data to identify and mitigate any potential negative impacts of the Site activities to workers and people living and working in the surrounding area.

The objectives of data collection for air monitoring activities are as follows:

- collect airborne radioactivity data to ensure worker and general population safety and provide radiological control information;
- collect airborne radioactivity data to evaluate work procedures and site control measures. In addition to identifying the need for corrective action, air monitoring also documents the effectiveness of such corrective action; and
- collect airborne radioactivity data to measure releases (if any occur) of airborne radioactivity to the environment and ensure that people living and working in the surrounding area is not exposed to radiation above acceptable limits for the area.

2.0 REGULATORY REQUIREMENTS

The excavation activities at the Site will be conducted in accordance with the terms and conditions of the UAO, the Removal Action Work Plan, the Quality Assurance Project Plan, the Health and Safety Plan, and all appendices thereto. Radiation exposures to workers, the public and the environment will be kept low in accordance with applicable regulations and the concept of maintaining exposures as low as is reasonably achievable (ALARA). The following discussion summarizes applicable regulatory requirements for excavation and restoration activities.

32 IAC 340.1050 specifies the radiation dose limits applicable to individuals in unrestricted areas. On January 1, 1994, IDNS revised 32 IAC 340 to conform to the current NRC 10 CFR 20 regulations. The revised Section 32 IAC 340.310 (revised the existing 32 IAC 340.1050) specifies the dose limits for individual members of the public, while proposed Section 32 IAC 340.320 allows a licensee to show compliance with the annual dose limit in Section 32 IAC 340.310 by measurement or calculation; or by demonstrating that the average concentrations of radioactive materials in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the limits specified in Table 2 of Appendix B to 10 CFR 20.

The Air Monitoring Plan is based on being able to demonstrate compliance with air effluent standards equivalent to the limits in Table 2 of Appendix B to 10 CFR 20 which are applicable to the excavation and restoration activities for radionuclides in the uranium and thorium series listed in Table 1. The effluent concentration of Derived Air Concentrations (DAC) corresponding to the most restrictive lung solubility class will be used.

3.0 AIR MONITORING DESIGN AND IMPLEMENTATION

3.1 Introduction

A primary concern during excavation activities at the Site will be generation of radioactive particulates from excavation and earth-moving activities as well as from resuspension of particulates from exposed soil storage piles. Fugitive dust generation may be caused by a range of activities including excavation, loading, dumping, transporting and scraping using heavy equipment such as bulldozers, front-end loaders, dump trucks and graders. Traffic along site roadways also causes resuspension of particulates.

The objectives of this Air Monitoring Plan, therefore, are to: 1) determine the concentration of radioactive airborne dust that is generated and emitted into the atmosphere as a result of the activities planned for the Site; 2) comply with applicable regulatory requirements for air quality; and 3) provide data which can be used to assess the potential impact of activities at the Site on the health and welfare of workers and residents in the surrounding area.

The following discussion provides more details of the planned activities for the Site, the specific design parameters of the air monitoring program and how the program will be implemented.

3.2 Planned Activities

The types and locations of excavation activities at the Site were considered in order to identify and characterize those activities that have the potential for releasing radioactive dust particles or gases into the atmosphere. Water will be used during excavation activities to prevent, mitigate or reduce dust resulting from remediation activities. Traffic speeds will be kept low on all driveways, haul routes and exposed surfaces to minimize dust generation. Stockpiled material and material excavated during construction activities will be stored with flat slopes (5:1) in the prevailing wind direction whenever possible and covered with geomembranes to minimize dust generation. Containers used to transport

excavated material will be covered. These dust control methods are intended to reduce dust generation dramatically. See Appendix 10, Dust Control Plan.

Excavation activities at the Site are planned for the 2001 construction season. Activities will include excavation to remove all residual radiologically-impacted soil with total radium concentrations above action limits established for the Site. Impacted, excavated soil will be transported to an approved disposal facility. Non-impacted soil will be stockpiled near the excavations and used as backfill.

Without dust control measures, dust is likely to be generated during these excavation and restoration activities. Potential primary dust sources include the excavation operations, the excavated soil storage piles, and transportation of soil.

3.3 Dust Emissions

The dust generated from activities at the Site will be present in a range of particle sizes. The smaller respirable size fractions are of greater concern in terms of the health and safety of workers as well as the general public. In particular, particulate matter with an aerodynamic diameter less than or equal to a nominal 10 microns (also known as PM-10 size particles) is the size range for which the U.S. EPA has established ambient air quality standards. However, for purposes of the air monitoring program at the Site, total particulate samplers will be used in the measurement of radioactivity associated with particulates in ambient air.

3.4 Air Monitoring

The air monitoring program at the Site serves the purpose of measuring and documenting the levels of airborne radioactivity during the excavation activities. The monitoring data provide information for evaluating the potential hazard from specific operations taking place during the excavation activities. Typically, ambient air monitoring will be carried out at four locations along the boundaries of the Site. During excavation activities at the Site, air

monitoring will be done to measure radioactive particulates. Air monitoring will utilize high-volume air particulate samplers.

Additional air monitoring will be carried out in accordance with the Health and Safety Plan. Air quality will be monitored in the breathing zone of workers in the exclusion zone using personal monitoring samplers and fixed-location or portable samplers.

High-Volume Air Sample: High-volume air samples will be obtained from monitoring stations located around the Site. The air monitoring program will alert project personnel to potential environmental releases of airborne contaminants that may impact off-site properties. Air monitoring stations will be placed at four sides of the Site, north, south, east, and west.

Personnel Monitoring: Personnel monitoring to determine the exposure of workers to airborne particulates will be conducted. A detailed description of this monitoring is included in the Health and Safety Plan, Attachment of this Work Plan.

4.0 IMPLEMENTATION

The following sections describe the particulate air monitoring procedures. Air monitoring will consist of particulate sampling to measure gross alpha radioactivity.

4.1 Ambient Air Particulate Sampling

4.1.1 Locations of Monitors

Four air monitoring stations will be established at the Site before the excavation begins. Air monitoring locations will be located along the boundary of each quarter of the Site, north, south, east, and west. Air samplers will be used to collect ambient air particulates on filters for subsequent counting.

4.1.2 Sampling Procedure

Sample volume requirements were determined based on minimum detectable activities (MDA) to be measured, and at the same time preventing the accumulation of excessive dust loading on the filters. These considerations indicated a high volume total particulate samples would be optimal for monitoring particulates during excavation and restoration activities. Air monitoring will be conducted in accordance with Standard Operating Procedure (SOP-212) in of the Quality Assurance Project Plan (QAPP). Standard equipment and sampling protocol will be used in the air monitoring program. USEPA guidelines will be followed whenever feasible in establishing sites, quality control on air monitoring equipment, height of the sampling head above the ground, and sampler orientation.

The samples will be positioned to draw air at the breathing zone, at a height between one and two meters above ground, and collect particles on two-inch diameter filters. Samplers used will be appropriate for sampling total suspended particulates (TSP), be capable of operating continuously during the work day, while maintaining a constant flow rate, and be equipped with timers and flow controllers.

Counting for low-level alpha radiation will be done in the laboratory in accordance with SOP-372.

4.1.3 Action Guide Levels

In the event the action levels in Table 1 are exceeded, the Health and Safety Coordinator will:

- address health and safety issues,
- verify laboratory data and calculations,
- analyze and review probable causes,
- evaluate need for reanalysis or additional analysis,
- evaluate need for resampling or sampling other pathways, and
- evaluate need for notifications to regulators. Following these actions, the Health and Safety Coordinator may implement corrective measures. These corrective measures will include modifications to personal protection equipment and/or engineering controls such as to mitigate further action level exceedances (see Health and Safety Plan, Section 7.7).

TABLE 1

Derived Air Concentrations (DACs) and Effluent Air Concentrations of Selected Radionuclides in the Uranium and Thorium Series

Radionuclide	Class	10 CFR 20	
		DAC (μCi/ml)	Air Effluent (μCi/ml)
^{238}U	D	$6x10^{-10}$	$30x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$6x10^{-14}$
^{234}Th	w	$8x10^{-8}$	$3x10^{-10}$
	Y	$6x10^{-8}$	$2x10^{-10}$
^{234}U	D	$5x10^{-10}$	$3x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$5x10^{-14}$
^{230}Th	w	$3x10^{-12}$	$2x10^{-14}$
	Y	$6x10^{-12}$	$3x10^{-14}$
^{226}Ra	w	3x10-10	$9x10^{-13}$
$_{222}Rn$	With Daughters Removed	$4x10^{-6}$	$1x10^{-8}$
	With Daughters Present	$3x10^{-8}$	$1x10^{-10}$
		or 0.33 of working level	
^{214}Pb	D	$3x10^{-7}$	$1x10^{-9}$
^{214}Bi	D	$3x10^{-7}$	$1x10^{-9}$
	w	$4x10^{-7}$	$1x10^{-9}$
^{210}Pb	D	$1x10^{-10}$	---
^{232}Th	w	$5x10^{-13}$	$4x10^{-15}$
	Y	$1x10^{-12}$	$6x10^{-15}$
^{228}Ra	w	$5x10^{-10}$	$2x10^{-12}$
^{228}Th	w	$4x10^{-12}$	$3x10^{-14}$
	Y	$7x10^{-12}$	$2x10^{-14}$
^{220}Rn	With Daughters Removed	$7x10^{-6}$	$2x10^{-8}$
	With Daughters Present	$9x10^{-9}$	$3x1^{-11}$
		or 1.0 working level	
^{212}Pb	D	$2x10^{-8}$	$5x1^{-11}$
^{212}Bi	D	$1x1^{-7}$	$3x10^{-10}$
	w	$1x10^{-7}$	$4x10^{-10}$
^{228}Ac	D	$4x10^{-9}$	$2x10^{-11}$
	w	$2x10^{-8}$	$8x10^{-11}$
	Y	$2x10^{-8}$	$6x10^{-11}$
^{234m}Pa	w	$3x10^{-6}$	$1X10^{-8}$
	Y	$3x10^{-6}$	$9x10^{-9}$
^{235}U	D	$6x10^{-10}$	$3x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$6x10^{-14}$
^{231}Pa	w	$6x10^{-13}$	$6x10^{-15}$
	Y	$2x10^{-12}$	$8x10^{-15}$
^{227}Ac	D	$2x10^{-13}$	$1x10^{-15}$
	w	$7x10^{-13}$	$4x10^{-15}$
	Y	$2x10^{-12}$	$6x10^{-15}$
^{227}Th	Y	$1x10^{-10}$	$5x10^{-13}$
	w	$1x10^{-10}$	$5x10^{-13}$

341 EAST OHIO STREET SITE

FIELD SAMPLING PLAN

APPENDIX 9

Title: Field Sampling Plan

Revision Number: 1

Date: September 13, 2001

Replaces: New

FIELD SAMPLING PLAN

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1.0 INTRODUCTION

This Field Sampling Plan (FSP) describes the quality-related sampling activities that will be implemented during the excavation activities at 341 East Ohio Street site (Site), located in Chicago, Illinois.

Samples will be collected under the Quality Assurance Project Plan (QAPP) for the following limited aspects of the work:

1. Air monitoring.
2. Sampling excavated backfill soil material to ensure that the material returned into excavations is clean, that is, that the radiological composition of the backfill material is statistically demonstrated to be below the cleanup criteria.
3. Confirmation that material proposed for loading has total radium concentrations greater than 7.1 pCi/g.
4. Local background has been established for total radium (Ra-226 and Ra- 228) at 2.1 pCi/g.
5. Verification sampling to ensure that contaminants which were present above the cleanup criteria have been removed.
6. Material to be shipped for disposal as radiologically-impacted soil does not exhibit hazardous waste characteristics per RCRA.
7. Groundwater removed from the Site for excavation dewatering meets pre-treatment standards for the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC).

The USEPA identified the constituents of concern as the entire thorium 232 and uranium 238 decay chains, including radium-226 and radium-228. This sampling program includes monitoring only for total radium (Ra-226 and Ra-228) in accordance with the Unilateral Administrative Order (UAO).

The characteristic hazardous waste classification analysis per 40 CFR 261.4 will include:

Ignitability	Flash Point
Corrosivity	pH
Reactivity	unstable, reacts violently with water, is sufficiently cyanide or sulfide bearing the produce toxic gas, or is capable of detonation.
Toxicity	TCLP analysis for regulated contaminants

The groundwater analysis will include the parameters specified in Appendix A of the MWRDGC Environmental Remediation Wastewater Ordinance (May 9, 1996).

Waste or Chemical	Concentration (mg/L)
Cadmium	0.11
Chromium (total)	2.77
Copper	2.07
Cyanide (total)	1.20
Fats, Oils and Greases (FOG) (total)	250.0
Iron	250.0
Lead	0.5
Mercury	0.0005
Nickel	3.98
Zinc	2.61
Dichloromethane	0.294
Chloroform	0.309
1,1,1-Trichloroethane	0.193
Trichloroethylene	0.242
Benzene	0.278
Tetrachloroethene	0.225
Toluene	0.247
Ethylbenzene	0.329
Volatile Organic Compounds (total)*	0.567
Total Toxic Organics**	2.13

pH Range - Not lower than 5.0 or greater than 10.0

Temperatures of liquids or vapors at point of entrance to the sewerage system shall not exceed 150°F.

* Total Volatile Organic Compounds shall be the arithmetic sum of the concentrations of:

dichloromethane
chloroform

1,1,1-trichloroethane
trichloroethylene
benzene
tetrachloroethene
toluene
ethylbenzene
acrolein
acrylonitrile
1,3-butadiene
carbon tetrachloride
chlorobenzene
dichloroethane
dichlorobenzene
1-ethyl 2-methylbenzene
napthalene
styrene
1,3,5-trimethylbenzene
vinyl chloride
xylenes
1,4-dioxane
ethylene dibromide
methyl ethyl ketone

** Total Toxic Organics shall be the arithmetic sum of the concentrations of those pollutants found under Title 40 Part 413.02(i) of the Code of Federal Regulations.

This FSP describes the basis for the backfill, air monitoring, verification, and waste characterization sampling programs. It describes sample locations, field sampling and surveying, field instruments, decontamination, and sample management that will comprise the quality-related excavation sampling.

Field sampling activities described in this plan include the following:

- Soil sampling for laboratory analysis of radioactive constituents of concern to document contaminant levels present and confirm excavated spoil soil are below cleanup criteria.

- Air sampling (filter paper) for laboratory analysis of radiological constituents of concern;

- Verification sampling to ensure removal of contamination above the cleanup criteria.

- Onsite management of samples;
- Decontamination; and
- Analytical programs.

The FSP specifies techniques, equipment, and procedures for each activity, number and type of sample, and contingencies that may be implemented during the excavation activities. Standard Operating Procedures (SOPs) that will be followed in the sampling and analyses are included in the QAPP.

2.0 SAMPLE NETWORK AND RATIONALE

This section describes the sampling collection programs and the bases upon which the programs have been developed.

2.1 SAMPLING OBJECTIVES

The objectives of the air sampling program described in this plan are to collect sufficient air samples during soil excavation to assure that excessive airborne contaminated dust is not being released. Air monitoring activities will be conducted within excavated areas to monitor personnel exposures, and at the perimeter of the site to monitor releases to the uncontrolled environment.

The objectives of the soil sampling program described in this plan are to assure that soil used as backfill is clean.

The objectives of the verification sampling program are to ensure that all contamination in excess of the cleanup criteria has been removed. Gamma screening and specific soil testing will be conducted, and the results reported to the U.S. EPA. A complete description of the verification sampling program is included in the specifications attached to the Construction Quality Assurance Plan (CQAP).

The following types of samples will be collected at the Site:

Air Samples

The following air samples will be taken during excavation activities:

- High-volume particulate air samples (for radioactivity) from site perimeter monitoring stations; and
- Samples from personal samplers (for radioactivity).

Backfill Soil Samples

Samples of excavated soil under consideration for use as backfill will be collected in accordance with soil sampling procedure (SOP-214). Statistical analysis will be conducted to document the soil is suitable as backfill.

Sampling will be from lifts, 18 inches or less thick, or from stockpiles, samples in accordance with SOP-214.

Verification Samples

The samples will be collected in accordance with the Soil Sampling Procedure (SOP-214) and the Verification Sampling Plan (Appendix 5 of the Work Plan). One set of 6 subsamples will be analyzed for each 100 m^2 , or less, of excavated area. The subsample set will be prepared from five samples, about 15 centimeters deep (six inches), obtained at the center (one sample) and half way between the center and each corner (four samples).

Waste Characterization Samples

The samples will be collected at locations where previous investigations (May 2000 Koh report) have shown elevated gamma readings. The sampling objective is to evaluate whether these soils exhibit characteristics of hazardous waste that would constrain disposal at the proposed low-level radioactive materials disposal facility.

Samples will consist of ten individual samples from the ten borings distributed across the seven identified locations with elevated gamma readings. Each sample will consist of the fill material above the native sand soil. Samples will be collected in 3-inch diameter split spoons through either hollow stem augers, or if the fill contains sufficient obstructions to constrain hollow stem augers, through borings drilled with solid flight augers.

Dewatering Groundwater Samples

A representative sample of site groundwater will be obtained to document the water quality of water which would be discharged to the Chicago city sewer as part of site dewatering. The objective of this sampling is to evaluate whether the water meets the City's Environmental Remediation Discharge Standards.

The groundwater sample will be from a well located where the excavation will extend to beneath the groundwater table, at the east end of the Site. The well will be a 2-inch diameter PVC well casing and screen with a natural sand sand-pack. The well will be developed by pumping or bailing until pH, temperature and specific conductance are stable (less than 15% variation between successive measurements). The samples will be preserved in accordance with SW-846 methods, stored on ice and shipped under chain-of-custody. The sample will be unfiltered prior to preservation.

2.2 SAMPLE TYPE, LOCATION AND QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

2.2.1 Air Monitoring

The air monitoring program is described in detail in the Air Monitoring Plan, Appendix 8 to the Work Plan.

High-volume air samples will be obtained from perimeter monitoring stations located at four points (north, south, east, and west) around the site.

Air samples will be collected during excavation activities to determine the presence of airborne radioactivity particulates. The air sampling procedure is included as SOP-212 in the QAPP.

Four air monitoring stations will be established at the Site before the excavation begins. Air monitoring locations will be located along the margins of each quarter of the Site at points

on the north, south, east, and west sides of the site. Air samplers will be used to collect ambient air particulates on filters for subsequent counting.

2.2.2 Verification Sampling

The verification sampling program is described in detail in the Verification Survey Procedure (SOP 223).

Verification sampling is intended to be confirmatory to the verification gamma scan. Laboratory analyses of sets of 6 subsamples, each consisting of a set of 6 subsamples representing an excavated area of 100 ^{m2}, shall be used to confirm that the cleanup criteria were achieved.

2.2.3 Waste Characterization Sampling

The waste characterization samples will consist of soil and debris encountered above the native sand soil. Samples will be recovered in 3-inch diameter split spoon samples. Samples will be placed in one 1-liter bottle and one 4-ounce jar with teflon sealed lids. Containers will be packed to minimize headspace.

Preservation will be limited to storing on ice. Holding times will be in accordance with SW-846 with extractions before seven days. QA/QC procedures will be in accordance with the laboratory (STL) QAPP, included in the QAPP.

3.0 SAMPLE MANAGEMENT PROCEDURES

3.1 FIELD ACTIVITY DOCUMENTATION

Field logbooks will be used to document daily field activities in accordance to Section 5 of the QAPP. Field logbook documentation procedures are in SOP-215 in this QAPP.

3.2 SAMPLE IDENTIFICATION

All samples collected at the Site will be identified according to the Soil Sampling Procedure (SOP-214).

3.3 SAMPLE CONTAINERS

Sample containers have been selected based on the sample matrix and requirements of the analytical methods. Suitable containers used during the excavation and restoration activities include:

Air Monitoring Station Sampling

- Envelopes of suitable size for glass fiber filters.

Soil Sampling

- Plastic bottles or plastic bags of suitable size for soil samples.

3.4 SAMPLE PRESERVATION

Soil samples to be tested for radioactivity do not require preservation.

Waste characterization samples will be stored on ice and shipped in a cooler, under chain-of-custody, by overnight courier.

3.5 SAMPLE HOLDING TIME

All initial radiological analysis will be performed within six months from the date the sample was collected.

All waste characterization analysis will be extracted within seven days of sampling.

3.6 SAMPLE LABELS

Each container will be labeled with the following minimum information:

- Date and time of sample;
- Unique sample number, including geographic (grid) location;
- Sample volume (air samples);
- Project identification; and
- Name of sampler.

Other information such as weather conditions, sample analysis, and sample preservation may be included on the sample label, as appropriate.

4.0 DECONTAMINATION

All discarded materials, waste materials, and other field equipment and supplies will be handled in such a way to prevent the potential spread of contamination during excavation activities. Discarded items that have contacted contaminated materials will be containerized and transported to the approved disposal facility. Non-contaminated discarded items will collected, bagged, and placed in dumpsters for disposal at an approved landfill.

4.1 PERSONNEL DECONTAMINATION

The following procedure will be implemented for personnel decontamination when work activities are conducted in contaminated areas. This procedure is based on USEPA's Standard Operating Safety Guides, Publication 9285.1-03, PB92-963414 (June 1992).

1. Equipment Drop: Deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, clipboards, etc.) on plastic drop cloths.

2. Outer Boot and Glove Removal Remove outer boot covers and gloves and deposit in appropriate container.

3. If Respirator Worn - Canister or Mask Change When a worker leaves the Exclusion Zone to change canister or mask, this is the last step in the decontamination procedure. The worker's canister is exchanged, new or clean outer gloves and boot donned, and the worker returns to duty.

4. Boots Gloves, and Outer Garment Removal Boots and outer garment (coveralls) and inner gloves are removed and deposited in appropriate containers.

5. Personal Radiation Survey Perform radiation survey of personnel.

6. Face Piece Removal: If applicable, face piece is removed. Avoid touching face with fingers. The face piece is deposited on plastic sheet.

7. Field Wash: Wash face and hands thoroughly. Shower as soon as possible.

4.2 EQUIPMENT DECONTAMINATION

All sampling equipment will be wiped clean of soil and dust between each use when work activities are conducted in contaminated areas:

4.3 CONTAINER AND SHIPPING CONTAINER DECONTAMINATION

The following general procedure for decontamination of sample containers and shipment packages will be followed:

1. Seal container or shipping package;
2. Wipe container or shipping package with paper and tap water;
3. Allow to air dry; and
4. Perform radiation release survey.

TEACHERS' RETIREMENT SYSTEM - GMO SITE

DUST CONTROL PLAN

APPENDIX 10

Title: Dust Control Plan

Revision Number: 0

Date:

Replaces: New

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DUST CONTROL PLAN

1.0 PURPOSE

The Dust Control Plan (Plan) describes methods STS and its contractors on behalf of TRS, will follow to conduct operations and maintain the work area within the GMO site (Site) so as to minimize the creation and dispersion of dust. This Plan also contains corrective measures that will be used in the event visual dust is created, air monitoring shows excessive particulates, or air sampling indicates limits have been exceeded.

A primary concern during the excavation activities at the Site will be the generation of radioactive particulates from excavation and earth-moving equipment. Fugitive dust generation may be caused by a range of activities including excavation, loading, and transportation of excavated soils. Traffic on the Site also may cause resuspension of particulates.

Dust control measures will be used throughout the excavation and restoration activities at the site, especially during excavation, backfilling, and grading activities.

2.0 GUIDANCE

Dust control will be performed in accordance with the Removal Action Work Plan (Work Plan), the Health and Safety Plan (HASP), and the Air Monitoring Plan (Appendix 8 to the Work Plan). STS will perform Site perimeter air monitoring in accordance with the Air Monitoring Plan.

3.0 IMPLEMENTATION

STS will be responsible for implementing dust control procedures as required in this Plan, the HASP, and the Air Monitoring Plan. The Field Team Leader will be responsible for ensuring compliance with the dust control procedures at the excavation site.

4.0 PRODUCTS

Water will be used in connection with mechanical dust suppression. Chemical foams, such as fire fighter foam, may also be used if approved by USEPA. If available, water will be obtained at the Site. If water cannot be obtained at the Site, temporary sources of water can be provided for construction activities from water trucks parked adjacent to the property or from portable plastic water tanks. Small (1,800 gallon) water trucks equipped with several hundred feet of hose and a pump can be used to spray water. Also, small pumps and hose can be used with the portable tanks to provide sufficient pressure and volume for dust control.

5.0 EXECUTION

Procedures to be followed to control dust may include traffic speed control, use of stockpiles, covering vehicles transporting borrow material and waste, and wind screens around excavation areas. These procedures will be utilized during excavation, restoration, transportation and associated materials handling activities.

5.1 TRAFFIC SPEEDS

Traffic speeds will be maintained in accordance with applicable County, City, State and Federal regulations. The speed limit for traffic on the site will be posted by TRS or its representatives. In no case shall speed limits in excess of 15 miles per hour be posted.

5.2 USE OF STOCKPILES

Where possible, excavated contaminated materials will be loaded into the transport containers the same day they are excavated. Any radiologically-impacted material stored on-site will be either in containers or in Supersacks if there is not sufficient material to mobilize a container. Stockpiled clean material, including excavated and borrow material, will be piled to minimize dust generation. Further, slopes of stockpiled materials will be minimized in the prevailing wind direction. A 5:1 slope or flatter in the prevailing wind

direction will be maintained whenever possible. Stockpiles will be constructed with their length perpendicular to the prevailing wind direction.

Stockpiled material will be covered during periods of high wind or when work on a stockpile is not actively occurring, such as the end of the work day. Stockpiles will be covered with a geomembrane cover to minimize dust generation during excavation and restoration activities. Approved geomembrane covers are Griffolyn TX 1200 manufactured by REEF Industries, Inc., and Sani-Cover SC #250 manufactured by Fluid Systems, Inc., or other equivalent.

5.3 OFF-SITE TRANSPORTATION OF EXCAVATED MATERIALS

Trucks used for transporting non-contaminated excavated or borrow material will be equipped with truck bed covers (tarps) to prevent the generation of dust from hauling. The tarps will be fastened down tightly to prevent materials from being blown out of the trucks. Empty trucks also will be tarped.

Roll-off containers for transporting low-level radioactive materials, will be lined with plastic or suitable leakproof liner and be equipped with full covers. The covers will be securely fastened to the containers before leaving the excavation area.

Trucks and other heavy equipment will be cleaned to remove mud, soil, and loose dust prior to leaving an excavation area. This cleaning will include the truck tires. Dirt that is tracked onto paved streets will be swept and added to stockpiles at the excavation area.

5.4 USE OF WATER AS A DUST SUPPRESSANT

Water will be applied during the course of excavation and restoration activities as directed by the Field Team Leader to prevent, mitigate, or reduce dust resulting from excavation activities. Water will be applied when:

- wind or vehicular traffic may cause visible dust generation;
- exposed surfaces of material stockpiles are potentially dry and wind or handling activities may cause dust generation;
- dust generation is possible during excavation activities on the site;
- hauling of excavated or borrow material may cause visible dust generation in truck beds; or
- dust generation is possible during placement of materials in stockpiles or fill areas.

A water truck or pump and storage tank assembly will apply water to the exposed ground surfaces via hoses, pumps, nozzles and other appurtenances as required. The truck or pump/tank assembly also will apply water to control dust generation from exposed surfaces of material stockpiles, excavation activities, and hauling or excavation of borrow material.

Water will be applied in sufficient quantity to prevent generation of dust, but not so as to cause the movement of water beyond site boundaries, ponding, or the disruption of other project site areas. Because the soils will absorb the water, watering is not expected to generate runoff. The Field Team Leader will monitor the excavation and restoration activities to make sure that enough water is used to adequately control dust, but that not too much water is used so as to create runoff.

5.5 CORRECTIVE MEASURES

If visual dust is created at a location during the excavation and restoration activities, or if air monitoring shows excessive particulates, the following corrective measures will be evaluated and applied as appropriate.

1. Increased wetting of surface areas.
2. Covering additional source areas.
3. Modifying future excavations and stockpiles to decrease the source areas.
4. Halting dust-creating activities until winds moderate.
5. Modify work activities.

If overwatering creates runoff into undisturbed areas, the water will be removed as practical, and the area radiologically surveyed. If radioactivity above the action level is found, the area will be cleaned by removing the contaminated materials, or by other appropriate means. Future occurrences will be prevented by more carefully controlling the amount of water applied by constructing earth berms around the area to retain the water, or by using a method of dust control other than water.

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May 4, 2001

VIA MESSENGER

Mary L. Fulghum, Esq.
Associate Regional Counsel
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: GMO Site, Northwest Corner of McClurg Court and East Grand Avenue, Chicago, Illinois

Dear Ms. Fulghum:

Enclosed are four copies of the Removal Action Work Plan dated May 1, 2001 prepared by STS Consultants, Ltd. ("STS") on behalf of our client Teachers' Retirement System of the State of Illinois ("TRS") with respect to the GMO Site. TRS requests that the U.S. Environmental Protection Agency ("USEPA") review and respond to this Work Plan at the earliest opportunity. TRS would like very much to have the excavation work commence during the early to mid-summer of this year so that the excavation work can be completed before the onset of winter freeze conditions. STS has used the Work Plan and other Scoping and Planning Documents previously developed by Kerr-McGee Chemical, LLC ("Kerr-McGee") for the Lindsay Light II site as a model for this Work Plan with some modifications.

The Work Plan provides for the removal action to proceed in two stages, *i.e.* (i) removal initially of the known areas of radiologically contaminated areas over the USEPA radiological cleanup criteria, and (ii) excavation of soils in lifts (and radiological screening of such lifts) on the remainder of the GMO Site (except for a small soil wedge at the site perimeter) to identify any remaining areas of radiological contamination requiring removal based on radiological contamination in excess of the cleanup criteria. TRS understands that this procedure reflects the evolution of removal strategies based on the work previously performed at the two other nearby sites at which removal action has been performed (Lindsay Light II and Lindsay Light II/RV3 North Columbus Drive). TRS proposes to slope the excavation up to the site perimeter so as to avoid the

need for an earth retention system or excavation into the sidewalks or rights of way adjacent to the GMO Site. This will leave a small soil wedge at the site perimeter which will not be excavated in the same fashion as the remainder of the GMO Site. TRS proposes to achieve clearance for this small soil wedge by a program of drilling and soil testing. The Work Plan provides for Kerr-McGee to transport and dispose of radiologically impacted materials at the facility operated by Envirocare of Utah, Inc.

TRS requests the following determinations from USEPA with respect to this Work Plan:

1. Approval of the Work Plan so that TRS can proceed to take the steps to implement the Work Plan on the schedule referred to above and more specifically described in the Work Plan;

2. Confirmation that the work provided in this Work Plan constitutes a time-critical removal action consistent with the National Oil and Hazardous Substances Pollution Contingency Plan at 40 C.F.R. Part 300 and the requirements of the Unilateral Administrative Order, as amended, previously issued to Kerr-McGee and other parties and as supplemented by the Action Memorandum Amendment dated March 1, 2001 issued by USEPA with respect to the GMO Site; and

3. Confirmation that, when the work provided by this Work Plan is completed, USEPA will issue a written determination that (i) all such work has been completed in accordance with this Work Plan, (ii) no further investigation or removal action is required at the GMO Site, (iii) there is no evidence of any radiologically impacted material remaining at the GMO Site and (iv) construction and development work at the GMO Site may proceed without further regulatory requirements relating to radiological impacts.

As you know, TRS has previously submitted to USEPA a request that USEPA recognize TRS as a secured lender for purposes of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") in view of TRS' acquisition of title to the GMO Site by deeds in lieu of foreclosure with respect to its security interests in the GMO Site. TRS believes that the information in support of that request is strong and convincing. Accordingly, TRS requests that USEPA respond to that request with a favorable determination. In addition, neither TRS' submission of this Work Plan, nor its performance of any of the removal action provided for thereunder, constitutes an admission by TRS that is a responsible party or potentially responsible party with respect to the GMO Site or otherwise has liability under CERCLA or under any other law or legal principle with respect to the environmental conditions at the GMO Site.

PIPER MARBURY RUDNICK & WOLFE

We look forward to USEPA's response to this Work Plan in the near future so that this excavation work can be commenced soon. Thank you for your assistance on this matter.

Very truly yours,

Timothy Ramsey

JTR:tr
Enclosures
cc: Mr. Terry A. McKay (w/enc.–by messenger)
Mr. Thomas J. Pabian (w/out enc.–by messenger)
Steven L. Loren, Esq. (w/out enc.)
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77 WEST JACKSON BOULEVARD
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REPLY TO THE ATTENTION OF

JUN 0 5 2001

SE-5J

VIA FACSIMILE AND U.S. MAIL

Mr. Richard Berggreen
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

RE: Teachers' Retirement System Removal Action Work Plan (341 East Ohio, Chicago, Illinois)- Quality Assurance Project Plan

Dear Mr. Berggreen:

As we discussed, enclosed is a copy of the memorandum dated June 4, 2001, from Patricia Scott, U.S. EPA Chemist, which evaluates the quality assurance project plan included in the above-referenced work plan. Please amend your plan accordingly.

Again, please feel free to contact me at (312) 886-3601, or Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Health Physicist, at (312) 886-5026.

Sincerely,

Verneta Simon

Verneta Simon
On-Scene Coordinator

Enclosure

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MEMORANDUM

DATE: June 4, 2001

SUBJECT: Review of Quality Assurance Project Plan for the Removal Action Work Plan, 341 East Ohio Street, Chicago, Illinois, dated May, 1, 2001. FSS QAPP Document Log #2719

FROM: Patricia J. Scott,
Superfund Field Services Section

TO: *Verneta Simon, OSC*
Superfund Division

CC: Steve Ostrodka, Chief,
Superfund Field Services Section

I have reviewed the Quality Assurance Project Plan for the Removal Action Work Plan, 341 East Ohio Street, Chicago, Illinois, dated May, 1, 2001. My review of the document was limited to the QAPP and FSP since I do not have the technical expertise to review radiation SOPs. Listed below are my comments.

QAPP:

1. The sign off page is missing.

2. The table of Acronyms is missing.

3. The distribution list is missing.

4. Element A-4 Project/Task Organization
   A. Responsibilities for data validation, data assessment and internal and external performance system audits need to be designated.
   B. The US EPA Region 5 Superfund Quality Assurance reviewer has the responsibility to review and approve QAPPs. Please add this to the QA responsibilities section.
   C. The responsibility of identifying and documenting non-comformances needs to be specified in the Field responsibilities section.
   D. The analysis that will be performed by Severn Trent Laboratories and RSSI need to be specified in the Laboratory responsibilities section.
   E. A project organizational chart needs to be included in this section.

5. Element A6 - Project/Task Description and Schedule

A. Please label Table 1-1 as Table 1-1.

B. The SOPs for the waste characterization and potential groundwater analysis performed by Severn Trent need to be attached to the document.

C. The Task 6 section should discuss the internal and external quality system reviews (audits) that will be performed during this project. Please resubmit this section to reflect this.

6. Element A7 - Quality Objectives and Criteria for Measurement Data

A. The data quality objectives need to be discussed in this section. Please refer to the QAPP instructions for guidance.

B. Accuracy must be defined.

7. Element A9 - Documentation and Records

A. Section B - Data package format and document control needs to be included in this section.

8. Section B2 - Sampling Methods Requirements

A. The attached FSP does not include any information on the waste characterization and potential groundwater analysis that will be performed by Severn Trent Laboratories. Sampling for these analysis needs to be discussed, particularly the volatile analysis sampling.

9. Section B3 - Sampling Handling and Custody Requirements

A. The sample handling requirements need to be detailed in this section, as indicated on page 33 of the QAPP instructions.

B. Field and laboratory custody procedures must be discussed or referenced in this section. Chain-of-custody SOPs for all laboratories participating in the project need to be attached to the document.

10. Section B4 - Analytical Methods Requirements

A. Analytical methods requirements for the waste characterization and groundwater analysis must be discussed in this section. Refer to the QAPP instructions for guidance.

11. Section B5 - Quality Control Requirements

A. Limits for precision need to be specified for the laboratory split samples.

12. Section B8 - Inspection/Acceptance Requirements for Supplies and Consumables. The text indicates that a discussion of this topic is included in the FSP. The FSP does not contain any such information. Please resubmit this section with the required information.

13. Section B10 - Instructions for Data Management

This section needs to be rewritten to included the requested information specified in the QAPP instructions.

14. Section C1 - Assessment and Response Audits
    A. Please add that the US EPA Region 5 Superfund FSS has the discretion to audit the waste characterization laboratory (Severn Trent) and these audits may or may not be announced.
    B. Rewrite the response action section, limiting the discussion to only QAPP non-conformances. Remove all references concerning equipment and material failures.

15. Section D1 - Data Review, Validation and Verification Requirements
    A. The laboratory data must be validated by an entity separate form the generating laboratory. The person responsible for this data validation must be specified in the project management section.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF SE-5J

July 11, 2001

VIA FACSIMILE AND U.S. MAIL

Mr. Richard Berggreen
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

RE: **341 East Ohio Street Workplan**
Lindsay Light II Site/RV 3 North McClurg Court

Dear Mr. Berggreen:

The U.S. Environmental Protection Agency (USEPA) has reviewed the 341 East Ohio Workplan (the Plan) submitted on May 4, 2001 and has the following comments:

General Comments

1) Overall, the Standard Operating Procedures (SOPs) should be revised to reflect the work being performed in Streeterville and not in West Chicago.

Specific Comments

2) Sec.1.0, SCOPE AND OBJECTIVES, Page 1: Add details about Velsicol's prior ownership/operation of property.

3) Sec. 1.0, SCOPE AND OBJECTIVES, Page 3 (ii): Insert "no further radiological investigation or removal action is required ..." (5th from the last sentence on this page)

4) Sec. 2.3, Project Management Structure, Page 5: Add s to (OSC), therefore, (OSCs).

5) Sec. 2.3, Project Management Structure, Page 6, First paragraph: This section must state the name of the project team, project manager, etc.

6) Sec. 2.4, Delineation and Design, Page 7: The wedge of material remaining on-site will need to be carefully surveyed in order to determine that this material is "clean". Many borings and/or lifts of material will be needed to conduct this survey work. The design for this work must be approved by this Agency before the Plan will be approved.

7) Sec. 3.1.5, Excavation Work, Page 14, Second paragraph: Provisions must also be made for the staging of "Baker Boxes".

8) Section 3.1.1, Site Preparation, Page 11, First paragraph: This section should mention that structures/foundations from Velsicol should be expected.

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9) Section 3.4.3, Training, page 25, First paragraph: Federal requirements must take precedence over State requirements as noted in the footnote on page 11 of Attachment 3.

10) Section 3.4.3, Second paragraph: Training should also include radiation basics.

11) Section 3.4.3, Third paragraph: Tailgate meetings may be needed more often than weekly.

12) Section 3.4.5, Monitoring, Page 26, First paragraph: A primary requirement of dust control is "no visible dust."

13) Section 3.5, Application of ALARA to Excavation, Page 27, Second paragraph: USEPA has an oversight role. It is not involved directly in cleanup.

14) Project Management Organization Chart: USEPA does not report to the STS Project
Coordinator. USEPA has an independent role.

Attachment 1, Section 01020, CONSTRUCTION HEALTH AND SAFETY

15) Part 3 - Execution, Page 1, Paragraph d: State specifically where emergency rescue equipment such as breathing apparatus, safety harness, etc. will be located.

16) Sec. 3.2, Training, Page 3: Add that there will be a competent person for shoring.

Attachment 1, Section 02200, Contaminated Material Loadout and Transport

17) Sec. 2.6, B., Loadout, Page 10: Will portable scales be present?

Attachment 1, Section 02840, Site Utilities

18) Sec. 3.4, Underground Utility Installations, Page 50, Paragraph D., Trench Preparation: Delete "at t2%"

Standard Operating Procedure, SOP-212, Air Monitoring Procedure

19) Section 5.1, Page 3: Delete use of REF background air monitoring station #17. A location closer to Streeterville must be found..

20) Section 5.4.2, Page 4: Counting filters at the REF?

Attachment 3, Health and Safety Plan

21) General comment: The specific names and resumes of key mangers such as the Health and Safety Coordinator and the Field Team Leader must be included in this document.

22) Figure 1.1, Page 2, next to last sentence at bottom of page: This is not a USNRC licensed site.

23) Section 2.1, Page 3, Last bullet: This sentence is unclear. Will this be simply an administrative function or will this coordinator be monitoring the air and counting the filters for concentration measurements?

24) Section 3.0, Personnel Responsibilities, Page 4, Second paragraph: Will the Field Team Leader conduct any training on radiation or any periodic briefings on radiation matters? This paragraph does not commit to that.

25) Section 4.1, Page 6: The title for this section should include the word "radioactive," as Principal Radioactive Contaminants.

26) Section 4.1, bullets: The hazards include the entire thorium (Th-232) and uranium (U-238) decay chains. There are two (2) radiums which have been singled out (Ra-226, Ra-228). Both radons (Rn-220, Rn-222) are potential hazards.

27) Section 4.1, Sentence after bullets: The known total radium concentration exceeds 3000 picocuries per gram. This should not be cited as a low concentration.

28) Section 4.1, ROUTE, ENTRY MADE VIA: Inhalation should include radon which is not a heavy metal. Direct exposure can also occur from X-rays.

29) Section 4.3.1, Dosimetry/Personal Monitoring, Page 11: Project Health Physics Personnel is nonspecific. There must be a specific project manager.

30) Section 4.3.3, Bioassay, Page 12, Second paragraph: The decision to use bioassay should not be based just on dosimetry. If there were an excessive intake, there could be a need for immediate bioassay that would not require any dosimetry justification.

The determination should be made by a specific, designated manager such as the Health and Safety Coordinator or the Field Team Leader. Project Health Physics personnel is nonspecific.

31) Section 4.3.4, Emergency Medical Treatment, Page 13, bullets: There should be an individual trained specifically on radiation emergency response.

32) Section 5.1, Page 17, Bullets: Training must include radiation in general as well as the hazards.

33) Section 5.3, Page 18: Tailgate meetings, as needed, should be held more often than weekly.

34) Section 5.4, Page 18: This trained individual should be trained in radiological response as well.

35) Safety Meeting Report: Supervisor and Department Head are not titles specific to this project. The appropriate titles should be applied.

36) Figure 5.2: Has this apparently Kerr-McGee form been reviewed for applicability to this site specifically?

37) Section 7.1, Page 28: A key control mechanism should be stated as "no visible dust."

38) Section 7.2, Page 28, Bullets: Monitoring also includes counting filters, computing concentrations and comparing concentrations to criteria.

39) Section 7.2, Paragraph beginning with "Lapel": This paragraph is vague. Air filters can be read on a daily basis to assess for the need to make procedural changes, but, for most filters, they cannot be read on a daily basis. The method must be specific in this section. How will the interferences be handled, specifically? How much time will be allowed for decay? These are some of the specific issues that should be addressed in this section.

40) Section 7.2, page 28, Last paragraph: If high volume samplers are used, then dust buildup will be an issue because a thick dust layer will shield out alpha particle emissions and give incorrect air concentrations. Low volume samplers are more appropriate. Depending upon the collection and analytical protocols, daily measurements of concentration may not be possible except to qualitatively compare one day to the next.

41) Section 7.2, Page 29, Last paragraph: The specificity in this paragraph is good and could be used to improve other, vague, sections.

42) Section 7.5, Page 30: There are no regulatory limits, specifically, for this project but there are relevant and appropriate requirements that must be conformed to.

The primary instruments for this project will probably be the sodium iodide count rate meter and a Geiger counter. The first for seek and find work and for soil concentration judgments. The later for personnel surveillance. A micro-R meter could be used periodically but would not be a primary instrument. This paragraph should be improved with these ideas in mind.

43) Section 7.6, Page 30, Second paragraph: Frisker is nonspecific. A more specific instrument should be identified.

44) Section 7.8.1, <u>Radiological Action Levels</u>, Page 31, First paragraph: Smearing workers is not an appropriate surveillance method. Trigger levels on specific worker surveillance instruments should be stated. These should include gamma exposure rates.

45) Table 7-1, Page 33, Item a: Smear samples are appropriate to objects. It is unclear how an object smear will indicate a need to upgrade respiratory protection.

The radionuclide specific DAC should be written down. Also, there will be a need to translate gross alpha counts to the appropriate level for a single radionuclide concentration.

It would be prudent to institute action levels before the regulatory criteria are reached.

46) Section 8.0, <u>Personal Protective Equipment</u>, Page 35, First set of bullets: Coveralls should be disposable or washable through a contaminated clothing vendor. Coveralls should be those removed at the boundary of the exclusion zone.

47) Section 9.2, Page 36, First paragraph: The boundary for removing contaminated clothing should be the exclusion zone, not the site boundary.

The following comments must be included in the final workplan. The final workplan must be submitted by July 26, 2001. Pending receipt of the final workplan, work can begin at the 341 East Ohio property immediately, if all parties are in agreement with the above comments.

If you have questions regarding this letter, please contact me, as soon as possible, at (312) 886-5123 or contact Verneta Simon, On-Scene Coordinator, at (312) 886-360, or Larry Jensen, Senior Health Physicist at (312) 886-5026.

Sincerely,

Fredrick A. Micke

Fredrick A. Micke, P.E.
On-Scene Coordinator
ERB Section #3

cc: Mark Krippel, Kerr-McGee

STS Consultants, Ltd.
Solutions through Science & Engineering

July 18, 2001

Mr. Fred Micke, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Environmental Gamma Radiation Survey, 341 East Ohio Street, Chicago, Illinois - STS Project No. 1-25585-XG

Dear Mr. Micke:

STS Consultants, Ltd. (STS) has prepared this scope of work for environmental services at the 341 East Ohio Street site in Chicago, Illinois. The proposed work described herein is for a drilling and downhole logging program to explore for potential radiologically impacted soil at the perimeter of the subject site. The proposed scope of work is based on the information gathered during previous studies of the site, discussions with USEPA, and our experience on similar projects in the Chicago area.

BACKGROUND

Previous investigations have identified areas indicative of material containing radionuclides above the cleanup level established for the area by the U.S. Environmental Protection Agency (USEPA). Excavation and disposal of radiologically impacted soil at the site is currently planned for later this year. This excavation will include radiation survey assessment of the fill material within the property boundary to depths of between 8 and 15 feet. Excavation to the required depths would necessitate installation of a soil retention system (sheet piling) along the property boundary.

To minimize the potential cost of soil retention, STS has reviewed alternatives to its use. One potential alternative would be maintaining a 1 V:1.5 H slope along the property boundary. However, to avoid the excavation of the slope material while still providing an assessment of potential radioactive material, USEPA would require a survey verifying that the material within that slope is not impacted by radiological materials.

PROPOSED SCOPE OF WORK

This scope of work describes a drilling program to explore the soil around the perimeter of the site. The objective of the drilling is to adequately demonstrate the absence of impacted soil, or to identify the locations where impacted soil is present. This demonstration could then be used to avoid construction of a soil retention system, which would be required if the soil were to be excavated.

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This drilling option for exploring the perimeter of the site would consist of drilling boreholes on a 2-meter square grid along the north, east and south margins. For areas with a proposed excavation depth of 8 feet (12-foot width), 2 rows of boreholes 1.4 meters apart would be required. A borehole spacing along each row of 2.8 meters would be utilized to obtain the required 2 meter boring density (see attached drawing) along with the post-excavation survey of the bottom edge of the slope. The 15-foot excavation would require 5 rows of boring with a similar borehole and survey spacing. The boreholes would extend to a depth beyond the proposed excavation depth (i.e., minimum 1 foot into native soils). The boring would be down-hole logged for gamma readings in 6-inch increments.

The exterior (closest to the property boundary) line of borings would be conducted first. Any sections exhibiting evidence of impact on the exterior line would not have to be drilled/logged on the interior line or lines because the presence of impacted material would necessitate the excavation of material and utilization of soil retention along the property boundary. Based upon the results on the exterior line, the interior drilling would be conducted. Gamma logging of the interior borings would only be performed on the lower portions of the borehole that are proposed to be unexcavated in the 1 V:1.5 H wedge of soil around the site perimeter. Finally, to minimize drilling costs, the innermost section of the slope (toe of slope, portion less than 18 inches thick) would not be drilled but would be surveyed following the excavation of that portion of the site.

STS would propose to conduct this downhole survey of the property boundary prior to the general site excavation utilizing a 2-meter square grid network (see attached sketch). Assuming that a hot spot would have the shape of an elongate ellipse (twice has long as it is wide), the 2-meter square grid would have the ability to detect a hot spot of 6.3 m^2 (68 ft^2) with better than a 99% probability. This probability estimate was calculated utilizing USEPA's ELIPGRID-PC (version 10/20/95) and assumes that the gamma probe has an effective zone of detection at least one foot radius from the center of the boring. The statistical program output is attached for your review. Contact Dr. Steven Kornder (847-279-2448) with questions regarding the statistical analysis.

To complete the above survey an estimated 380 borings would be required. The total footage consisting of both 10 and 16 foot borings would be approximately 5320 feet. Soil borings would be completed at the corner of each 2-meter square utilizing a solid stem auger. In the event an obstruction is encountered which prevents completion of a boring, an offset within a 0.3 meter (1 foot) radius will be drilled. If the obstruction continues to prevent the completion of the boring after 2 offset attempts, an alternate drilling method utilizing a rotary bit capable of rock drilling will be employed. This method is expected to be able to penetrate any large stone, concrete, or masonry obstruction encountered.

Following completion of the boring, a section of 3-inch PVC pipe would be temporary inserted into the borehole to allow for the completion of the down-hole gamma logging.

The PVC pipe would prevent the borehole from collapsing and protect the logging equipment from being damaged during the survey.

Cuttings from the boreholes would be segregated for disposal based upon a gamma radiation survey. Cuttings would be surveyed at the ground surface using a Ludlum 2221 detector and a 2 x 2 NaI probe. Impacted soils would be containerized (placed in drums or Supersacks) for disposal. Soils exhibiting background levels of gamma radiation would be stockpiled onsite for later utilization and/or disposal. This stockpiled material will be covered to prevent wind or precipitation erosion. Costs for disposal and/or further characterization of either the impacted soil or clean soil have not been included within this proposal.

STS proposes a four task scope of work for the program. The tasks are:

1. Finalize a work plan and health and safety plan (HASP) for review by USEPA. This work scope and the generic HASP for vicinity sites are being submitted for Agency review. If USEPA agrees with the plan, drilling of the shallow boreholes could commence while a CERCLA waiver is pursued for the deeper borings.

2. Installation of approximately 380 borings along the perimeter of the property on the north, east and south margins. (The presence of the deep foundation and basement for the Time-Life building precludes the need for a soil retention system along the west margin of the site.)

3. Down-hole gamma logging to determine the potential presence and vertical extent of the radiologically impacted soil at each borehole.

4. Project management and preparation of a summary report of the investigation findings.

A detailed description of these tasks is presented below.

Task 1—Work Plan and Health and Safety Plan Revisions

It is anticipated that this work scope description would serve to provide the information necessary for USEPA to complete a review. This task also includes submittal of a generic HASP that has been prepared for similar projects. Alternatively, the HASP submitted and reviewed by USEPA for the Remediation Work Plan can be applied to this work.

Task 2—Soil Borings

Time is a potential issue with the installation of the borings. Upon approval by USEPA, the installation of the shallow borings would commence. Depending upon the soil conditions encountered, installation of the boring is anticipated to require 35 to 45 rig-days of drilling to complete. While additional drill rigs could be utilized to shorten the time, the deeper

holes (>12 feet) require approval by the Board of Underground (BOU). This approval might typically take 45-60 days. However, a quicker turnaround may be possible given the CERLCA allowance for permit waiver for "substantial compliance with permit provisions". BOU approval is for the purpose of protection of utilities. In that the excavation plan has been submitted and is nearing completion of the BOU approval process, the requirement for "substantial compliance with permit provision" has, in our opinion, been met. A meeting with Chicago Department of Transportation representatives would be proposed, but we would request USEPA efforts in support of seeking a waiver of the full BOU review cycle.

The exterior line of borings closest to the property boundary would be conducted first. This drilling is anticipated to include about 115 boreholes (1,420 linear feet) and would require 10 to 12 rig-days to complete. Following the completion of each boring a 3 inch ID PVC casing will be placed in the boring to keep the borehole from collapsing and protect the logging equipment from potential damage during logging. After completion of the down-hole logging the PVC casings would be removed for potential reuse in future boreholes. Following removal of the PVC, the boreholes would be backfilled with high solids bentonite chips or similar material. If an exterior borehole section exhibits evidence of radiological impacts, subsequent interior boreholes would not be drilled since the presence of impacted materials would necessitate excavation and utilization of soil retention along that stretch of the property boundary.

Task 3—Gamma Survey

The boreholes will be gamma logged in 6-inch increments. The down-hole logging will be conducted using a Ludlum 2221 detector and a 2 x 2 NaI probe. Gamma logging of the interior borings would only be performed on the lower portions of the borehole that are proposed to remain onsite post-excavation. Following the completion of the excavation, the innermost section of the slope (last two feet with a thickness of less than 18 inches) would be surveyed as part of surveying the surface of the sloping wedge of material remaining in place (see figure).

Task 4— Project Management and Summary Report

A summary report will be prepared for the data generated in this investigation. The report will include tabulated results and a map with boring locations and gamma survey results from the down-hole logging. The report will be provided for your review and comment before being finalized.

It is also anticipated that a meeting may be held to discuss and present the data generated as part of this investigation. The meeting would include the property owner (or representatives) and the USEPA. For the purpose of this proposal, STS has anticipated one meeting.

SCHEDULE

This work would entail a schedule of 5 to 6 weeks. We would seek to advise the Chicago Department of Transportation of our program and seek to obtain a waiver under CERCLA. That effort would take on the order of 1 to 2 weeks. Drilling could be completed in 2 to 3 weeks depending on the number of rigs mobilized. The downhole logging would proceed concurrent with the drilling and be completed within several days of the completion of the drilling program. The final report of findings would be completed within perhaps 2 weeks of completion of the drilling and logging efforts.

Should you have any questions with regard to the scope of services, fee estimate or work schedule as indicated herein, please contact us.

Respectfully,

STS CONSULTANTS, LTD.

Steven Kornder, Ph.D.
Senior Geochemist

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Marbury Rudnick & Wolfe

Attachments: Figure 1
Statistical Analysis

ATTACHMENT

STATISTICAL ANALYSIS

File: Readme
Date: 10/20/95
By: Jim Davidson, ORNL/GJ, (970) 248-6259

The ELIPGRID-PC program provides an easy-to-use interface to the ELIPGRID algorithm. It should run on just about any PC with 512 KB RAM. Also, disk space requirments are very small in this day of multiple MB Windows programs.

Note that two input file formats are supported. (1) The original ELIPGRID FORTRAN-style format. See Test100.In for an example. (2) A Simplified Input Format (SIF) that removes the need to worry with exact column positions. See Test100.SIF sample input file for more information. OF COURSE, THE SCREEN INPUT OPTION REMOVES THE NEED FOR A DATA INPUT FILE ALTOGETHER.

TO USE THE PROGRAM UNDER DOS:

(1) Make a new subdirectory on your harddrive, for example:
C:\>MD ELIPGRID

(2) Change to new subdirectory:
C:\>CD ELIPGRID

(3) Copy all files from the floppy disk in drive A: or B:
C:\ELIPGRID>COPY A:*.* or COPY B:*.*

(4) To use ELIPGRID-PC:
C:\ELIPGRID>EGPC

(5) For a help screen listing start-up options:
C:\ELIPGRID>EGPC ?

TO USE THE PROGRAM UNDER WINDOWS:

(1) Copy program to your harddrive as described above.

(2) Use the Windows File menu, Run option to start ELIPGRID-PC.

OR

Use the Windows File menu, New option to create an icon to start

ELIPGRID-PC.

(3) Use the Alt-Enter key sequence to switch the program from a DOS character mode screen to a Window DOS box in graphics mode and back.

GENERAL NOTE:

See chapter 10, Locating Hot Spots, in "Statistical Methods for Environmental Pollution Monitoring" (Gilbert 1987). This chapter is an explanation of how to use the ELIPGRID algorithm by graphical means. ELIPGRID-PC can be used to extend or replace the graphs.

The F1 key provides some further help in the program.

SOME REFERENCES:

Gilbert, R.A. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York.

U.S. EPA. 1989. Methods for Evaluating the Attainment of Cleanup Standards Volume 1: Soils and Solid Media, EPA, Washington, DC.

Output from ORNL ELIPGRID-PC Program Version: 10/20/95
File name.: A:\GRIDSA~1\SCREEN2.OUT
Created on: 07/09/01
Input file: From screen

Grid Type	Semi-major Axis in Rel. Units (L/G)	Gridspace in Meters	Shape	Angle deg	Prob. Hitting 1.0-P(0)
Square	1.00	2.00	0.50	0.0ø	0.9566
Square	1.00	2.00	0.50	10.0ø	0.9920
Square	1.00	2.00	0.50	30.0ø	1.0000
Square	1.00	2.00	0.50	45.0ø	1.0000•

Output from ORNL ELIPGRID-PC Program Version: 10/20/95
File name.: A:\GRIDSA~1\SITE001.OUT
Created on: 07/18/01
Input file: From screen

Grid Type	Semi-major Axis in Rel. Units (L/G)	Gridspace in Meters	Shape	Angle deg	Prob. Hitting 1.0-P(0)
Square	1.00	2.00	0.50	Random	0.9925
Square	1.00	2.00	0.50	0.0ø	0.9566
Square	1.44	1.39	0.50	0.0ø	1.0000•

STS CONSULTANTS

STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061-3153

voice 847-279-2500
fax 847-279-2510
web www.stsconsultants.com

July 26, 2001

Mr. Fred Micke, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard., SE-5J
Chicago, Illinois 60604

RE: Response to Comments regarding 341 East Ohio Street Workplan - STS Project No. 1-25585-XG

Dear Mr. Micke:

The following presents the incorporation of the U.S. Environmental Protection Agency (USEPA) comments into the 341 East Ohio Work Plan, with accompanying attachments.

General Comments

1) Overall, the Standard Operating Procedures (SOPS) should be revised to reflect the work being performed in Streeterville and not in West Chicago.

   We have changed references from West Chicago to Streeterville.

Specific Comments

Revised Work Plan is included in Attachment 1.

2) **See. 1.0, SCOPE AND OBJECTIVES, Page 1**: Add details about Velsicol's prior ownership/operation of property.

   The following was inserted to the Work Plan:

   The site has historically been used for several different purposes, including buildings used to support supply and wholesale distributors; shipping and receiving operations; an experimental lab, a machine shop, printing and lithography operations and a waxed paper manufacturer. Velsicol Chemical Corporation (Velsicol) used all of the site buildings constructed by the previous occupants as their corporate headquarters and as research and development laboratories for herbicides, insecticides and plant growth regulators from as early as 1917. Foundations and basements from these buildings are expected to be found on the property during the excavation and removal action process.

3) **See. 1.0, SCOPE AND OBJECTIVES, Page 3 (ii)**: Insert "no further radiological investigation or removal action is required..."(5th from the last sentence on this page)

Suggested wording was inserted.

4) **Sec. 2.3, Project Management Structure, Page 5**: Add s to (OSC), therefore, (OSCs).

Suggested wording was inserted.

5) **Sec. 2.3, Project Management Structure, Page 6, First paragraph**: This section must state the name of the project team, project manager, etc.

The following was inserted:

The TRS Project Team consists of the following members:

- TRS Project Manager, Mr. Tim Ramsey
- STS Project Coordinator, Mr. Richard Berggreen
- Quality Assurance Manager, Mr. Ron Palmieri
- STS Project Manager, Ms. Julie Apolinario
- STS Field Team Leader, Mr. Dumas Guerrier
- Health and Safety Officer, Mr. Glen Huber
- Kerr-McGee, Mr. Mark Krippel
- Health Physicist Supervisor, Mr. Steve Carlson

6) **Sec. 2.4, Delineation and Design, Page 7:** The wedge of material remaining on-site will need to be carefully surveyed in order to determine that this material is "clean". Many borings and/or lifts of material will be needed to conduct this survey work. The design for this work must be approved by this Agency before the Plan will be approved.

The following was inserted:

The wedge of material remaining unexcavated on-site will be sloped as steeply as can be safely accomplished without endangering the adjacent right-of-way, likely on the order of 1 V:1.5 H. Prior to excavation, this wedge of material will be surveyed for elevated gamma radiation utilizing a series of borings on a 2-meter square grid. The Work Plan detailing the proposed slope survey was submitted to USEPA by STS on July 18, 2001. Pending approval by USEPA, this Work Plan will be utilized to confirm that the slope materials are "clean". Any identified radiologically impacted material will be removed to the property line during the excavation phase of the project.

This design detail and the results of the slope survey will be provided as part of any bid package to contractors who might be invited to bid on the proposed excavation and removal work. The design will be submitted for review and will conform to the requirements of the appropriate public agency or governmental oversight unit.

7) **Sec. 3.1.5, Excavation Work, Page 14, Second paragraph**: Provisions must also be made for the staging of "Baker Boxes".

The following was inserted:

Arrangements for the use of "Baker Boxes" will be made before construction starts; site mobilization will include provisions for the staging of these boxes as soon as they are needed.

8) **Section 3.1.1, Site Preparation, Page 11, First paragraph**: This section should mention that structures/Foundations from Velsicol should be expected.

Inserted as suggested.

9) **Section 3.4.3,Training, page 25, First paragraph**: Federal requirements must take precedence over State requirements as noted in the footnote on page 11 of Attachment 3.

"As noted in the Health and Safety Plan, Federal safety requirements take precedence over state requirements. "

10) **Section 3.4.3, Second paragraph**: Training should also include radiation basics.

Included as noted

11) **Section 3.4.3, Third paragraph**: Tailgate meetings may be needed more often than weekly.

Included as noted.

12) **Section 3.4.5, Monitoring, Page 26, First paragraph**: A primary requirement of dust control is "no visible dust."

"A primary requirement of dust control is "no visible dust"."

13) **Section 3.5, Application of ALARA to Excavation, Page 27, Second paragraph**: USEPA has an oversight role. It is not involved directly in cleanup.
"ALARA and the numerical criterion will be met through a coordinated program of surveys and verification conducted by TRS. USEPA will provide oversight role in the application of ALARA to the excavation activities."

14) **Project Management Organization Chart**: USEPA does not report to the STS Project Coordinator. USEPA has an independent role.

Changed as noted, see attached organization chart.

Attachment 1, Section 01020, Construction Health and Safety

Revised Construction Health and Safety is included in Attachment 2.

15) **Part 3 - Execution, Page 1, Paragraph d**: State specifically where emergency rescue equipment such as breathing apparatus, safety harness, etc. will be located.

"d. Emergency rescue equipment such as breathing apparatus, a safety harness and line, etc., will be readily available in the project trailer."

16) **Sec. 3.2, Training, Page 3**: Add that there will be a competent person for shoring.

Inserted as suggested.

Attachment 1, Section 02200, Contaminated Material Loadout and Transport

Revised Contaminated Material Loadout and Transport is included in Attachment 3.

17) **Sec. 2.6, B, Loadout, Page 10**: Will portable scales be present?

The following was inserted:

2. Portable scales will be present at the loadout and equipment decontamination facilities for use where loadout is occurring.

Attachment 1, Section 02840, Site Utilities

Revised Site Utilities is included in Attachment 4.

18) **Sec. 3.4, Underground Utility Installations, Page 50, Paragraph D, Trench Preparation**: Delete "at t2%"

Deleted as noted.

Standard Operating Procedure, SOP-212, Air Monitoring Procedure

Revised Air Monitoring Procedure is included in Attachment 5.

19) **Section 5.1, Page 3**: Delete use of REF background air monitoring station #17. A location closer to Streeterville must be found.

The SOP has been revised to reflect a location closer to the project site. This SOP was revised to more adequately address air monitoring activities:

One downwind, high volume air sample shall be collected for a minimum of eight hours prior to the commencement of excavation activities. This sample shall be analyzed the day after collection and then again after four days to allow for the decay of short lived radon and thoron daughters. The count, after four days decay, will serve as the official measurement of the background airborne alpha concentration. Future results during Site operations should be compared to this value to see if further engineering controls or procedural changes are warranted.

20) **Section 5.4.2, Page 4**: Counting filters at the REF?

This SOP was revised to more adequately address air monitoring activities, including more specific references to filter measurements:

Four air monitoring locations shall be used during all excavation activities. Samples shall be collected during all operations where potentially contaminated soils are being excavated, moved, or loaded. One monitor shall be placed on each perimeter of the site (North, South, East, and West) and collect samples at a height between one and two meters above the ground. Flow rate through air samples shall remain between 20 and 60 cubic feet per minute. Air sample filters shall be collected and replaced daily and submitted to the laboratory for analysis. Samples analyzed from the perimeter high volume monitors shall be used to determine the amount of airborne radionuclides leaving the Site.

Attachment 3, Health and Safety Plan

Revised Health and Safety Plan is included in Attachment 6.

21) **General comment**: The specific names and resumes of key managers such as the Health and Safety Coordinator and the Field Team Leader must be included in this document.

Mr. Glen Huber has been named as the Health and Safety Coordinator, and Mr. Dumas Guerrier has been named as the Field Team Leader. All other key personnel have been named as well. Resumes of key personnel not included in the original work plan have included in the revised Health and Safety Plan.

22) **Figure 1.1, Page 2, next to last sentence at bottom of page**: This is not a USNRC licensed site.

This reference has been removed.

23) **Section 2.1, Page 3, Last bullet**: This sentence is unclear. Will this be simply an administrative function or will this coordinator be monitoring the air and counting the filters for concentration measurements?

The sentence has been revised as follows:

- Administer personnel and perform ambient air monitoring procedures.

24) **Section 3.0, Personnel Responsibilities, Page 4, Second paragraph**: Will the Field Team Leader conduct any training on radiation or any periodic briefings on radiation matters? This paragraph does not commit to that.

The paragraph has been revised as follows:

The Field Team Leader, Mr. Dumas Guerrier, will conduct tailgate safety meetings to familiarize the Site personnel with Site conditions, boundaries, and physical hazards. Site personnel will conduct their assigned tasks in accordance with the HASP at all times. As necessary, the Field Team Leader will conduct radiation training and provide briefings on radiation issues that arise during construction. These activities will take place as part of the tailgate safety meetings, or during special meetings to address more immediate concerns, dependent on the issues being addressed.

25) **Section 4.1, Page 6**: The title for this section should include the word "radioactive," as Principal Radioactive Contaminants.

Revised as noted.

26) **Section 4.1, bullets**: The hazards include the entire thorium (Th-232) and uranium (U-238) decay chains. There are two (2) radiums which have been singled out (Ra-226, Ra-228). Both radons (Rn-220, Rn-222) are potential hazards.

Revised as noted.

27) ***Section 4.1, Sentence after bullets***: The known total radium concentration exceeds 3000 picocuries per gram. This should not be cited as a low concentration.

Revised as follows:

The known total radium concentration present in the soil exceeds 3000 pCi/g for some locations within the project site.

28) **Section 4.1, Route, Entry Made Via**: Inhalation should include radon which is not a heavy metal. Direct exposure can also occur from X-rays.

Revised with inclusions as noted.

29) **Section 4.3.1, Dosimetry/Personal Monitoring, Page 11**: Project Health Physics Personnel is nonspecific. There must be a specific project manager.

The paragraph has been revised as follows:

All project personnel shall participate in a dosimetry program administered by the HSC. (The dosimetry program shall comply with 32 IAC 340; i.e., dosimeters shall be processed by a dosimetry processor accredited by the National Voluntary Laboratory Accreditation Program.) The HSC shall maintain records of all radiation exposures incurred by field personnel including all contractors. These records will be maintained in an up-to-date manner to comply with the requirements of 32 IAC 340.4010. The HSC shall review the results of personal exposure monitoring to determine compliance with exposure limit requirements.

30) **Section 4.3.3, Bioassay, Page 12, Second paragraph**: The decision to use bioassay should not be based just on dosimetry. If there were an excessive intake, there could be a need for immediate bioassay that would not require any dosimetry justification.

The determination should be made by a specific, designated manager such as the Health and Safety Coordinator or the Field Team Leader. Project Health Physics personnel is nonspecific.

The paragraph has been revised as follows:

The decision to use bioassay shall be made by the Health and Safety Coordinator. In the event that a worker has an excessive intake or the potential to receive greater than 10% of the Annual Limit on Intake (ALI) , bioassay shall be ordered. Data from Lapel Air Samplers shall be used as a factor in determining whether or not bioassay is warranted. If workers are found to have been present in locations where airborne radioactivity concentrations are found to be greater than 30% of the Derived Air Concentration, bioassay will be considered.

31) **Section 4.3.4, Emergency Medical Treatment, Page 13, bullets**: There should be an individual trained specifically on radiation emergency response.

Revised as noted.

32) **Section 5.1, Page 17, Bullets**: Training must include radiation in general as well as the hazards.

Revised as noted.

33) **Section 5.3, Page 18**: Tailgate meetings, as needed, should be held more often than weekly.

Revised as follows:

Additional meetings will be conducted throughout the week, as needed, to address safety concerns and precautions.

34) **Section 5.4, Page 18**: This trained individual should be trained in radiological response as well.

Revised as noted.

35) **Safety Meeting Report**: Supervisor and Department Head are not titles specific to this project. The appropriate titles should be applied.

Figure 5.1 has been revised and is attached to this document.

36) **Figure 5.2**: Has this apparently Kerr-McGee form been reviewed for applicability to this site specifically?

Figure 5.2 has been revised and is attached to this document.

37) **Section 7.1, Page 28**: A key control mechanism should be stated as "no visible dust.

The paragraph has been revised as follows:

A key control measure to minimize exposure levels and off-site migration of contaminants will be a policy of "no visible dust".

38) **Section 7.2, Page 28, Bullets**: Monitoring also includes counting filters, computing concentrations and comparing concentrations to criteria.

The bullets have been revised as follows:

Monitoring for airborne radioactivity exposure requires the following elements:

- Air sampling for radioactive particulates,
- Recordkeeping regarding personnel work locations and time in location,
- Respiratory protective equipment records regarding devices used by workers in airborne radioactivity areas,
- Counting and analyzing air sample filters,
- Calculating air concentrations of radioactive material, and
- Comparing air concentrations to applicable air quality criteria

39) **Section 7.2, Paragraph beginning with "Lapel"**: This paragraph is vague. Air filters can be read on a daily basis to assess for the need to make procedural changes, but, for most filters, they cannot be read on a daily basis. The method must be specific in this section. How will the interferences be handled specifically? How much time will be allowed for decay? These are some of the specific issues that should be addressed in this section.

The paragraph has been revised as follows:

Lapel samplers worn for personal air monitoring shall be utilized for airborne radioactivity monitoring any time a worker enters a radiological exclusion zone. The filters from the lapel samplers shall be analyzed the following day after use for comparison purposes to assess the need for procedural changes. It is expected that naturally occurring radon and thorium daughters will interfere with analyses. Additional evaluation of samples shall be performed when determined necessary based upon elevated results. If sample analysis shows concentrations greater than background levels a follow-up analysis shall be performed. The follow-up analysis shall be performed after four days to allow for the decay of the thoron daughter Pb-212 (10.6 hour half life). The "four day count" should be free from radon daughter interference and will serve as the official measurement of Th-Alpha.

40) **Section 7.2, page 28, Last paragraph**: If high volume samplers are used, then dust buildup will be an issue because a thick dust layer will shield out alpha particle emissions and give incorrect air concentrations. Low volume samplers are more appropriate. Depending upon the collection and analytical protocols, daily measurements of concentration may not be possible except to qualitatively compare one day to the next.

The paragraph has been revised as follows:

Low volume air samplers shall run continuously during operations and be evaluated on a daily basis for gross alpha activity.

41) **Section 7.2, Page 29, Last paragraph**: The specificity in this paragraph is good and could be used to improve other, vague, sections.

As noted.

42) **Section 7.5, Page 30**: There are no regulatory limits, specifically, for this project but there are relevant and appropriate requirements that must be conformed to.

The primary instruments for this project will probably be the sodium iodide count rate and a Geiger counter. The first for seek and find work and for soil concentration judgments. The later for personnel surveillance. A micro-R meter could be used periodically but would not be a primary instrument. This paragraph should be improved with these ideas in mind.

This section has been revised as follows:

Radiological surveys will be performed to ensure that radiation levels and contamination levels are within applicable guidelines for workers and the general public. Radiation surveys will be performed using the following instrumentation:

- Ludlum Model 2221 Portable Scaler/Ratemeter with 2"x2" NaI probe (or equivalent). This instrument will be used to conduct surface soil scans. Instrument specific action levels shall be used to determine approximate radiological soil concentrations. Any areas where the count rate is greater than the determined action level shall be considered exclusion zones and marked appropriately.

- Ludlum Model 3 Survey Meter with pancake G-M probe (or equivalent). This instrument will be used to conduct surveillance surveys of both personnel and equipment leaving exclusion zones. The action level for both equipment and personnel surveys is any count rate that exceeds background level. Decontamination procedures detailed in section 9.0 of the HSP will be used when contamination is located.

- Ludlum Model 3 Survey Meter with 1"x1" NaI probe "MicroR meter" (or equivalent) and Eberline Model RO-2 Ion Chamber (or equivalent). These instruments will be used periodically to ensure that dose rates in work areas as well as the Site perimeter are below prescribed levels. The action levels for both on and off site are detailed in Section 7.8 of the HSP in Table 7.1.

43) **Section 7.6, Page 30, Second paragraph**: Frisker is nonspecific. A more specific instrument should be identified.

Revised as follows:

Before leaving the exclusion zone, Site personnel shall be checked through use of a hand-held frisker to ensure that contamination is not present on skin or clothes. The frisker will be a Ludlum Model 3 survey meter with a pancake G-M probe (or equivalent).

44) **Section 7.8.1, Radiological Action Levels. Page 31, First paragraph**: Smearing workers is not an appropriate surveillance method. Trigger levels on specific worker surveillance instruments should be stated. These should include gamma exposure rates.

Revised as follows:

Radiological action levels for on-site workers will be determined by performing surveillance surveys as well as airborne particulate monitoring for the presence of radioactivity.

Table 7.1 has also been revised to address these comments, and is attached to this document.

45) **Table 7-1, Page 33, Item a:** Smear samples are appropriate to objects. It is unclear how an object smear will indicate a need to upgrade respiratory protection.

The radionuclide specific DAC should be written down. Also, there will be a need to translate gross alpha counts to the appropriate level for a single radionuclide concentration.

It would be prudent to institute action levels before the regulatory criteria are reached.

Table 7.1 has been revised to address these comments, and is attached to this document.

46) **Section 8.0, Personal Protective Equipment, Page 35, First set of bullets**: Coveralls should be disposable or washable through a contaminated clothing vendor. Coveralls should be those removed at the boundary of the exclusion zone.

Revised as follows:

- Coveralls, disposable or washable through a contaminated clothing vendor. Coveralls are to be removed at the boundary of the exclusion zone.

47) **Section 9.2, Page 36, First paragraph**: The boundary for removing contaminated clothing should be the exclusion zone, not the site boundary.

Revised as follows:

If levels of radioactivity show that individuals can remove coveralls and other personal protective clothing and equipment before leaving the exclusion zone and, thus complete decontamination, the individuals may leave the exclusion zone.

If you have any questions or comments, please contact us at 847-279-2500.

Regards,

STS CONSULTANTS, LTD.

Julie R. Apolinario
Senior Project Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Marbury Rudnick & Wolfe

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

August 17, 2001 SE-5J

Mr. Richard G. Berggreen, C.P.G.
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061-3153

RE: Lindsay Light II Site--North McClurg Court

Dear Mr. Berggreen:

The U.S. Environmental Protection Agency (USEPA) has reviewed the proposed gamma radiation survey plan for soils at the perimeter of the North McClurg (341 East Ohio Street) Site which was submitted on July 18, 2001.

The proposed survey plan, which entails drilling and downhole logging at a 2 meter spacing interval for gamma radiation, is hereby approved.. The survey work can, therefore, begin immediately.

If you have questions regarding this letter, please contact me, as soon as possible, at (312) 886-5123 or contact Verneta Simon, On-Scene Coordinator, at (312) 886-360, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Fredrick A. Micke

Fredrick A. Micke, P.E.
On-Scene Coordinator
ERB Section #3

cc: Mark Krippel, Kerr-McGee
T. Ramsey, PMRW

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STS Consultants. Ltd.
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Vernon Hills, Illinois 60061-3153

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August 28, 2001

Mr. Fred Micke
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard, SE-5J
Chicago, Illinois 60604

RE: 341 East Ohio Street Site Work Plan - STS Project No. 1-25585-XG, Correspondence No. 004

Dear Mr. Micke:

USEPA provided comments dated July 11, 2001 to the above-referenced document. Your comment number 17 asked whether a truck scale to weigh shipping containers would be available on site. In our response dated July 26, 2001, we indicated a portable scale would be available on site.

By this letter we are revising that comment response. Throughout the duration of the off-site shipment of soils, representative containers will be weighed at a certified fixed scale facility enroute between the site and the railyard in Blue Island, Illinois. Those weights will be used to develop an average weight for all containers shipped. No portable scale will be present on site.

This revision has been discussed with Kerr-McGee and they are in agreement with the proposed use of the fixed scale facility.

Please call with any comments to this change.

Regards,

STS CONSULTANTS, LTD.

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Tim Ramsey, Piper Marbury Rudnick & Wolfe
Bernie Bono, Kerr-McGee

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100-LH-7 (7 02)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

SE-5J

September 12, 2001

VIA FACSIMILE AND U.S. MAIL

Mr. Richard G. Berggreen, C.P.C.
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061-3153

RE: **341 East Ohio Street Workplan**
Lindsay Light II Site/RV3 North McClurg Court

Dear Mr. Berggreen:

The U.S. Environmental Protection Agency (USEPA) has reviewed your letter of July 26, 2001 which responded to USEPA's letter of July 11, 2001. USEPA hereby approves the 341 East Ohio Workplan with the proviso that the comments raised below are incorporated into the Workplan. The contents of the July 26 letter must be added to and made a part of the Workplan document submitted on May 4, 2001.

Furthermore, work at the Site can begin immediately if the comments raised below are incorporated. The comments are as follows:

Comment to Reply #5: The Health Physicist Supervisor listed here is Steve Carlson. The Health and Safety Plan contains a resume for Keith Carlson. Are these the same people?

Comment to Reply #18: "at t2%" was not removed.

Comment to Reply #19: No downwind site was specified in Section 4.1. It would be more appropriate to sample for the length and times of a standard work day so that concentrations can be more easily compared.

One air sample will not be representative of background. For example, the weather that one day could affect the concentration in that a dry day may be dusty with more radioactive particulates (higher background concentration), a wet day may have all the particulates swept out by rain (lower background concentration).

Comment to Reply #45: The release level for radium-226 and radium-228 by Nuclear Regulatory Commission Regulatory Guide 1.86 is 20 dpm/100 cm^2. Where Federal

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limits exceed state limits, the Federal limits take precedence.

The Action Levels of ambient gamma (off-site areas) are set to be triggered just at the regulatory level, unlike the Action Level for work areas. Having the action to be triggered before the regulatory level is reached is useful to avoid an exceedence.

If you have questions regarding this letter, please contact me, as soon as possible, at (312) 886-5123 or contact Vernota Simon, On-Scene Coordinator, at (312) 886-360, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Fredrick A. Micke

Fredrick A. Micke, P.E.
On-Scene Coordinator
ERB Section #3

cc: Mark Krippel, Kerr-McGee

STS Consultants, Ltd.
Solutions through Science & Engineering

September 21, 2001

Mr. Fred Micke, On-Scene Coordinator
U.S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard, SE-5J
Chicago, Illinois 60604

RE: Response to Comments regarding 341 East Ohio Street Site Quality Assurance Project Plan – STS Project No. 1-25585-XG, Correspondence No. 012

Dear Mr. Micke:

The following present the incorporation of the U.S. Environmental Protection Agency (USEPA) comment into the 341 East Ohio Street Site Quality Assurance Project Plan (QAPP), with accompanying attachments.

Specific Comments

1) **The sign off page, list of acronyms and the distribution list are missing.**

These have been added.

2) **Element A4 - Project/Task Organization**

Responsibilities for data validation, data assessment, system audits, and identifying non-conformances have been identified. Laboratory analyses have been clarified. USEPA review of the QAPP has been added.

3) **Element A6-Project /Task Description and Schedule**

The SOPs for the waste characterization and potential groundwater analysis have been attached to one copy of this document. A discussion of the internal and external quality system audits has been included.

4) **Element A7 – Quality Objectives and Criteria for Measurement Data**

This section has been completely revised to incorporate the data quality objectives. Accuracy has been defined.

750 Corporate Woods Parkway • Vernon Hills, IL 60061-3153 • (847) 279-2500 • (847) 279-2510 Fax

5) **Element A9 – Documentation and Records**

Data package format and document control needs were included in this section.

6) **Section B2 – Sampling Methods Requirements**

The waste characterization and potential groundwater analysis sampling methods have been included.

7) **Section B3 – Sampling Handling and Custody Requirements**

Sample handling requirements and field and laboratory custody procedures are included and the applicable SOPs referenced. Chain of Custody Forms and SOPs have been attached.

8) **Section B4 – Analytical Methods Requirements**

Analytical method requirements for the waste characterization and groundwater analysis have been included in the discussion.

9) **Section B5 – Quality Control Requirements**

Limits for precision have been specified for the laboratory split samples.

10) **Section B8 – Inspection/Acceptance Requirements for Supplies and Consumables**

A discussion of the inspection/acceptance requirements for supplies and consumables has been included. Additionally, the Field Sampling Plan has been revised to include more details, and has been attached to this document.

11) **Section B10 – Instructions for Data Management**

This section has been rewritten according to the QAPP instructions.

12) **Section C1 – Assessment and Response Audits**

A note was added to indicate that USEPA Region 5 has the discretion to audit the waste characterization laboratory. The Response Action Section was rewritten as indicated.

13) Section D1 – Data Review, Validation and Verification Requirements

The person responsible for validating the laboratory data was specified.

If you have any questions or comments, please contact us at 847.279.2500.

Regards,

STS CONSULTANTS, LTD.

Julie R. Apolinario
Senior Project Manager

for

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Marbury Rudnick & Wolfe

U.S. ENVIRONMENTAL PROTECTION AGENCY
SUPERFUND DIVISION
77 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

October 17, 2001 SE-5J

Richard G. Berggreen, C.P.G.
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

Dear Mr. Berggreen:

Enclosed are comments on the U.S. Environmental Protection Agency's (USEPA) review of the revised Quality Assurance Project Plan for the property at 341 East Ohio Street in Chicago, Illinois.

Comment 1 deals with the Title and Approval pages. For your assistance I have included a copy of USEPA's instructions on preparing these. I also prepared a draft of these pages for the Ohio Street property to aid you, although you may have to revise these further to include all the items appropriate to the instructions. If there are any questions on these, please feel free to call and I will put you in contact with the QAPP review staff.

Sincerely,

Larry Jensen for Fred Micke

Larry Jensen, CHP
Senior Health Physicist
Emergency Response Section #3

MEMORANDUM
DATE: 10/10/01

SUBJECT: Review of Quality Assurance Project Plan for the Removal Action Work Plan 341 East Ohio Street, Chicago, Illinois, dated May 1, 2001. FSS QAPP Document Log #2719

FROM: Luba Finkelberg,
Superfund Field Services Section

To: Verneta Simon, OSC
Superfund Division

CC: Steve Ostrodka, Chief,
Superfund Field Services Section

I have reviewed the revised Quality Assurance Project Plan for the Removal Action Work Plan at 341 East Ohio Street, Chicago, Illinois, dated September 21 ,2001. My review of the document was limited to the QAPP and FSP since I do not have the technical expertise to review radiation SOPs. Listed below are my comments.

1. Title and an approval page.

   Title and an approval page is not acceptable. Signature space and date should be included for the individuals who have reviewed and approved the document (US EPA On-Scene Coordinator, US EPA QAPP Reviewer, Contractor Project Manager, Contractor QA Manager, Contract Laboratory Manager(s). The example of the requirements is on list is on the page 7 of the Region 5 Instruction of the Preparation of Superfund Division QAPP.

2. Element A7 - Quality Objectives and Criteria for Measurement Data.

   Please provide the definition of Precision and quality measurement performance criteria for acceptable field and laboratory precision for each matrix, analytical parameter and concentration level.

3. Section B4- Analytical Methods Requirements.

   Please address the function of each lab. Also provide the summary table of all matrices, parameters and methods (in case of different labs involvement SOP should be provided from each lab.)

INSTRUCTIONS FOR

TITLE/SIGNATURE PAGE

All QAPPs prepared by non-EPA organizations must be approved by EPA before implementation. None of the environmental work addressed by the QAPP should be started until the initial QAPP has been approved and distributed to project personnel. The QAPP must contain a Title/Signature Page. This title page will document the following:

1) The complete title of the project and investigation (RI/FS; RD/RA, etc.) specifying the location (city, state) of the Superfund site;

2) The firm that prepared the plan as well as the organization for whom it was prepared; and

3) The date and the revision number (the initial draft should be considered Revision 0 and subsequent revisions as Revision 1, 2 etc.).

4) Signature space with the title and date should be included for the individuals who have reviewed and approved the document.

Functionally, this page ensures that the desired content and level of detail are achieved through the review and approval (at a minimum) by the following personnel:

1. For Fund-lead projects:

   * U.S. EPA Region 5, Remedial Project Manager

   * U.S. EPA Region 5, Quality Assurance Reviewer

   * Contractor Project Manager

   * Contractor sampling organization

   * Responsible EPA contract laboratories (excluding CLP laboratories for RAS analysis).

2. For enforcement-lead projects:

   * U.S. EPA Region 5, Remedial Project Manager

   * U.S. EPA Region 5, Quality Assurance Reviewer

   * Contractor Project Manager

   * Contractor Quality Assurance Manager

   * Contract Laboratory Directors

   * Sampling Contractors

NOTE: The titles and names of all individuals appearing on the title page will be consistent with the references to these people elsewhere in the QAPP (e.g. project organization, corrective action, and QA reports to management sections).

QUALITY ASSURANCE PROJECT PLAN

FOR THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY OR REMEDIAL DESIGN/REMEDIAL ACTION [PROJECT TYPE (FUND-LEAD, ENFORCEMENT-LEAD] AT

[SUPERFUND SITE NAME]

REVISION [NUMBER]

[DATE OF SUBMITTAL]

Prepared by: [Contractor Name]

[Contractor Project Manager]	Date
[Contractor QA Officer]	Date
[Laboratory QA Manager] (if applicable)	Date
State Project Manager (if applicable)	Date
U.S. EPA Region 5 Remedial Project Manager	Date
U.S. EPA Region 5 Quality Assurance Reviewer	Date

Draft, see Instructions to adopt for this project

QUALITY ASSURANCE PROJECT PLAN
341 EAST OHIO STREET SITE

Prepared for

U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

October xx, 2001

QUALITY ASSURANCE PROJECT PLAN
341 EAST OHIO STREET SITE

October xx, 2001

Prepared By:_____Date:_____
Julie Apolinario
Project Manager

Approved By:_____Date:_____
Richard G. Berggreen, C.P.G.
Project Coordinator

Approved By:_____Date:_____
Fredrick Micke
U.S. EPA On-Scene Coordinator

Approved By:_____Date:_____
Luba Finkelberg
U.S. EPA QAPP Reviewer

+ possible lab signoff lines, see "Instructions for Title/Signature Page"

PIPER MARBURY RUDNICK & WOLFE

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December 21, 2001

VIA OVERNIGHT COURIER

Ms. Renee Cipriano, Director
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

Re: **GMO Site, 341 East Ohio Street, Chicago, Illinois**

Dear Renee:

Our client Teachers' Retirement System of the State of Illinois, a pension fund created under Illinois statutes ("TRS"), has previously acquired by deeds in lieu of foreclosure a parcel of vacant real estate comprising approximately 2.16 acres located in the Streeterville area of Chicago with the street address of 341 East Ohio Street (the "GMO Site"). Although TRS is a secured creditor with respect to the GMO Site, TRS is in the process of performing a removal action with respect to certain radiological materials at the GMO Site in accordance with a Unilateral Administrative Order ("UAO") previously issued by the U.S. Environmental Protection Agency ("USEPA") pursuant to Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act. USEPA issued the UAO to require the cleanup of radiological materials in the Streeterville area which are residual to the former operations of Lindsay Light Company, a former manufacturer of gas lanterns, to which Kerr-McGee Chemical, LLC is the corporate successor. TRS understands that USEPA has consulted with the Illinois Environmental Protection Agency ("IEPA") with respect to the UAO. Although TRS is not a respondent to the UAO, TRS is proceeding with the removal action in accordance with the UAO. USEPA has requested that TRS provide, as a condition of USEPA's final approval of TRS' work plan, a confirmation from IEPA concerning certain pesticides which have been identified at the GMO Site, and in this letter TRS requests such confirmation from IEPA as described below.

In making the final preparations for the commencement of the removal action, TRS discovered earlier this fall certain concentrations of pesticides in a portion of the GMO Site which Velsicol Chemical Corporation ("Velsicol"), a former owner and operator of the GMO Site, used as a hazardous waste storage facility. In this regard, please note that in 1988 IEPA

approved the closure of that hazardous waste storage facility. One composite soil sample taken by TRS in September 2001 from a soil boring in the vicinity of Velsicol's former hazardous waste storage area indicated an exceedance over the threshold for chlordane, a pesticide, under the Toxicity Characteristic Leaching Procedure ("TCLP"). However, TRS' subsequent (and more extensive) investigations of this area in November 2001 indicated that no pesticides are in concentrations which, under the TCLP test, would cause the soils to exhibit the characteristic of toxicity under 40 C.F.R. 261.24 or 35 Ill. Admin. Code 721.124 so as to constitute hazardous waste under the Resource Conservation and Recovery Act or the Illinois Environmental Protection Act. STS Consultants, Ltd. ("STS"), TRS' environmental consultant, has advised that the subsequent and more extensive TCLP data suggest that the TCLP exceedance for chlordane in the initial composite soil sample taken in September 2001 was not representative of subsurface conditions in the area.

Based on the results of the extensive TCLP testing for pesticides in November 2001, TRS has proposed to USEPA that it will proceed with the removal action at the GMO Site in accordance with its original plan without any complications which would have resulted from the presence of hazardous wastes (for pesticides) in the vicinity of the former hazardous waste storage facility. The essential elements of this plan include the following: (i) removal of all previously identified radiological materials in excess of the radiological cleanup standard established by USEPA, (ii) excavation of the remaining soils at the GMO Site down to the native sands and radiological screening of those excavated soils in 18 inch excavation lifts, (iii) removal of all additional radiological materials which are identified in the screening process described above to the extent that the materials exceed USEPA's radiological cleanup standard and (iv) leaving at the GMO Site all other excavated soils and fill materials which are not identified as radiological materials in excess of the radiological cleanup standard. Under this approach, any soils or fill materials (including those with pesticides) in compliance with USEPA's radiological cleanup standard will be left at the GMO Site. USEPA has advised that it has not identified any requirement under federal laws or regulations which would prevent TRS from leaving at the GMO Site any soils or fill materials containing pesticides of the character identified in the vicinity of the former hazardous waste storage area which are excavated for purposes of radiological screening and are radiologically cleared. USEPA has requested that TRS obtain a similar confirmation from IEPA to the effect that there is no requirement under Illinois laws or regulations which would prevent TRS from leaving at the GMO Site any such soils or fill materials which are radiologically cleared. Accordingly, TRS requests that IEPA provide that confirmation so that the removal work at the GMO Site can proceed in accordance with the UAO.

In connection with your review of this request, we are enclosing with this letter copies of the following documents which contain information about the GMO Site:

1. Letter dated March 23, 1988 from Robert S. Thiel of Velsicol to IEPA, along with the Closure Documentation Report/Container Waste Storage Facility/Research

Laboratory, 330 E. Grand Avenue, Chicago, IL 60611 dated February 29, 1988 prepared by TEAM, Inc.;

2. Letter dated June 29, 1988 from IEPA to Mr. Thiel confirming that the hazardous waste storage facility was approved by IEPA for closure under the approved closure plan;

3. Letter report dated October 8, 2001 prepared by STS setting forth the results of its initial investigation of the GMO Site for potential hazardous wastes, including the results of the one soil boring (identified as B-3) from which the composite soil sample showed a TCLP exceedance for chlordane;

4. Letter dated October 19, 2001 from STS which supplemented its October 8, 2001 letter report;

5. Status Report, Pesticide Investigation dated November 20, 2001 prepared by STS which contains information about the total pesticide concentrations in discrete soil samples taken from 10 soil borings in the vicinity of the former hazardous waste storage facility; and

6. Letter dated December 7, 2001 from STS setting forth the TCLP results for pesticides with respect to soil samples taken from the 10 soil borings identified in the Status Report dated November 20, 2001.

As noted above, TRS is seeking USEPA's final approval of TRS' work plan for the removal action, and USEPA has indicated that the confirmation from IEPA requested in this letter must be provided as a condition of USEPA's final approval. Because this is one of the last items to be obtained to enable TRS to proceed with the removal action, TRS would appreciate IEPA's expeditious response to this request so that TRS can proceed in the near future with the planned removal action. Thank you for your consideration.

Very truly yours,

James S. Montana, Jr.

JTR/tr
Enclosures
cc: Mr. William D. Seith, Deputy Director (w/encl.—by overnight courier)
Mr. Terry A. McKay (w/out encl.)
Mr. Thomas J. Pabian (w/out encl.)
Steven L. Loren, Esq. (w/out encl.)
Timothy Ramsey, Esq. (w/out encl.)

STS Consultants, Ltd.
Solutions through Science & Engineering

January 14, 2002

Mr. Fred Micke, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard., SE-5J
Chicago, Illinois 60604

RE: Response to Comments regarding 341 East Ohio Street Quality Assurance Project Plan - STS Project No. 1-25585-XG, Correspondence No. 043

Dear Mr. Micke:

The following presents the incorporation of the U.S. Environmental Protection Agency (USEPA) comments into the 341 East Ohio Quality Assurance Project Plan (QAPP) with accompanying attachments.

SPECIFIC COMMENTS

Revised QAPP is included in Attachment 1.

1) **Title and Approval Pages, Pages 1 and 2**: Signature space and date should be included for the individuals who have reviewed and approved the document, including the USEPA On-Scene Coordinator, USEPA QAPP Reviewer, Contractor Project Manger, Contractor Quality Assurance Manager, and Contract Laboratory Manager.

   The Title and Approval pages have been revised as noted above and as required on page 7 of the Region 5 Instruction of the Preparation of Superfund Division QAPP.

2) **Element A7 – Quality Objectives and Criteria for Measurement Data:** Provide the definition of precision and quality measurement performance criteria for acceptable field and laboratory precision for each matrix, analytical parameter, and concentration level.

   Precision is defined in Section A7.B: Measurement Performance Criteria, page 32. Table 2 in the same section presents the data quality objectives for the field measured data. The quality measurement performance criteria are provided for laboratory precision for each matrix, analytical parameter and concentration in tables 8.4-5, 8.4-6 and 8.4-7 in Section 8 of the laboratory QAMP, attached as Appendix D to the QAPP, and as Attachment 2 to this letter.

3) **Section B4 – Analytical Methods Requirements:** Address the function of each lab. Also provide a summary table of all matrices, parameters and methods (in case of different laboratory's involvement, SOPs should be provided from each lab).

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The function of each lab has been presented in Section B4, page 51. Table 8 in the same section provides information on the laboratory parameters and methods by matrixes. SOPs for the various laboratories are included in Appendix B of the QAPP as originally submitted.

If you have any questions or comments, please contact us at 847-279-2500.

Regards,

STS CONSULTANTS, LTD.

Julie R. Apolinario
Senior Project Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Marbury Rudnick & Wolfe

Attachments

STS CONSULTANTS

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January 18, 2002

Mr. Fred Micke, On-Scene Coordinator
U.S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard, SE-5J
Chicago, Illinois 60604

RE: Response to Comments regarding 341 East Ohio Street Site Quality Assurance Project Plan – STS Project No. 1-25585-XG, Correspondence No. 046

Dear Mr. Micke:

The letter sent by STS Consultants, Ltd. on January 14, 2002 containing the revised QAPP for the 341 East Ohio Street Site was sent out without one of the attachments. A copy of the letter, the revised QAPP and the missing attachment is contained in this transmittal.

We apologize for any confusion this omission has caused. If you have any questions or comments, please contact us at 847-279-2500.

Regards,

STS CONSULTANTS, LTD.

Julie R. Apolinario
Senior Project Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Marbury Rudnick & Wolfe

ATTACHMENT 1

QUALITY ASSURANCE PROJECT PLAN

ATTACHMENT 2

MEASUREMENT PERFORMANCE CRITERIA

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January 29, 2002

BY TELECOPY AND U.S. FIRST CLASS MAIL

William Ingersoll, Esq.
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, Illinois 62794

Re: **GMO Site, 341 East Grand Avenue, Chicago, Illinois**

Dear Mr. Ingersoll:

This letter supplements the letter dated December 21, 2001 from James Montana of our office to Renee Cipriano, Director of the Illinois Environmental Protection Agency ("IEPA"), concerning the 2.16 acre parcel at 341 East Grand Avenue, Chicago, Illinois which we refer to as the "GMO Site." We have previously advised you that (i) our client Teachers' Retirement System of the State of Illinois ("TRS") has previously acquired the GMO Site by deeds in lieu of foreclosure and (ii) although TRS is a secured creditor with respect to the GMO Site, TRS is in the process of performing a removal action with respect to certain radiological materials at the GMO Site in accordance with a Unilateral Administrative Order ("UAO") previously issued by the U.S. Environmental Protection Agency ("USEPA") pursuant to Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act. USEPA issued the UAO to require the cleanup of radiological materials in the Streeterville area which are residual to the former operations of Lindsay Light Company, a former manufacturer of gas lanterns, to which Kerr-McGee Chemical, LLC is the corporate successor. Our letter dated December 21, 2001 related to certain pesticides which have been identified at a portion of the GMO Site (near the northwest corner of the building formerly located at 330 East Grand Avenue) at levels which do not exceed the limits for toxicity under the Toxicity Characteristic Leaching Procedure ("TCLP") under 40 C.F.R. 261.24 and 35 Ill. Admin. Code 721.124. In that letter, TRS requested that IEPA confirm that there is no requirement under Illinois laws or regulations which would prevent TRS from leaving at the GMO Site any such soils or fill materials containing pesticides after those soils or fill materials are

radiologically cleared through the excavation and screening process described in that letter.

Our discussions with IEPA and USEPA concerning the matters in that letter have focused on two separate aspects of this matter, as follows:

1. First, there have been discussions as to whether the process of excavation and radiological screening of those soils containing non-TCLP pesticides, and the leaving of those soils at the GMO Site after radiological clearance of the same, would constitute a regulated waste management activity under Illinois laws and regulations. TRS has indicated that, even if the materials constituted special waste under Illinois law (a conclusion which TRS does not believe to be required based on these facts), it could implement procedures for the excavation work to assure that any questions raised by IEPA about whether these proposed actions constituted regulated waste management activities would be satisfactorily addressed.

2. Second, there have been discussions as to whether the levels of total pesticides in the non-radiological soils proposed to be left at the GMO Site are consistent with the residential redevelopment and use of this property which are proposed after TRS sells the GMO Site to its purchaser. IEPA has indicated that, if TRS leaves the non-radiological soils and fill materials containing pesticides in the ground as proposed in the December 21, 2001 letter, IEPA's letter of response to the December 21, 2001 letter would include significant qualifications and limitations to the effect that the levels of pesticides proposed to be left at the GMO Site may not be consistent with the proposed residential use, that precautions should be taken to protect construction workers or excavation workers from unacceptable exposures to pesticides and that any party subsequently excavating or disposing of those materials would be required to adhere to Illinois laws and regulations relating to such materials. IEPA has expressed particular interest in establishing mechanisms to assure that subsequent owners of the GMO Site are aware of these conditions and requirements.

We have indicated in our discussions with IEPA that TRS believes it can address satisfactorily any of the questions relating to the matters described in paragraph 1 above. However, with respect to the matters in paragraph 2 above, TRS believes that any restrictions or qualifications required by IEPA relating to the proposed residential use of the GMO Site are inconsistent with the proposed residential use of the GMO Site by

TRS' purchaser and that TRS cannot proceed with its proposal if such limitations or restrictions are required as a result of that proposal. Accordingly, TRS proposes to modify the way in which the non-radiological soils or fill materials containing pesticides will be addressed during the excavation work for the removal action. In short, TRS proposes to remove from the GMO Site the non-radiological soils or fill materials containing pesticides and to have those soils or fill materials disposed of at a disposal facility with the required licenses and permits to accept such materials. We are enclosing herewith a copy of a letter dated January 18, 2002 from STS Consultants, Ltd. ("STS"), TRS' environmental consultant, which describes the excavation of these materials and the confirmation sampling which will be performed to verify the removal of such materials. Any pesticide-impacted soils which are also radiologically impacted in excess of USEPA's radiological cleanup standard will be transported and disposed by Kerr-McGee Chemical, LLC at the low level radioactive waste disposal facility in Clive, Utah operated by Envirocare of Utah, Inc. Any pesticide-impacted soils which are not radiologically impacted above USEPA's radiological cleanup standard will be transported to and disposed of at a landfill which has appropriate licenses or permits to accept such material. It is intended that this modification to TRS' proposal for handling the non-radiological materials containing pesticides will render moot the issues described above in paragraph 2.

Please note that the enclosed letter from STS indicates that the pesticide cleanup objectives for purposes of this work will be the Tier 1 residential values for ingestion and inhalation under the Tiered Approach to Corrective Action Objectives ("TACO") regulations at 35 Ill. Admin. Code Part 742, Appendix B, Table A. The soil component of the groundwater ingestion pathway values will not be utilized in view of the City of Chicago groundwater ordinance. Based on these cleanup objectives, STS has estimated that approximately 1,500 cubic yards of pesticide-impacted soils will be removed from the GMO Site, some of which are radiologically impacted and will disposed of by Kerr-McGee Chemical, LLC at the Envirocare facility in Utah. However, if the use of TACO Tier 1 residential standards for ingestion and inhalation causes the volume of pesticide-impacted materials to be removed to be significantly greater than 1,500 cubic yards and if the greater volumes are attributable to soils which are not radiologically impacted in excess of USEPA's radiological cleanup standard, TRS may submit to USEPA and IEPA a proposal for less stringent cleanup objectives for pesticides. TRS would not proceed to utilize any such modified cleanup objective for pesticides without approval of the modified objective by USEPA and IEPA.

We appreciate the opportunity to work with IEPA in this matter. It is the intention that the modification to TRS' proposal for addressing the non-radiological soils and fill materials impacted by pesticides as described in this letter will respond

satisfactorily to all of the questions raised by IEPA in the discussions concerning the letter dated December 21, 2001. We anticipate that USEPA will need to receive confirmation from IEPA that it concurs with this modified proposal so that the cleanup work at the GMO Site can proceed. We would appreciate your assistance in having IEPA provide that confirmation at your earliest convenience. Thank you for your cooperation and assistance in this matter.

Very truly yours,

Timothy Ramsey

JTR/tr
Enclosure
cc: Mary L. Fulghum, Esq. (w/encl.-by telecopy)
Gaylene Vasaturo, Esq. (w/enc.-by telecopy)
Mr. Terry A. McKay (w/encl.-by telecopy)
Mr. Thomas J. Pabian (w/encl.-by telecopy)
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Mr. Richard Berggreen (w/encl.-by telecopy)
Ms. Julie Apolinario (w/encl.-by telecopy)

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February 6, 2002

Mr. Timothy Ramsey
Piper Marbury Rudnick & Wolfe
203 N. LaSalle, Suite 1500
Chicago, Illinois 60601

RE: Perimeter Drilling Results, 341 East Ohio Street, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 041

Dear Mr. Ramsey:

In accordance with our work scope and proposal dated July 17, 2001 and approved by the U.S. Environmental Protection Agency (USEPA) August 17, 2001, STS Consultants, Ltd. (STS) completed a drilling program to explore the soil around the perimeter of the 341 East Ohio Street site (the Site), with the objective of identifying locations with radiologically impacted soils or adequately demonstrating the absence of such soils. The original estimate for the total number of borings was approximately 380 borings to cover the site. Figure 2 shows 369 borings to cover the site, based on a projected layout of borings in the field. The actual number of borings drilled was 340 borings, as presented in the boring logs attached in Attachment A.

The USEPA required a survey verifying that the material remaining on the site is not impacted by radiological materials as a condition of its issuance of a completion letter confirming that all radiological contamination at the site has been removed. In order to satisfy that requirement, the boring plan was proposed and approved as sufficient if that material was to remain unexcavated at a 1V:1.5H slope as an alternative to excavation at a vertical slope and installation of an earth retention system.

SURVEY DETAILS

The drilling program consisted of drilling boreholes on a 2-meter grid along the north, east and south margins of the subject site (see Figures 1 and 2). The 2-meter square grid was accepted by USEPA in that this spacing would be able to detect a hot spot of 6.3 m^2 (68 ft^2) with better than a 99% probability, assuming that the target hot spot would have the shape of an elongate ellipse (twice has long as it is wide). This probability estimate was calculated utilizing USEPA's ELIPGRID-PC (version October 20, 1995) and assumed that the gamma probe has an effective zone of detection at least one foot radius from the center of the boring. The ELIPGRID calculation package is included as Attachment A.

The borings were drilled using 4-inch diameter solid flight augers. Following completion of the boring, a section of 3-inch PVC pipe was temporarily inserted into the borehole to allow for the completion of the down-hole gamma logging. The PVC pipe prevented the borehole from collapsing and protected the logging equipment from being damaged during the survey.

Along the north and south perimeters of the site, where the proposed excavation depth is 8 feet, two rows of boreholes were drilled to a depth of at least nine feet (minimum one foot into native sand) unless obstructed, providing a sampling width of 12 feet. Boring A.4 – 2.8 and A.4 – 3.4,

which read "No hole – exterior hole contaminated" are labeled such due to the fact that the row of downholes located at the exterior of the property (row A.1) had a contaminated hole, located at A.1 – 3.1. Since this hole was contaminated, excavation will need to continue to the edge of the property line. These holes were not recorded since they will need to be monitoring during the excavation through that location in order to excavate the material at boring A.1 – 3.1.

Along the eastern perimeter, where the excavation depth is proposed to be 15 feet, five rows of boring were drilled to a depth of 16 feet or one foot into native sand whichever was shallower, providing a sampling width of 24 feet. The boreholes extended to a depth beyond the proposed excavation depth (i.e., minimum 1 foot into native soils). The exterior (closest to the property boundary) line of borings was conducted first. Once this exterior line of borings was shown to be free of radiologically impacted soils the interior drilling was conducted.

Obstructions from rebar and/or buried concrete foundations were encountered at 26 holes, generally at depths of 9 to 14 feet. In addition, no boring was drilled in the area of the subsurface utility vault. Obstructions occurred at the following locations:

Table 1

Obstructed Borings			
Boring Number	Obstruction Depth	Boring Number	Obstruction Depth
A.1 – 13.6	No boring – Utility Vault	I.3 – 25.8	11'
A.4 – 10.5	4.25'	K.1 – 25.9	8.4'
B.7 – 26.2	11'	L.3 – 25.9	9.9'
C.4 – 27	11.5'	L.9 – 18.9	10.9'
C.5 – 26.5	10'	L.9 – 20	11.10'
D.4 – 26.5	10.5'	L.9 – 21.7	8.3'
D.5 – 27	11'	L.9 – 22.3	10'
D.7 – 26.2	8.5'	L.9 – 22.8	11'
E.7 – 26.2	6.5'	L.9 – 27	11.5'
E.7 – 26.5	11.5'	N – 20	Surface Obstructed
E.7 – 27	11'	N – 21.8	16' 3"
F.7 – 26.5	14'	N – 24.7	Surface Obstructed
H.3 – 25.8	6.10'	N – 25	13.5'
H.9 – 25.8	8'	N – 25.6	12.8'

Boreholes were gamma logged to the depth of the obstruction. Additional borings were attempted adjacent to any obstructions in an attempt to advance the boring to native soils. The borings noted above could not be completed to native soil after several offset attempts. All other borings were completed on either the initial attempt or in an offset boring. Figure 3 shows the labeled 5-meter site grid, the location of the borings with elevated gamma readings, and the obstructed borings.

The borings were down-hole logged for 30-second gamma readings in 6-inch increments. Gamma readings in counts per 30-second intervals were compared to a calibrated value for material exceeding the clean-up criteria (≥ 7.2 picocuries per gram (pCi/g)). The 30-second counts equivalent to 7.2 pCi/g are shown on Table 2, below. Logging was conducted using a

Ludlum 2221 rater-scaler and 2 x 2 NaI detector. The results of the down-hole logging are discussed below in the Survey Results section and presented in Attachment B.

Soil cuttings from the boreholes were segregated for disposal based upon a gamma radiation survey. Cuttings were surveyed at the ground surface using a Ludlum 2221 detector and a 2 x 2 NaI probe. Radiologically-impacted soils were containerized (placed in Supersacks) and stored in a secure locked storage container on site for subsequent transport and disposal. Soils exhibiting gamma radiation at or below cleanup levels (7.1 pCi/g) were used to backfill the borings. Excess cuttings exhibiting gamma radiation at or below cleanup levels were collected and placed in a roll-off dumpster onsite for later utilization and/or disposal.

SURVEY RESULTS

Gamma readings have been obtained from all of the 340 perimeter borings. Attachment B presents the field logs and gamma measurements for each boring. Boring designations are based on the five meter site grid which ranges from A to N from south to north, and 1 to 27 from west to east. Borings are recorded with both a letter and a number, with gradations between the five-meter spaces on the grid recorded as tenths, for example A.2 – 3.8 is two tenths of the distance between grid lines A and B, and eight tenths of the way between grid lines 3 and 4.

Data analyzed from the 191 deep (16 feet) perimeter borings on the east side of the site indicated no locations with elevated gamma readings. This set of readings is consistent with the site history with the building at the east end of the site being constructed before the Lindsay Light operation began on the adjacent parcel, and being razed in the 1980s, well after the Lindsay Light operation had discontinued on the adjacent parcel.

Six of the shallow (9 feet) perimeter borings on the north and south sides of the western portion of the site indicated elevated gamma readings as follows:

Table 2
Borings Exceeding Cleanup Criteria

Boring	Depth (ft)	Counts/30 Seconds	Cutoff Value (=7.2 pCi/gm)
North			
M.9-8.5	2.5	24,899	18.804
	3.0	25,581	18,804
N.1-10	1.5	68,291	18,059
	2.0	26,772	18,059
South			
A.4-3.9	1.5	23,288	18,059
A.4-5.1	1.0	33,267	18,804
A.4-4.4	1.0	28,333	18,804
	1.5	22,240	18,804
A.1-3.1	1.5	62,645	18,804
	2.0	49,889	18,804
	2.5	19,754	18,804

The shallow depth of the radiologically-impacted soils indicates that there is no need for an earth retention system.

The obstructed borings on the east end of the site are located along the apparent basement wall footings for the building formerly on the east end of the site. The obstructed locations are generally clustered in two areas, along a line 25.8 and 25.9 from H to L along the east side of site, and from B to F and 26.2 to 27 near the southeast corner of the site.

Two obstructions were noted along the south margin of the site, one obstruction was caused by the presence of the utility vault and the other obstruction appears to be from the basement wall footings for the former 330 E. Grand building.

The obstructed borings on the east end of the site are also located along the basement wall footings for the same former building as encountered for the obstructed borings along the east end of the site. The obstructed locations are generally clustered in three areas, at L to N and 19 to 20 and at L to N and 22 to 23 along the north site margin, and in N from 24.5 to 25.5 near the northeast corner of the site.

Inasmuch as the former building at the east end of the site was built before Lindsay Light began operations on the adjacent site, and was not razed until long after Lindsay Light ceased operations, there is virtually no potential for material to be beneath these footings. These footings include all the obstructions encountered along the east side that there is no real possibility for impacts beneath the basement footings, it is the opinion of the investigators that no additional exploration is warranted based on the absence of any detection in the survey of the east end of the site.

CONCLUSIONS

The perimeter drilling program was designed to satisfy USEPA's requirement for verification that material along the perimeter slopes is not impacted by radiological materials. The drilling program has been completed according to the parameters outlined in our proposal, and has identified those locations within the perimeter with radiologically-impacted soils.

On the basis of the survey results, excavation will be required of those shallow soils where radiation levels exceeded the cleanup criteria on the north and south sides of the site. Additional screening of those excavated areas will be conducted to verify removal of all impacted soils. No additional excavation will be required in the deeper areas, as those areas have been cleared through the borings.

Areas radiologically cleared through the borings will not need to be excavated for further screening except that gamma surveys will be done on the slope surface during the excavation process. Any additional radiological materials identified in such slope surveys within the boundaries of the site will be excavated.

In areas where the gamma survey of the excavation slope identifies no exceedances of the cleanup criteria, no additional radiological clearance will be required for those areas to obtain the completion letter from USEPA.

As the locations with indications of impacted soil along the north and south sides of the site show only shallow impacts and none of the deeper borings along the eastern perimeter exhibited elevated gamma readings, an earth retention system will not be required as part of the site excavation. USEPA concurrence with the findings of this report should be requested.

Respectfully,

STS CONSULTANTS, LTD.

Julie Apolinario
Senior Project Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

Attachments

Attachment A

ELIPGRID Calculation Package

Attachment B

Down-Hole Logging

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February 8, 2002

BY MESSENGER

Mary L. Fulghum, Esq.
Associate Regional Counsel, Region 5
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: **GMO Site, 341 East Ohio Street, Chicago, Illinois**

Dear Mary:

Enclosed are three copies of the letter report dated February 6, 2002 prepared by STS Consultants, Ltd. ("STS") and entitled "Perimeter Drilling Results, 341 East Ohio Street, Chicago, Illinois – STS Project No. 1-25585-XG, Correspondence No. 041" relating to the GMO Site. This letter report sets forth the results of STS' radiological investigation of perimeter areas at the GMO Site through subsurface soil borings. STS has identified six boring locations with shallow soils in excess of the radiological cleanup standard of 7.1 pCI/g total radium. The shallow soils in these locations will be excavated as part of the removal action. Based on the results in the enclosed letter report, we would appreciate receiving confirmation from the U.S. Environmental Protection Agency that no additional radiological investigation of the other perimeter areas is needed to obtain radiological clearance of such areas other than the gamma survey of the excavation slope which is provided for in the Removal Action Work Plan dated May 1, 2001, as amended.

Very truly yours,

Timothy Ramsey

JTR:tr
Enclosure
cc: Mr. Terry A. McKay (w/out enc.)
Mr. Thomas J. Pabian (w/enc.)
Steven L. Loren, Esq. (w/out enc.)
Mr. Richard Berggreen (w/out enc.)

CHGO1 30101935 v1 2/8/02
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STS CONSULTANTS

STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061-3153

voice 847-279-2500
fax 847-279-2510
web www.stsconsultants.com

March 8, 2002

Mr. Fred Micke
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Fire Insurance Map of 341 East Ohio Street Site – STS Project No. 1-25585-XG, Correspondence No. 058

Dear Mr. Micke:

Enclosed please find a historical fire insurance map of the former Velsicol Building at the east end of the 341 East Ohio Street Site. This map is of interest with particular regard to the date of construction relative to operations at the Lindsay Light II site on the southern adjacent property.

We note that the building was completed in 1917. Lindsay Light operated on the adjacent parcel from 1915 to 1936. This suggests there was little opportunity for material to be present beneath the building foundation. This concern for material beneath the foundation is an issue due to the presence of obstructions at several locations along the footing lines of this former building which constrained our completion of downhole gamma logging at these locations. The previously submitted perimeter drilling report shows the locations of those obstructed borings.

As stated in the report, it is our opinion that the absence of any indications of elevated radiation in the east end of the site and the age of the building on this site indicate the absence of impacts and support the sufficiency of the perimeter boring program.

We are providing the enclosed map for your use in reviewing the perimeter drilling report.

Please contact us with any questions you may have with regard to this report.

Regards,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

PIPER MARBURY RUDNICK & WOLFE

203 North LaSalle Street, Suite 1800
Chicago, Illinois 60601-1293
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PHONE (312) 368-4000
FAX (312) 236-7516

TIMOTHY RAMSEY

timothy.ramsey@piperrudnick.com
PHONE (312) 368-4066
FAX (312) 630-7350

March 15, 2002

BY MESSENGER

Mary L. Fulghum, Esq.
Associate Regional Counsel, Region 5
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: **GMO Site, 341 East Ohio Street, Chicago, Illinois**

Dear Mary:

Enclosed are three bound copies of the Amended Removal Action Work Plan dated March 13, 2002 prepared by STS Consultants, Ltd. ("STS") with respect to the GMO Site which consists of the following:

Attachment 1 – Revised text of the Amended Removal Actin Work Plan;

Attachment 2 - Revised Organizational Chart (Figure 2-1);

Attachment 3 – Revised Construction Schedule (Figure 3-2);

Attachment 4 – Health and Safety Plan, Revision 2 dated February 14, 2002; and

Attachment 5 – SOP-500, Immunoassay Pesticide Field Test Method.

In addition, we are enclosing three copies of the revised text of the Amended Removal Action Work Plan which has been blacklined to show all of the changes from the initial version of the Removal Action Work Plan dated May 1, 2001 which we submitted with our letter dated May 4, 2001. Please note that some of the changes marked on this blacklined copy are not new but were contained in the revised text which STS submitted with its letter dated July 26, 2001.

The enclosed bound copies include only the portions of the Removal Action Work Plan which have been changed from the forms previously submitted to the U.S.

Environmental Protection Agency ("USEPA"). As such, the five Attachments listed above in the enclosed bound volumes replace earlier versions of those same documents previously submitted. All other portions of the Removal Action Work Plan previously submitted are unchanged from the latest versions in the previous submissions, which previous submissions consist of the following:

1. Removal Action Work Plan dated May 1, 2001, including all appendices and attachments, which I submitted to USEPA with my letter dated May 4, 2001;

2. STS letter dated July 18, 2001 to USEPA re: Enviornmental Gamma Radiation Survey, 341 East Ohio Street, Chicago, Illinois – STS Project No. 1-25585-XG (relating to radiological clearance of the perimeter areas of the GMO Site through soil borings);

3. Letter dated July 26, 2001 from STS to USEPA re: Response to Comments regarding 341 East Ohio Street Workplan, - STS Project No. 1-25585-XG, together with revised sections to replace portions of the May 1, 2001 version;

4. Quality Assurance Project Plan dated September 21, 2001 (consisting of three bound volumes);

5. Letter dated January 14, 2002 from STS to USEPA re: Response to Comments regarding 341 East Ohio Street Site Quality Assurance Project Plan - STS Project No. 1-25585-XG, Correspondence No. 043 (note that the attachment to this letter was replaced by the attachment to STS' letter dated January 18, 2002 listed in paragraph 6 below);

6. Letter dated January 18, 2002 from STS to USEPA re: Response to Comments regarding 341 East Ohio Street Site Quality Assurance Project Plan Quality Assurance Project Plan, - STS Project No. 1-25585-XG, Correspondence No. 046, and including the attachment with that letter consisting of the Quality Assurance Project Plan, Revision 2, dated January 11, 2002 prepared by STS;

7. Letter dated February 6, 2002 from STS re: Perimeter Drilling Results, 341 East Ohio Street, Chicago, Illinois – STS Project No. 1-25585-XG, Correspondence No. 041, which I sent to you with my letter dated February 8, 2002; and

8. Pesticide Investigation Report dated February 25, 2002 prepared by STS which I submitted to you with my letter dated February 27, 2002.

Our client Teachers' Retirement System of the State of Illinois ("TRS") requests that USEPA approve the Amended Removal Action Work Plan and confirm its consistency with the Unilateral Administrative Order which USEPA has previously issued and pursuant to which this removal action is being performed.

Finally, please note that TRS will send you the response of the Illinois Environmental Protection Agency ("IEPA") to our two letters dated December 21, 2001 and January 29, 2002 relating to pesticides when we receive that response from IEPA.

Thank you for your cooperation and assistance in this matter.

Very truly yours,

Timothy Ramsey

JTR:tr
Enclosure
cc: Mr. Terry A. McKay (w/out enc.)
Mr. Thomas J. Pabian (w/enc.—by messenger)
Steven L. Loren, Esq. (w/out enc.)
Mr. Richard Berggreen (w/out enc.)

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TIMOTHY RAMSEY

timothy.ramsey@piperrudnick.com
PHONE (312) 368-4066
FAX (312) 630-7350

March 18, 2002

BY FACSIMILE

Mary L. Fulghum, Esq.
Associate Regional Counsel, Region 5
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: **GMO Site, 341 East Ohio Street, Chicago, Illinois**

Dear Mary:

Enclosed is a copy of a letter dated March 15, 2002 from Renee Cipriano, Director of the Illinois Environmental Protection Agency ("IEPA"), directed to James S. Montana, Jr. of our firm, in response to our two letters dated December 21, 2001 and January 29, 2002 relating to pesticides at the GMO Site. It appears that IEPA's response to the proposal for addressing pesticide-impacted soils at the GMO Site is completely favorable.

Very truly yours,

Tim Ramsey

Timothy Ramsey

JTR:mmz
Enclosure
cc: Mr. Terry A. McKay (w/enc.) (by telecopy)
Mr. Thomas J. Pabian (w/enc.) (by telecopy)
Steven L. Loren, Esq. (w/enc.)
Mr. Richard Berggreen (w/enc.) (by telecopy)
Mr. John Esser (w/enc.) (by telecopy)

CHGO1:30118500.v1 3/18/02
20051/26260717-17006

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276

RENEE CIPRIANO, DIRECTOR

(217)782-3397
(TDD: 217-782-9143)

March 15, 2002

Mr. James S. Montana, Jr.
Piper, Marbury, Rudnick & Wolfe
203 North LaSalle Street, Suite 1800
Chicago, Illinois 60601-1293

Re: GMO Site, 341 East Ohio Street, Chicago, Illinois

Dear Mr. Montana:

This is in response to your December 21, 2001 letter and a January 29, 2002 supplemental letter from Mr. Timothy Ramsey of your firm regarding remedial activities being carried out at the former GMO site located at 341 East Ohio Street in Chicago, Illinois (Illinois EPA ID No. 0316080002). Additional information has been provided to my staff during several telephone conferences. According to the information provided, the Teacher's Retirement System (TRS) of the State of Illinois has acquired this site by deeds in lieu of foreclosure. In addition, USEPA, Region 5 has issued a Unilateral Administrative Order requiring that the radiological contamination present at this facility be remediated. Finally, although TRS is not a respondent to the order, it is working with USEPA to carry out the removal action required by the order. In making final preparation for the commencement of the required removal action, TRS discovered that pesticide contaminated soil is present in certain portions of the site.

Your December 21, 2001 letter requested that Illinois EPA provide confirmation that there is no requirement under Illinois law or regulations that would prevent TRS from moving the pesticide contaminated soil around at the site and then leaving the contaminated soil at the site. Mr. Ramsey's letter made certain changes to this request by stating that TRS planned to remove the contaminated pesticide soil from the facility as part of the overall removal action. Based upon the proposed revisions described in his letter, Mr. Ramsey requests that Illinois EPA: (1) confirm that there is no requirement under Illinois law or regulations preventing TRS from moving forward in this modified proposal; and, (2) actually concur with the modified proposal.

The modified proposal for removing pesticide contaminated soil includes: (1) removal of pesticide contaminated soil to the Tier 1 residential levels set forth in 35 Ill. Adm. Code 742 for the soil ingestion and inhalation pathways; (2) collection/analysis of soil samples

to verify that no pesticide contaminated soil remains in the areas where removal took place; and (3) development of a final report to document the results of the overall effort.

Before responding directly to the requests you and Mr. Ramsey have presented, I would like to thank you, Mr. Ramsey and Mr. Richard Berggreen (STS Consultants) for responding to the Illinois EPA concerns about the pesticide contamination. The removal by TRS of the pesticide contamination and with the radiological contamination not only reduces our regulatory concerns, but also provides added protection to human health and the environment.

The Illinois EPA concurs with the proposal to remove pesticide-contaminated soil from the subject facility. Further, we believe that the removal activity as presented in the modified proposal will not violate any state laws or regulations, and should not require any waste management permit (RCRA or state solid waste). Additionally, it appears that TRS will meet residential cleanup objectives for the identified pesticides. However, the Illinois EPA cannot draw broader conclusions about other possible issues not reviewed, so this letter should not be construed as any official Illinois EPA approval of the property for a particular end use,

Please contact me if you have any further questions. You may also contact Bill Ingersoll in the Division of Legal Counsel at (217)782-9827.

Sincerely,

Renee Cipriano
Director

cc: Mary Fulghum, U.S. EPA, Region 5
Gaylene Vasaturo, U.S. EPA, Region 5
Timothy Ramsey

FILE COPY

STS Consultants, Ltd.
Solutions through Science & Engineering

April 1, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard, SE-5J
Chicago, Illinois 60604

RE: Request for Approval of Field Laboratory Procedure, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 069

Dear Mr. Micke and Ms. Simon:

In accordance with the Remedial Action Work Plan previously approved by USEPA, we propose to use a field laboratory for analysis of radiochemistry for samples from the 341 East Ohio Street Site. The field laboratory, which will use NUTRANL software in the data analysis, has been set up in the adjacent Time-Life Building, has been calibrated, and a series of check samples have been run. The samples were subsequently run by Radiation Safety Services, Inc. (RSSI) of Morton Grove, Illinois and at Argonne National Laboratory, using high resolution gamma spec analysis.

The results of these three separate analysis of the same six samples are attached. While there is some difference in the results from each laboratory, we find the data to be in sufficiently close agreement to meet the quality assurance/quality control specifications for this project. We are with this letter requesting your concurrence and approval of the field laboratory using NUTRANL for use on the 341 East Ohio Street Site.

Please contact the undersigned at 847-279-2500 with any questions concerning this information.

Sincerely,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Marbury Rudnick & Wolfe
Harold Holmberg, Kerr-McGee
Mark Krippel, Kerr-McGee
Bernie Bono, Kerr-McGee
Thomas Pabian, Capri Capital
Terry McKay, Capri Capital

K:\Projects\125585XG\C185G078.doc

750 Corporate Woods Parkway • Vernon Hills, IL 60061-3153 • (847) 279-2500 • (847) 279-2510 Fax

GMO Nutranl QC Samples

	Argonne Nat Lab			*RSSI*			*SAHCI*		
Sample	Ra-226	Ra-228	Total	Ra-226	Ra-228	Total	Ra-226	Ra-228	Total
14	17.7	11.2	28.9	27.38	12.63	40.01	28.15	17.66	45.81
15	290	93	383	314.73	76.52	391.25	280.6	97.29	377.89
16	16.6	10.5	27.1	39.48	14.12	53.6	32.2	17.95	50.15
17	2.19	1.35	3.54	4.19	2.4	6.59	4.36	3.34	7.7
18	1.1	1.31	2.41	1.5	1.07	2.57	0.87	2.01	2.88
19	2.15	1.18	3.33	1.9	1.39	3.29	2.9	0.91	3.81

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

COPY

REPORT OF ANALYTICAL RESULTS

Sample Material: Soil, GMO, Columbus, OH; U.S. EPA
Submitted by: Larry Jensen, U.S. EPA
Rich Berggreen, STS Consultants, Ltd.

Date Received: 11/06/01
Date Reported: 01/21/02

Submitter's Sample No.	ACL Sample No.	Gamma-emitting Radionuclides			
		Reporting Unit: pCi/g at T-0			
		Ra-228		Ra-228	
		pCi/g	±1σ	pCi/g	±1σ
C-14	02-8020-01	1.77E+01	1.50E+00	1.12E+01	1.79E+00
C-15	02-8020-02	2.90E+02	4E+00	9.30E+01	7.9E+00
C-16	02-8020-03	1.68E+01	1.0E+00	1.05E+01	1.1E+00
C-17	02-8020-04	2.19E+00	1.9E-01	1.35E+00	5.0E-01
C-18	02-8020-05	1.10E+00	2.1E-01	1.31E+00	6.1E-01
C-19	02-8020-06	2.15E+00	1.1E-01	1.18E+00	3.2E-01

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. about the results reported here, please call:
Elane Streets at 2- 4460.

Reference(s): CMT Logbook No. 1638, Det. 3, pg. 45;CMT Logbook # 1779, Det. 2, 4, 7, 11, pg. 61-63

Copies To: Larry Jensen, U.S. EPA
Rich Berggreen, STS Consultants, Ltd.
A. Boparai
F. Martino
D. Bowers
ACL File

Analyst(s): E. Streets

1/21/02

1-22-02

RSSI NUTRANL ANALYSIS RESULTS

Sample	Nutranl Sample ID	Location	Collected	Analyzed	Weight (g)	U-238	TH-232	RA-226	K-40
15	STS B1034	P.5-21.5	1/1701	1/24/01	37.6	34.1	76.52	314.73	68.28
	STS B1035	Q.5-21.5	1/1701	1/24/01	16.4	-	1960.79	230.09	601.03
16	STS B1036	Q-21.5	1/1701	1/24/01	39.3	20.96	14.12	[redacted]	0.97
	STS B1037	R-23	1/22/01	1/24/01	25.8	-	14853.8	-	24700.43
14	STS B1038	R-22	1/19/01	1/24/01	35.3	12.48	[redacted]	27.38	5.09
19	STS B1039	O-21 PRE-EPA#1	1/23/01	1/24/01	36.8	3.53	1.39	1.9	11.68
18	STS B1040	O-21 PRE-EPA#2	1/23/01	1/24/01	26.7	5.32	[redacted]	[redacted]	25.64
	STS B1041	O-21 PRE-EPA#3	1/23/01	1/24/01	28.6	2.43	1.03	1.33	11.73
17	STS B1042	O-21 PRE-EPA#4	1/23/01	1/24/01	39.7	4.37	2.4	4.19	21.7
	STS B1043	O-21 PRE-EPA#5	1/23/01	1/24/01	38.5	5.68	1.14	2.43	16.46

"-" Negative value

h:\home\400001\sts-grand\data\b-log3.xls

Date: 11/ 7/01

Nutranl Gamma Spec Report

Page: 1

Samp #	Sample Date	Description	Count Date	Weight	U-238	+/-	Th-232	+/-	Ra-226	+/-
14	10/ 2/01	STS B1038		35.00	3.53	7.04	17.66	2.04	28.15	2.72
15	10/ 2/01	STS B1034		37.60	-55.29	29.74	97.29	8.64	280.60	12.17
16	10/ 2/01	STS B1036		39.30	4.39	6.22	17.95	1.79	32.20	2.39
17	10/ 2/01	STS B1042		39.70	-1.98	2.81	3.34	0.84	4.36	1.11
18	10/ 2/01	STS B1040		26.70	-0.19	2.08	2.01	0.60	0.87	0.79
19	10/ 2/01	STS B1039		36.80	-0.39	2.12	0.91	0.63	2.90	0.85
20	10/ 2/01	Bkg100201		7.20	-2.44	1.45	-0.02	0.44	0.90	0.61

[redacted]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

SE-5J

May 15, 2002

VIA FACSIMILE AND U.S. MAIL

Mr. Richard G. Berggreen, C.P.G.
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061-3153

RE: **341 East Ohio Street Workplan**
Lindsay Light II Site/RV3 North McClurg Court

Dear Mr. Berggreen:

The U.S. Environmental Protection Agency (USEPA) has reviewed the Workplan for 341 East Ohio Street dated March 13, 2002. USEPA hereby approves this Workplan which TRS submitted in response to the March 1, 2001 Action Memorandum regarding the radioactive contamination at this property and notes that the approved Workplan is consistent with the Administrative Order issued June 6, 1996 Lindsay Light II/316 E. Illinois, Chicago, Illinois, Unilateral Administrative Order, Docket No. V-W-96-C-353, as amended March 29, 2000 by Lindsay Light II, RV# North Columbus Drive Administrative Order. Note that the USEPA Action Memorandum dated March 1, 2001 that was issued with respect to the GMO/341 E. Ohio site designated the action as a time-critical removal for which no Environmental Engineering Cost Analysis (EECA) is required.

Work at the 341 East Ohio Street site can begin immediately. However, USEPA requests that the work schedule for this project be given to USEPA, as soon as possible, so that we can assure proper coverage for this project.

If you have questions regarding this letter, please contact me, as soon as possible, at (312) 886-5123 or contact Verneta Simon, On Scene Coordinator, at (312) 886-3601, or Larry Jensen, Senior Health Physicist at (312) 886-5026.

Sincerely,

Fredrick A. Micke

Fredrick A. Micke, P.E.
On-Scene Coordinator
ERB Section #3

cc: Mark Krippel, Kerr-McGee

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

May 31, 2002 SE-5J

Mr. Richard G. Berggreen, C.P.G.
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061-3153

RE: Lindsay Light II Site--North McClurg Court

Dear Mr. Berggreen:

The U.S. Environmental Protection Agency (USEPA) has reviewed the radiation survey perimeter drilling results report for the North McClurg (341 East Ohio Street) Site dated February 6, 2002.

The report indicates that no further characterization of the perimeter area is required except for the excavation of shallow soils where elevated radiation levels were found. These areas are located at the north and south sides of the Site. USEPA agrees with the report's conclusions and does not foresee additional excavation work in the perimeter area unless additional "hot spots" are found during routine gamma screening surveys of the sloped areas which will be performed during site excavation activities.

If you have questions regarding this letter, please contact me, as soon as possible, at (312) 886-5123 or contact Verneta Simon, On-Scene Coordinator, at (312) 886-360, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Fredrick A. Micke

Fredrick A. Micke, P.E.
On-Scene Coordinator
ERB Section #3

cc: Mark Krippel, Kerr-McGee
T. Ramsey, PMRW

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 1

To Rich Berggreen	From Fred Micke
Dept./Agency STS	Phone # 312-886-5123
Fax # 847-279-2510	Fax # 353-9176

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
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CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

June 4, 2002 SE-5J

Mr. Richard G. Berggreen, C.P.G.
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061-3153

RE: Lindsay Light II Site--North McClurg Court

Dear Mr. Berggreen:

The U.S. Environmental Protection Agency (USEPA) has conditional approved the Quality Assurance Project Plan (QAPP) for the PRP-Lead Removal activities at 341 East Ohio Street Site/Lindsay Light II, Chicago, Illinois. The following two items, must be addressed before final approval can be granted:

(1) On the Title/Approval Page Signature lines for all the contract Laboratory Directors performing analyses for this project must be included. Include Signature lines for all the Laboratory Directors: **STL St. Louis**, **Grace Laboratories** of Chicago, **RSSI** of Morton Grove, and **Argonne National Laboratory**. Delete Luba Finkelberg from the Title/Approval page.

(2) The item concerning Quality Objectives and Criteria for Measurement Data may have been properly addressed. Element A7.B references Section 8.3.1 and tables 8.4-5, 8.4-6 and 8.4-7 of the laboratory QAMP, but this document was not included in Appendix D. Appendix D is not listed in the QAPP Table of Contents (TOC). The Criteria was probably included in Attachment 11 Tables of Data Quality Objectives for Laboratory Analyses. Attachment 11 is listed in the TOC, but was not included with the QAPP.

Additionally, the Project Schedule (Figure 3-2) referenced in Element A6.B. should be included and listed in the TOC. The typo and reference in first sentence of paragraph 2 of Element B3.B. should be amended.

The attached Title/Approval page has been signed by the QAPP reviewer and myself.

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If you have questions regarding this letter, please contact me, as soon as possible, at (312) 886-5123 or contact Verneta Simon, On-Scene Coordinator, at (312) 886-360, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Fredrick A. Micke

Fredrick A. Micke, P.E.
On-Scene Coordinator
ERB Section #3

QUALITY ASSURANCE PROJECT PLAN

341 EAST OHIO STREET SITE

NOVEMBER 27, 2001

PREPARED BY:_____ DATE:_____
JULIE APOLINARIO
PROJECT MANAGER

APPROVED BY:_____ DATE:_____
RICHARD G. BERGGREEN, C.P.G.
PROJECT COORDINATOR

APPROVED BY: _____ DATE:_____
GLEN HUBER
DIRECTOR, ON-SITE LABORATORY

APPROVED BY: Fredrick A. Micke DATE: 5/30/02
FREDERICK MICKE
U.S. EPA ON-SCENE COORDINATOR

APPROVED BY: Richard L Byvik DATE: 6/3/02
~~LUBA FINKELBERG~~
U.S. EPA QAPP REVIEWER
RICHARD L BYVIK
(Conditional Approval)

Item 25

Quality Assurance Project Plan, Revision 3, dated June 13, 2002, as submitted to USEPA by STS with its letter dated July 12, 2002, and as supplemented by STS' letter dated July 16, 2002 submitting a corrected Appendix C thereto.

Included in Item 1.

STS CONSULTANTS

STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061-3153

voice 847-279-2500
fax 847-279-2510
web www.stsconsultants.com

June 25, 2002

Ms. Verneta Simon
Mr. Fred Micke
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Request for Removal Action Work Plan Change, 341 East Ohio Street Site, Chicago, Illinois – STS Project No. 1-25585-XI, Correspondence No. 090, Task 5000

Dear Ms. Simon and Mr. Micke:

The Removal Action Work Plan for the above-referenced site involves two phases of work. The first phase consists of removing the pavement and excavating all radiologically-impacted soil that is evident at that time. Phase 1, as proposed in the Removal Action Work Plan, is to be completed over the entire site, Areas 1, 2, 3 and 4. Following completion of Phase 1, the second phase will involve excavating all remaining fill soil in lifts 18 inches thick.

The requested change is to conduct Phase 2 in Area 1, at the southwest part of the site, before completing Phase 1 in Areas 2, 3 and 4. This will allow Area 1 to be backfilled and used for project operations (equipment storage, truck staging, etc.).

The specific Phase 2 work for clearing Area 1 would consist of the following:

1. All areas would be surveyed to document that the surface is below the 7.1 pCi/g cleanup threshold.

2. All concrete walls, footings, foundations, etc., would be removed and frisked clean as they are removed.

3. All steep side slopes, knobs and ridges within the areas excavated as part of Phase 1 will be graded to more gentle slopes, on the order of 3 or 4 horizontal to 1 vertical. That graded surface will be surveyed to identify any elevated radioactivity. Any area exhibiting elevated radioactivity will be excavated to clean limits, below 7.1 pCi/g.

4. The remainder of the fill will be screened as it is excavated in 18 inch lifts through to the natural sand soil. Records will be made of each lift and the measured radioactivity. USEPA signoff will be obtained upon completion of the lift excavations, at native sand, for each sub-area surveyed clean. Upon receipt of USEPA signoff, the area will be available to be backfilled.

We request USEPA approve this revision to the Removal Action Work Plan. Please contact Richard Berggreen, Project Coordinator, with any questions you may have.

Regards,

STS CONSULTANTS, LTD.

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Rudnick

STS CONSULTANTS

STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061-3153

voice 847-279-2500
fax 847-279-2510
web www.stsconsultants.com

July 8, 2002

Mr. Fred Micke
Ms. Verneta Simon
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Work Plan Revision Request – STS Project No. 1-25585-XI, Correspondence No. 093

Dear Mr. Micke and Ms. Simon:

STS Consultants, Ltd. (STS) submitted a request June 25, 2002 to revise the Work Plan. The request included a change in sequence where Area 1 would be carried through Phase 1 (removal of all identified radiologically-impacted soil) and Phase 2 (excavation and screening of all fill soil in 18 inch lifts) before moving to Area 2. Further, we had requested that the Phase 2 work in Area 1 include flattening the slopes of the excavations left after Phase 1, to facilitate walkover surveys.

In response to our request, in a telephone call from Ms. Verneta Simon, we understand the request as proposed was denied. The objection was to the flattening of the slopes which might spread radiologically-impacted soil to unimpacted areas.

We therefore, are revising the change request to specify that no flattening of the slopes will be done. The 18 inch lift surveys will be performed as the fill is excavated without any grading.

The change request consists of only the sequence change, wherein Area 1 is taken through Phases 1 and 2 before progressing to Area 2. Based on our telephone conversation, we understand USEPA has no objection to this revision. Please confirm you concurrence in writing for our files.

Thank you for your consideration in this matter.

Regards,

STS CONSULTANTS, LTD.

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Rudnick

STS CONSULTANTS

STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061-3153

voice 847-279-2500
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web www.stsconsultants.com

July 12, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard, SE-5J
Chicago, Illinois 60604

RE: Response to USEPA Comments on QAPP, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 096

Dear Mr. Micke and Ms. Simon:

This letter transmits the Quality Assurance Project Plan (Revision 3). The enclosed QAPP incorporates revisions made pursuant to the USEPA's letter dated 4 June 2002. The specific corrections are described below.

1. Title/Approval Page - STS provided copies of the Title/Approval page to our subcontractors/laboratories (refer to the attached STS memorandum dated 18 June 2002). The following changes are incorporated in the attached QAPP pursuant to the USEPA's comments:
    a. Signature lines were added to the Title/Approval Page for STL St. Louis, Grace Analytical Lab, Inc, RSSI, and Argonne National Laboratory.
    b. Julie Apolinario's name was deleted.
    c. Luba Finkelberg's name was deleted (by USEPA's transmittal of 4 June 2002).
    d. Signatures for USEPA representatives Frederick A. Micke (30 May 2002) and Richard L. Byvik (Conditional Approval - 3 June 2002) are provided (by USEPA's transmittal of 4 June 2002).
    e. Signatures for STS representatives John Esser (19 June 2002) and Richard Berggreen (19 June 2002) are provided.
    f. Signatures for laboratory directors for the SAHCI On-Site Laboratory (19 June 2002), STL St. Louis (3 July 2002), Grace Analytical Lab, Inc. (20 June 2002), and RSSI (9 July 2002) are provided on individual signature pages.
    g. A signature for Argonne National Laboratory was not provided by the Argonne representative as of the date of this letter. Based on our discussion with Argonne National Laboratory on 11 July 2002, we anticipate receiving their executed signature page soon. We will forward a Title/Approval Page with their signature after we receive it.

2. Quality Objectives and Criteria for Measurement Data - We apologize for the confusion concerning the location of the referenced tables. The tables were transmitted in our letter to the USEPA dated 18 January 2002 and were to have been included as Appendix D of the QAPP. The following corrections are incorporated in the attached QAPP pursuant to the USEPA's comments:
    a. The QAPP table of contents is corrected to include reference to "Appendix D Measurement Performance Criteria."

b. The tables 8.4-5, 8.4-6, and 8.4-7 from the laboratory's QAMP that are referenced in Element A7.B of the QAPP and that were sent with our January 18, 2002 letter to USEPA are now included in QAPP "Appendix D Measurement Performance Criteria."

3. Figure 3-2 Project Schedule - The Figure 3-2 (Project Schedule) that is referenced in Element A6.B of the QAPP is Figure 3-2 of the Amended Work Plan. The wording in the QAPP did not identify the location of this figure. The same is true with respect to the references in the QAPP to Amended Removal Action Work Plan Figure 1-1 (Site Location Map), Figure 2-1 (Project Management Organization Chart), and Figure 3-1 (Pavement Stripping, Soil Staging, Anticipated Traffic Patterns). We apologize for the confusion that the incomplete references caused. The following corrections are incorporated in the attached QAPP pursuant to the USEPA's comments:
   a. The QAPP table of contents is revised to omit reference to Figure 3-1 (Pavement Stripping, Soil Staging, Anticipated Traffic Patterns).
   b. All references to figures of the Amended Removal Action Work Plan within the QAPP are expanded to identify the figure as a component of the Amended Removal Action Work Plan document. These references occur at the following locations in the QAPP:
      i. Element A4, paragraph 1, sentence 1 is revised to: "*The management structure under which the project will be accomplished is illustrated in Figure 2-1 of the Amended Removal Action Work Plan, and also included as Attachment 1 of this Quality Assurance Project Plan (QAPP).*"
      ii. Element A5, paragraph 1, sentence 1 is revised to: "*The subject site for this Work Plan and QAPP is a vacant parcel of approximately 2.16 acres located at 341 E. Ohio Street, Chicago, Illinois and is depicted on Figure 1-1 of the Amended Removal Action Work Plan.*"
      iii. Element A6.B, paragraph1, sentence 1 is revised to: "*The Project Schedule (Figure 3-2 of the Amended Removal Action Work Plan) shows the projected start and completion dates for project activities.*"
      iv. Element A7.A, paragraph 1, sentence 5 is revised to: "*Thorium concentrations at 7 locations were found to exceed the NRC release limit (see Figure 3-1 of the Amended Removal Action Work Plan).*"

4. Typographical Error in QAPP Element B3.B, paragraph 2, sentence 1 - The following correction is incorporated in the attached QAPP pursuant to the USEPA's comments:
   a. The cited sentence now reads: "*The technician shall ensure that the information on the sample container is also transferred to the Chain of Custody Form (See Attachment 1).*"

5. Distribution List – The distribution list (Element A3 of the QAPP) did not formally list Argonne National Laboratory in the previous version of the QAPP. Argonne National Laboratory is added to the distribution list in the attached QAPP.

We believe that these changes address all of the remaining concerns identified in the USEPA's letter of 4 June 2002. Therefore, we respectfully request that the USEPA's conditional approval of the QAPP granted on 4 June 2002 be amended to final approval.

If you have any questions concerning this letter or the attached QAPP, please contact Richard Berggreen or John Esser at 847-279-2500.

Sincerely,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Rudnick (QAPP - 1 copy)

Encl. QAPP – 4 copies

STS CONSULTANTS

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750 Corporate Woods Parkway
Vernon Hills, Illinois 60061-3153

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July 16, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard, SE-5J
Chicago, Illinois 60604

RE: Corrected Version of Field Sampling Plan for QAPP Revision 3, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 098

Dear Mr. Micke and Ms. Simon:

On July 12, 2002, STS Consultants, Ltd. transmitted Revision 3 of the Quality Assurance Project Plan (QAPP) for the above-referenced project to USEPA. It was brought to my attention that the Field Sampling Plan included in Appendix C of the QAPP was an incorrect version. Four copies of the correct version of the Field Sampling Plan are enclosed. Please remove the existing Field Sampling Plan from Appendix C of the QAPP (Revision 3) and replace it with the enclosed version. For your reference, the correct version of the Field Sampling Plan has the following path and filename identifier in the footer of the document:

K:\25585\XG\Z185G002 Appendix 9-rev1.doc.

I apologize for the error and any inconvenience this may have caused. If you have questions, please feel free to contact me at 847-279-2500.

Sincerely,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Enclosures: QAPP Appendix C - Field Sampling Plan – 4 copies

cc: Timothy Ramsey, Piper Rudnick (1 copy)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

JUL 18 2002

SE-5J

VIA FACSIMILE (847) 279-2510 & (312) 755-6022
AND U.S. MAIL

Mr. Richard Berggreen
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

RE: 341 East Ohio Work Plan
Lindsay Light II Site/North McClurg Court

Dear Mr. Berggreen:

This letter is in response to your facsimile dated July 8, 2002 regarding written documentation for a verbal denial made by U. S. EPA for a work plan change proposed on June 25, 2002. On July 2, 2002, the following work plan change was denied:

3. All steep side slopes, knobs and ridges within the areas excavated as part of Phase 1 will be graded to more gentle slopes on the order of 3 or 4 horizontal to 1 vertical. That graded surface will be surveyed to identify and elevated radioactivity. Any area exhibiting elevated radioactivity will be excavated to clean limits below 7.1 picoCuries per gram (pCi/g).

This change was denied because this activity may mix together radioactive material above and below the cleanup level of 7.1 pCi/g, which is not an acceptable method of cleanup. Instead U.S. EPA requires that you excavate the steep slopes, knobs, etc. in 18 inch lifts. After determining that the 18 inch lift material does not exceed 7.1 pCi/g, this removed material can be

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used as clean fill for slope or grading. The remainder of the work plan change requested in your June 25, 2002 facsimile to me, i.e., conducting Phase 2 work in Area 1 prior to completing Phase 1 work in Areas 2, 3, and 4 is approved. In addition, the sequencing of Phase 2 work, as proposed in your June 25, 2002 facsimile to me is approved with the following changes:

1. All areas would be surveyed to document that the surface is below 7.1 pCi/g cleanup threshold.

2. All concrete walls, footings, foundations, etc. would be removed and frisked clean as they are removed.

3. All steep side slopes, knobs and ridges, within the areas excavated as part of Phase 1 will be excavated in 18 inch lifts. After determining that the 18 inch lift material does not exceed 7.1 pCi/g, this removed material can be used as clean fill for slope or grading. Records will be made of each lift and measured radioactivity. U.S. EPA signoff will be obtained upon completion of the lift excavations, at native sand, for each sub-area surveyed clean. Upon receipt of U.S. EPA signoff, the area will be available to be backfilled.

If you have any questions regarding this correspondence, please contact me at (312) 886-3601 or Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Verneta Simon

Verneta Simon
On-Scene Coordinator

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July 31, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Pesticide Excavation and Verification Sampling, 341 E. Ohio Street Site, Chicago, Illinois – STS Project No. 1-25585-XI, Task 2300, Correspondence No. 103

Dear Mr. Micke and Ms. Simon:

Attached please find for your reference a copy of a memorandum regarding pesticide excavation and verification sampling at the 341 E. Ohio Street Site in Chicago, Illinois. Note that this memorandum provides the field team with guidance for removal and verification sampling which is described in general terms in the Amended Removal Action Work Plan (Work Plan) and does not represent a revision or change to the Work Plan.

Because the work described in this memorandum does involve sampling and verification of the cleanup, we are requesting that upon demonstration in accordance with this memorandum that the soil meets the specified cleanup criteria for pesticides, USEPA provide signoff on the completion of this portion of the removal action in the applicable grid areas. We propose to provide USEPA with the pre-verification immunoassay results, the laboratory verification analytical results and a sign-off form for each grid area.

Obtaining USEPA sign-off will facilitate our ability to demonstrate completion of the Phase 1 excavation work (which includes removal of these pesticide-impacted soils) and compliance with the non-radiological remedial portion of the Work Plan.

Please contact us with any questions.

Regards,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Tim Ramsey, Piper Rudnick

Enclosure

K:\WPDOCS\PROJECT\125585xg-xi\C185I113.doc

100-LH-7 (7/02)

Memorandum

TO: Dumas Guerrier

cc: Tim Ramsey
Steve Kornder

FROM: John Esser, Richard Berggreen

DATE: July 26, 2002

RE: Pesticide Excavation and Verification Sampling
341 E. Ohio Street, Chicago, Illinois
STS Project No. 1-6-25585-XI, Task 2300

This memorandum is intended to describe procedures to be followed in the field to complete the excavation and verification sampling in the Pesticide Impact Area. This memorandum provides additional details for this portion of the removal action which is described in general terms in the Amended Removal Action Work Plan (Work Plan) and associated documents and is intended to be consistent with the general approach reflected in the Work Plan.

Pesticide Impact Area

The Pesticide Impact Area is defined on the basis of the previously completed soil borings and analytical sampling and is depicted in the attached Figure 1. Additional soil sampling and analysis will be performed during the removal action to further delineate continuous extensions of the Pesticide Impact Area depicted on Figure 1 the extent of pesticide impacts for the purpose of removing pesticide contaminated soil in the Pesticide Impact Area and any continuous extensions thereof that exceeds the Illinois Tier 1 residential remediation objective for ingestion and inhalation.

Excavation Sequence

The excavation sequence and procedures are defined in the Work Plan. In review, the excavation and removal sequence for subsurface soils are as follows:

1. Area 1/Area 2 - Phase 1 Radiological-Impacted Soil Removal

    a. Remove pavement/gravel base course.

    b. Perform Phase 1 removal of radiological-impacted soils.

    c. Perform verification surveys/sampling of the excavation grade following Phase 1 removal of radiological-impacted soils in accordance with Work Plan.

d. USEPA Notification of Successful Phase 1 Verification Survey in accordance with Work Plan.
e. At this point, it is anticipated that the excavation grade will likely be characterized as a hummocky with irregular topography. The excavation depths may vary from near zero (just below pavement/base course removal) to approximately 10 feet below grade. The soils exposed at the completion of Phase 1 radiological material removal may consist of urban fill or natural sand (in deepest portions of excavation).

f. Note that it may be necessary during Phase 1 radiological material removal to excavate a limited amount of non-radiological soil for excavation access or excavation stability. Within the defined Pesticide Impact Area, these non-radiological soils will be loaded, transported, and disposed as pesticide-impacted soil in accordance with the procedures defined in the Work Plan.

2. Pesticide Impacted Soil Excavation

a. Discretionary pesticide sampling (described later) will be used to further delineate the lateral and vertical limits of remaining soil with pesticide impacts above the Tier 1 clean-up objectives.

b. Where pesticide concentrations exceed the Tier 1 objectives, soil will be excavated in 18-inch lifts to a depth based on the depth of the discretionary sampling. Radiological screening will be performed following excavation of each 18-inch lift of soil. Radiological-impacted soils will be managed and disposed in accordance with the Work Plan. Non-radiological-impacted soils that are impacted by pesticides above the Tier 1 clean-up levels will be managed and disposed as pesticide-impacted soils in accordance with the Work Plan.

c. Excavation in 18-inch lifts will continue as deep as necessary to remove pesticide-impacted soil that exceeds the Tier 1 objective. Additional discretionary sampling can be used to guide the lateral and vertical limits of excavation.

d. After discretionary sampling indicates that pesticide-impacted soils have been removed, pre-verification sampling (described later) will be performed.

Soil Sampling and Analysis for Pesticide Contamination

1. Discretionary Pesticide Sampling - Discretionary pesticide sampling will be used in the field at the direction of the Field Team Leader for the purpose of evaluating pesticide concentrations of in-situ soils in the vicinity of the original soil borings. Discretionary samples will be collected as grab samples from shallow test pits, grab samples from the excavation surface following Phase 1 radiological soil removal, and as composite samples taken over a vertical interval on the excavation sidewalls. The soil sample and analysis will be performed using the field immunoassay procedure (SOP 500). Discretionary sampling will be employed to aid in delineating the lateral and vertical extent of pesticide impacts. The results of the discretionary sampling will be used to aid in the excavation and management of pesticide-impacted soils.

2. Pre-Verification Pesticide Sampling - Pre-verification pesticide sampling will be performed on a pre-specified grid pattern (for excavation floor samples) or a pre-specified horizontal spacing (for excavation sidewall samples) after soils exceeding the Tier 1 clean-up objective have been excavated.

    a. Pre-Verification Grid Samples - The pre-verification sampling grid for these types of samples will be defined by 10-meter by 10-meter squares (see Figure 2) to yield an effective sampling area of 100 square meters per pre-verification sample. Each pre-verification grid sample will be prepared from a composite of five sub-samples collected from within the 10-meter by 10-meter sample area. The sub-sampling locations will be obtained by dividing the 10-meter by 10-meter sampling area into four equal quadrants measuring 5-meters by 5-meters. Four of the sub-samples will be collected from the center of the 5-meter by 5-meter quadrants. The fifth sub-sample will be obtained from the center of the 10-meter by 10-meter sample area. Sufficient soil volume will be obtained to allow pre-verification analysis and also subsequent laboratory analysis (if desired).

    b. Pre-Verification Sidewall Samples - The excavation following completion of Phase 1 radiological soil removal and pesticide-impacted soil removal is anticipated to characterized as a near-horizontal but irregular surface. In particular, it is possible that the excavation will not have distinct excavation sidewalls. Consequently, conventional "sidewall sampling" will not be possible and in that case the pre-verification grid sampling described above is expected to appropriately represent conditions in the sampled area. However, in the event that distinct excavation sidewalls are exposed following the removal of the pesticide-impacted soils, pre-verification sidewall samples will be collected. The pre-verification sidewall samples will be collected as a vertical composite of 5 sub-samples taken at equally spaced vertical intervals over the full height of the excavation sidewall. Additional pre-verification sidewall samples will be taken at a horizontal spacing of one per 10-meters of excavation sidewall. Sufficient soil volume will be obtained to allow pre-verification analysis and also subsequent laboratory analysis (if desired).

    c. Sample Analysis - The pre-verification sample will be analyzed using the field immunoassay procedure (SOP 500).

    d. Comparison to Clean-up Standard - The results of the pre-verification sample analyses will be compared to the compound-specific Illinois Tier 1 Residential Remediation Objectives for Ingestion and Inhalation listed below. In the event that the measured concentration in the pre-verification sample exceeds the applicable Tier 1 objective, pesticide excavation will resume in that area and the associated laboratory verification sample will not be submitted for laboratory analysis. Instead, pre-verification sampling will be repeated following the additional excavation.

3. Verification Pesticide Sampling - When the results of the pre-verification pesticide sampling and analysis for a given 100-square meter area and any applicable excavation sidewall samples are below the Tier 1 objective, verification samples will be submitted for laboratory pesticide analysis by STL St. Louis.

a. Verification Grid Samples - The sampling grid and sampling procedure for the verification grid samples will be identical to that of the pre-verification grid samples described above.

b. Verification Sidewall Samples - If the excavation characteristics are such that they allow the collection of one or more pre-verification sidewall samples, verification sidewall samples will be collected for the same location(s). The sample spacing and sampling procedure for the verification sidewall samples will be identical to that of the pre-verification sidewall samples described above.

c. Soil Sampling Procedure - The soil sample for laboratory verification sampling can be obtained as a split-sample from the pre-verification sample volume or as an independent sample collected from the same location and in the same manner as the associated pre-verification sample All verification soil samples will be collected in laboratory-supplied sample containers and preserved in accordance with laboratory requirements for shipping to STL St. Louis.

d. Sample Analysis - Verification soil samples will be analyzed for the seven pesticides listed in the Work Plan as well as 4,4-DDT (and provided in the table below) by STL St. Louis in accordance with the applicable requirements of the Quality Assurance Project Plan (QAPP). Test method will be SW-846 Method 8081A.

e. Comparison to Clean-up Standard - The results of the verification sample laboratory analyses will be compared to the Illinois Tier 1 Residential Remediation Objectives for Ingestion and Inhalation listed below. In the event that a target pesticide concentration in the verification sample exceeds the applicable Tier 1 objective, pesticide excavation will resume in that grid area (in 18-inch lifts) and the area will be re-sampled.

Illinois Tier 1 Residential Remediation Objectives for Ingestion and Inhalation

The following Illinois Tier 1 residential standards are provided for reference in evaluating the verification sample laboratory analysis results.

Compound	Site-Specific Clean-up Objective	Illinois Tier 1 Remediation Objective	
	(mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)
Aldrin	0.04	0.04	3
alpha-BHC	0.1	0.1	0.8
Chlordane	1.8	1.8	72
Dieldrin	0.04	0.04	1
Heptachlor	0.1	0.1	0.1
Heptachlor epoxide	0.07	0.07	5
Lindane	0.5	0.5	--
4,4-DDT	2	2	--

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF
SE-5J

JUL 07 2002

VIA FACSIMILE (847) 279-2510 AND U.S. MAIL

Mr. Richard Berggreen
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

RE: Pesticide Excavation and Verification Sampling
341 East Ohio, Chicago, Illinois
Lindsay Light II Site/North McClurg Court

Dear Mr. Berggreen:

This letter is in response to your facsimile dated July 31, 2002 regarding U.S. EPA signoff on the pesticide verification sampling. We have reviewed your facsimile and the letter dated March 15, 2002 from Renee Cipriano , Director of the Illinois Environmental Protection Agency (Illinois EPA) to James Montana, Jr., Piper, Marbury, Rudnick & Wolfe. We agree that our signoff of the pesticide verification sampling will expedite remediation activities as long as the excavation meets the residential clean-up objectives specified by Illinois EPA. Therefore, please provide us with the pre-verification immunoassay results, the laboratory verification analytical results and sign-off form for each applicable grid.

If you have any questions regarding this correspondence, please contact me at (312) 886-3601 or Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Verneta Simon
On-Scene Coordinator

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August 1, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard, SE-5J
Chicago, Illinois 60604

RE: Signature Page from Argonne National Laboratory for QAPP, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XG, Correspondence No. 106

Dear Mr. Micke and Ms. Simon:

This letter transmits the remaining signature page for the Quality Assurance Project Plan (Revision 3) transmitted to you on 12 July 2002. In that transmittal we noted that the signature page had not been received from Argonne National Laboratory (ANL). The enclosed signature page was signed on 31 July 2002 by Elane Streets, laboratory director for ANL.

We believe this completes all outstanding issues relative to the QAPP and we respectfully request that the USEPA's conditional approval of the QAPP granted on 4 June 2002 be amended to final approval.

If you have any questions, please contact Richard Berggreen or John Esser at 847-279-2500.

Sincerely,

STS CONSULTANTS, LTD.

John S. Esser

John S. Esser, P.E., P.G.
Senior Project Engineer

cc: Timothy Ramsey, Piper Rudnick

Encl. QAPP signature page executed by ANL

STS CONSULTANTS

STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061-3153

voice 847-279-2500
fax 847-279-2510
web www.stsconsultants.com

August 16, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Proposed Revision to Approved Amended Removal Action Work Plan, 341 East Ohio Street Site, Chicago, Illinois – STS Project NO. 1-25585-XG, Correspondence No. 110

Dear Mr. Micke and Ms. Simon:

On behalf of TRS, STS Consultants, Ltd. (STS) is requesting a revision to the approved Amended Removal Action Work Plan for the 341 East Ohio Street Site. We previously requested and USEPA approved a revision relative to the sequence of removal actions in Area 1. The revision was to conduct Phase I and Phase II removals in Area 1 before proceeding to Areas 2, 3 and 4. That request was primarily to allow the use of Area 1 for equipment and material staging without having multiple moves.

The current request is for the same change in sequence for Areas 2, 3 and 4. That is to complete Phase I followed by Phase II on Area 2 before moving to Area 3, and complete Phase I followed by Phase II on Area 3 before moving to Area 4.

The principal reason for this requested revision is an effort to minimize traffic on exposed soil and reduce dust generation. Additionally, the maintenance of pavement in Area 4 until completion of Areas 2 and 3 will allow for the use of the on-site scale for weighing trucks.

It is our opinion that this change will not significantly change the schedule or cost, and may increase the efficiency of the work, as traffic patterns will be less disrupted during Phase II work in Areas 2 and 3.

Upon your review of this request, if it can be approved, please provide written confirmation of your concurrence for our project files. Please contact the undersigned with any questions you may have.

Regards,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Rudnick

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

SE-5J

AUG 2 2 2002

VIA FACSIMILE (847)279-2510 AND U.S. MAIL

Mr. Richard Berggreen
Mr. John Esser
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

RE: 341 East Ohio Work Plan, Chicago, Illinois
Lindsay Light II Site/North McClurg Court

Dear Messrs. Berggreen and Esser:

This letter is in response to your facsimile dated August 16, 2002 regarding written concurrence on the sequence of remediation activities in Areas 2,3, and 4. U.S. EPA agrees with the following sequence proposed: complete Phase I and Phase II activities in Area 2 before moving to Area 3, and then complete Phase I and II activities in Area 3, before moving to Area 4, etc.

If you have any questions regarding this correspondence, please contact me at (312) 886-3601 or Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Verneta Simon

Verneta Simon
On-Scene Coordinator

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STS CONSULTANTS

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750 Corporate Woods Parkway
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September 27, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Work Plan Change Request, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 25585-XI, Correspondence No. 122

Dear Mr. Micke and Ms. Simon:

This letter is to request your written concurrence with two revisions in the Work Plan related to work currently being conducted at the above referenced site. We understand these revisions from the procedures specified in the Work Plan were accepted in discussions in the field during a site visit. By this letter we are providing a written description of the changes and are requesting your concurrence.

The first change deals with the wedge of soil remaining along the north margin of the site. The Work Plan provides that the wedge of material below a slope of 1.5H:1V extending inward from the property line, be allowed to remain in place after the perimeter drilling program documented the material as non-radiologically-impacted. Note that in those areas where the drilling program showed the presence of impacted material, that material would be removed to clean limits or to the property line. In the course of excavating this location along the north margin of Areas 3 and 4, a foundation wall was encountered approximately 7 feet south of the northern property line. It was feasible to excavate vertically along the inside of this wall, toward the site, down to the natural sands, thus removing and allowing an increased quantity of the soil to be surveyed south of the wall. The presence of the wall, however, made the excavation between the wall and the sidewalk difficult as the bucket of the backhoe could not articulate to a point where the material on the outside of the wall could be excavated. As a result, the upper portion of the wedge on the outside of the wall, from a zero thickness at the sidewalk to a thickness of about 3 feet adjacent to the wall, would remain in place. That soil, however, was subject to a walkover gamma survey following the pavement stripping, such that the upper approximately 18 inches was surveyed. A sketch illustrating the slope, the concrete wall and the material proposed to remain is attached. This material was explored with the perimeter drilling program and was found to be non-radiologically impacted.

We are therefore requesting a change in the Work Plan to allow the upper part of the sloping wedge (north of the wall) to remain in place where this wall occurs. Soil has been removed which was not previously proposed to be removed, as the lower portion of the wedge was removed and surveyed on the inside of the wall. In that the soil remaining north of the wall has been explored through the perimeter drilling program, the upper portion of the remaining soil was surveyed through the walkover gamma survey, and soil was removed that was not originally proposed to be removed, we request your written concurrence with this change, and your concurrence that no restriction on your sign-off regarding the completeness and adequacy of the removal action will result from this change in the Work Plan.

The second change involves the presence of a number of large concrete foundation elements in Areas 3 and 4. These elements appear to be pile caps for a former building at this site. It is noteworthy that they do not appear to have been associated with the building most recently removed from the site. In the course of the excavation and removal, it was noted that the floor slab for the most recent building did not have columns at the locations where these foundation elements were present. This indicates that the foundation elements were not constructed for that building, but were left from a former structure. In that the most recent building was constructed at the time Lindsay Light and Chemical Company was beginning operations on the adjacent parcel to the south (based on Sanborn Fire Insurance maps documenting building construction in 1917 and Lindsay operations to the south beginning 1916), these concrete pile caps must necessarily predate the Lindsay Light operations. Additionally, the field observations show that the concrete pile caps were formed and poured in the natural sand. No evidence of urban fill was noted surrounding these features. In accordance with the Work Plan, all fill material will be excavated down to and surrounding the features. At all of the concrete pile caps exposed, no evidence of radiologically impacted material was noted beneath the floor slab for the building that post-dated these features. As a result, we request your concurrence that these items may be left in place, and that no restriction on your sign-off regarding the completeness and adequacy of the removal action will result from this change in the Work Plan.

We appreciate your concurrence on this matter. Please provide us written confirmation of your agreement with this letter for our files. Please contact us with any questions you may have regarding this matter.

Regards,

STS CONSULTANTS, LTD.

John S. Esser, P.G., P.E.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Tim Ramsey, Piper Rudnick
Tom Pabian, Capri Capital

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

OCT 03 2002

REPLY TO THE ATTENTION OF

SE-5J

VIA FACSIMILE (847) 279-2510 AND U.S. MAIL

Mr. Richard Berggreen
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

RE: 341 East Ohio Work Plan
Lindsay Light II Site/North McClurg Court

Dear Mr. Berggreen:

Approximately two weeks ago, U.S. EPA mentioned to you that dust was raised again as an issue during our joint City of Chicago and SOAR meeting of September 19, 2002 and that it was imperative to find out your client's plans for site closure. In addition, at the previous City of Chicago and SOAR meeting, U.S. EPA arranged for you and your client to attend so you could hear first-hand the issues about dust. Furthermore, U.S. EPA suspects that the current use of watering during the week and on the weekends and the use of a street-sweeper during the week will both stop when the remediation work finishes. We are aware that your client has now received several estimates and alternatives on how to eliminate dust, but is reluctant to proceed. Therefore, we strongly urge that you and your client address the dust issue before you demobilize the work at the site. We would prefer that you take measures to eliminate dust now rather than wait to address this issue after the City of Chicago issues you tickets for creating a nuisance, as a result of telephone calls by Streeterville residents to the City of Chicago to send an inspector to observe the "dust".

If you have any questions regarding this correspondence, please contact me at (312) 886-3601 or Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Verneta Simon

Verneta Simon
On-Scene Coordinator

cc: Naren Prasad, City of Chicago - Department of Environment

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October 8, 2002

Ms. Verneta Simon
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Change to Work Plan Request, Additional Information – STS Project No. 1-25585-XI, Correspondence No. 127

Dear Ms. Simon:

STS Consultants recently submitted a request for a change in the Work Plan regarding leaving certain concrete structures at the site. That request was dated September 27, 2002. In your review of that request, you have asked for some additional information, which we are providing in this letter.

With regard to the wall we are planning on leaving along the north margin of the site, we noted the perimeter drilling found no evidence of impacts in this area. You asked us for more specific information. Along the north portion of the perimeter drilling, impacts were noted between M.9-8.5 and N.1-10. The area where we are proposing to leave the wall is farther to the east, extending from 13.5 to 15.5 between lines M and N. As a result, we have no evidence of impacted material in the vicinity of the wall we request to leave in place.

You also asked for the specific dates when the discussion regarding this matter occurred with the STS field representatives. In checking field notes we find the site visit for this area occurred on September 19, 2002.

Finally, to clarify a question you asked in our telephone conversation this date, the additional material removed from the inside, site side, of the wall was removed for engineering reasons, as it was easier to remove it than to try to work the slope adjacent to the wall. No impacted material was found at that location.

We appreciate your attention to this matter. Please contact us with any further questions you have regarding this matter.

Regards,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Rudnick

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October 8, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: Cessation of Air Monitoring, 341 East Ohio Street Site, Chicago, Illinois - STS Project No. 1-25585-XI, Correspondence No. 128

Dear Mr. Micke and Ms. Simon:

This letter is to confirm your concurrence with the cessation of air monitoring at the above referenced site. On Tuesday October 1, 2002, during a site visit to verify the cleanup of radiological impacts, the STS personnel on site were advised that the verification survey indicated there was no remaining radiological-impacted material. Samples were taken for confirmation and will be provided to USEPA for analysis. Based on the field determination that all radiologically-impacted material was removed from the site, we were advised by USEPA that radiological air monitoring would no longer be required. As a result, no further sampling was performed. The analysis of previously collected samples will continue until all collected samples have been tested through the 4-day decay period for radon progeny.

Please provide written confirmation for our files of your concurrence with this directive to discontinue air monitoring at this site. Thank you for your attention to this matter.

Regards,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Rudnick

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:
SE-5J

OCT 0 9 2002

VIA FACSIMILE (847) 279-2510 AND U.S. MAIL

Mr. Richard G. Berggreen, C.P.G.
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061-3153

RE: Lindsay Light II Site--North McClurg Court-- QAPP

Dear Mr. Berggreen:

The U.S. Environmental Protection Agency (USEPA) has approved the Quality Assurance Project Plan (QAPP) for the PRP-Lead Removal activities at 341 East Ohio Street Site/Lindsay Light II, Chicago, Illinois. Five completed signature pages are enclosed.

If you have questions regarding this letter, please contact me at (312) 886-3601 or contact Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Verneta Simon

Verneta Simon
On-Scene Coordinator

Enclosures 5

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REPLY TO THE ATTENTION OF:

OCT 15 2002

SE-5J

VIA FACSIMILE (847) 279-2510 AND U.S. MAIL

Mr. Richard Berggreen
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

RE: 341 East Ohio Work Plan
Lindsay Light II Site/North McClurg Court

Dear Mr. Berggreen:

This letter is in response to your facsimiles dated September 27 and October 8, 2002 regarding written concurrence for discussions in the field on September 19, 2002. U.S. EPA agrees to the work plan changes described in your September 27, 2002 facsimile and supplemental information provided on October 8, 2002, which both involve leaving soil that was either surveyed and deemed non-radiologically impacted or by inference was deemed non-radiologically impacted.

If you have any questions regarding this correspondence, please contact me at (312) 886-3601 or Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Verneta Simon

Verneta Simon
On-Scene Coordinator

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October 17, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard, SE-5J
Chicago, Illinois 60604

RE: Post-Remediation Site Restoration, 341 E. Ohio Street Site, Chicago, Illinois – STS Project No. 1-25585-XI, Correspondence No. 131

Dear Mr. Micke and Ms. Simon:

This letter provides the U. S. Environmental Protection Agency (USEPA) with additional detail relative to proposed site restoration at the above-referenced project. This information is provided in response to the request in your letter dated October 3, 2002, the informational meeting held by the City of Chicago Department of Environment (CDOE) with local residents on August 8, 2002, and the recent site visit by a CDOE representative on October 7, 2002.

As you know, dust control has been a significant concern of the site Owner, STS, the USEPA, and local residents from the initial phases of project planning through implementation of the removal action. The site Owner, STS and the excavation contractor have employed all reasonable means to comply with the requirements of the Work Plan, USEPA and other governmental directives, and resident concerns concerning dust control and monitoring. The proposed site restoration activities are intended to establish appropriate site security and dust control measures consistent with risk management considerations and applicable regulatory requirements until eventual site development activities commence at the site. In particular, these measures will limit site access and reduce the potential for dust generation, as requested by USEPA and local residents.

With these considerations in mind, site closure and restoration will consist of the following measures.

The site will be rough-graded to eliminate significant depressions or mounds. Slopes will be as flat as practical to minimize potential for erosion. The site is lower than the surrounding sidewalks, so that all drainage will be directed into the site, with no off-site flow under normal rainfall events.

Site security will be provided by replacing the temporary construction fencing with an installed chain-link fence and gates. The fence will be installed at the property line on the north, east and south margins. The Time-Life Building will prevent access from the west. The fence will be a standard 6-foot tall chain-link fence with two truck access gates and two pedestrian access gates. These gates will remain locked and under the control of the site Owner.

The concern regarding dust generation will be addressed with the installation of a gravel cover over the site. An area at the southwest corner of the site was previously covered with gravel to aid with traffic and truck staging during the final weeks of the removal effort. The remainder of the site will also be covered with a layer of gravel sufficiently thick to prevent wind entrainment

of the underlying soil. Furthermore, the gravel will be free of any fine-grained soil fraction that could generate dust under windy conditions. No further dust control measures are anticipated to be necessary after placement of the gravel.

We request your review and written approval of these proposed site closure measures. If you have any questions, please do not hesitate to contact the undersigned.

Regards,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Rudnick

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

OCT 24 2002

REPLY TO THE ATTENTION OF:

SE-5J

VIA FACSIMILE (847) 279-2510 AND U.S. MAIL

Mr. Richard Berggreen
Mr. John Esser
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

RE: 341 East Ohio Work Plan
Lindsay Light II Site/North McClurg Court

Dear Messrs. Berggreen and Esser:

U.S. EPA has reviewed your facsimile dated October 17, 2002, which requested written approval of the following measures:

1. The site will be rough-graded to eliminate significant depressions or mounds.

2. Slopes will be as flat as practical to minimize the potential for erosion.

3. Temporary construction fencing will be replaced with a 6 foot chain-link fence, two truck access gates, and two pedestrian access gates.

4. Gravel cover over the remainder of the site in a thickness that will prevent wind entrainment of the underlying soil.

U.S. EPA approves the above measures.

If you have any questions regarding this correspondence, please contact me at (312) 886-3601 or Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Senior Health Physicist, at (312) 886-5026.

Sincerely,

Verneta Simon

Verneta Simon
On-Scene Coordinator

cc: Naren Prasad, City of Chicago - Department of Environment

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November 1, 2002

Mr. Fred Micke, On-Scene Coordinator
Ms. Verneta Simon, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

RE: 341 E. Ohio Street, Radiation Survey of Adjacent Sidewalk Area – STS Project No. 1-25585-XI, Correspondence No. 136

Dear Mr. Micke and Ms. Simon:

In response to your request made to Rich Berggreen on October 23, 2002, a field radiation survey was completed at areas adjacent to the above-referenced site, where radiologically-impacted soil appears to exist beneath the sidewalk. As you know, all radiological-impacted soil above the action level established in the Amended Removal Action Work Plan (7.1 pCi/g) was removed from within the property limits of the site during the recently completed Removal Action. Fill material exposed at three locations along the excavation wall beyond the property limits (beneath the sidewalk) appeared to exhibit radioactivity above the cleanup level based on the final verification surveys performed in those areas. This material was not removed because it was beyond the property limit. Furthermore, from a practical standpoint removing the fill would potentially result in undermining and settling or collapse of the sidewalk.

On October 29, 2002, a microR survey was conducted of the locations where impacted material is believed to remain beyond the property limit. The locations surveyed were:

- South sidewalk, along former project grid line A, between grid lines 3 to 4 and 12 to 14; and
- North sidewalk, along former project grid line N, between grid lines 8.5 to 12.

The following table presents the ranged of the microR readings at the sidewalk surface and at a distance of 1 meter above the sidewalk surface for the survey alignments noted above. The survey was performed using a Ludlum Model 3 MicroR Meter with 1' x 1' NaI probe (Serial No. 113256).

Location	Sidewalk Surface (μR/hr)	1 meter above Sidewalk Surface (μR/hr)
Along A, from 3 to 4	5 – 7	5 – 7
Along A, from 12 to 14	6 – 9	6 – 9
Along N, from 8.5 to 12	5 – 9	6 – 9

Attached please find the NUTRANL analytical results for samples collected from the locations exhibiting residual impacts. The samples are from A, 2.75 to 3.5; A, 12.25; and N, 10. The analysis shows total radium levels for these three locations of 5.86 pCi/g, 8.17 pCi/g, and 240.66 pCi/g, respectively.

Please contact us with any additional questions you may have regarding this matter.

Regards,

STS CONSULTANTS, LTD.

John S. Esser, P.E., P.G.
Senior Project Engineer

Richard G. Berggreen, C.P.G.
Principal Geologist

Attachments: NUTRANL Gamma Spec Report

Cc: Mr. Timothy Ramsey (Piper Rudnick)

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100-LH-7 (7/02)

Nutranl Gamma Spec Report- 341 East Ohio Street Site

Samples of Contamination Beneath Sidewalks

Sample ID	Sample Date	Sample Group	Description	Weight	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
655	8/2/02	exclusion zone	S1361 A/2.75-3.5 WALL	29.3	-0.99	3.92	4.58	1.14	1.28	1.46	5.86	1.852349859
659	8/5/02	Pre EPA	S1363 A/12.25	31.3	-3.66	2.35	6.07	0.71	2.1	0.88	8.17	1.130707743
842	9/11/02	exclusion zone	S1494 N-10 North Wall	25.9	-91.15	21.6	225.01	6.14	15.65	6.95	240.66	9.273731719