UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

November 27, 1989

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Mr. Brad J. Berggren, P.E.
Project Coordinator
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322 E. Michigan Street, Suite 600
Milwaukee, Wisconsin 53202

Dear Sirs:

Re: Red Oak Landfill Superfund Site
Administrative Order on Consent
Docket no. VII-89-F-0016

Attached is a copy of the Administrative Consent Order providing for a Remedial Investigation and Feasibility Study to be conducted by the consenting respondents at the Red Oak

Landfill Superfund site in Red Oak, Iowa, pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The order has now been signed on behalf of respondents Eveready Battery Company, Inc., Bangor Punta Diversified Holding Corporation, Uniroyal Holding, Inc., Universal Cooperatives, Inc., and the City of Red Oak, and the order was executed by the U.S. Environmental Protection Agency (EPA) on November 24, 1989.

Paragraph 86 of the order provides that this Consent Order shall be effective 5 business days after the date that notification of EPA's execution of the order has been mailed to respondents. This letter constitutes such notification. Please be advised that the effective date of this order will be December 4, 1989.

A copy of the text of the order and its Table of Milestones (Appendix II of the Consent Order) are enclosed for your information.

Please telephone me at (913) 236-2809 if you have any questions about this matter. Thank you for your cooperation in helping to put this Consent Order together.

Sincerely,

Jonathan S Kahn

Jonathan S. Kahn
Assistant Regional Counsel

Enclosure

cc: Mr. A. Ross Pearlson, Esq.
Fried, Frank, Harris, Shriver & Jacobson
One New York Plaza, 23rd Floor
New York, New York 10004-1980

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

IN THE MATTER OF:

RED OAK LANDFILL,

Red Oak, Iowa,

EVEREADY BATTERY COMPANY, INC.

BANGOR PUNTA DIVERSIFIED
HOLDING CORPORATION,

UNIROYAL HOLDING, INC.,

UNIVERSAL COOPERATIVES, INC.,

AND

CITY OF RED OAK, IOWA,

Respondents.

Proceeding Under Sections
104, 106(a) and 122(d)(3)
of the Comprehensive Environmental Response, Compensation and
Liability Act, 42 U. S. C.
§§9604, 9606(a) and 9622(d)(3)

ADMINISTRATIVE ORDER

ON CONSENT

Docket No. VII-89-F-0016

I. PRELIMINARY STATEMENT

1. This Consent Order ("Order") is entered into by the United States Environmental Protection Agency, Region VII ("EPA") and the above captioned respondents pursuant to authority vested in the President of the United States by Sections 104, 106(a) and 122(d)(3) (42 U.S.C. §§9604, 9606(a) and 9622(d)(3)) of the

Comprehensive Environmental Response, Compensation and Liability Act, as amended, 42 U.S.C. §§9601-9675 ("CERCLA" or "Superfund"), and delegated to the Administrator of the EPA by Executive Order 12580, dated January 23, 1987, 52 Federal Register 2923. This authority has been further delegated to the Regional Administrators of EPA by EPA Administrative Delegations 14-14-A and 14-14-C, and to the Director, Waste Management Division, EPA Region VII, by Delegation R7-14-14C.

2. Respondents agree that EPA has jurisdiction to issue this Order, and agree not to contest or legally challenge said jurisdiction, nor the terms or validity of this Order. Respondents agree to undertake all the actions required of them by this Order.

3. At the same time, Respondents specifically deny any and all liability with respect to the Red Oak Landfill Superfund site (the "Site"). Moreover, Respondents do not admit any of the Findings of Fact, Conclusions of Law, or Determinations contained in this Order. The Respondents have entered into this Consent Order in recognition of their identification by EPA as "potentially responsible parties" with reference to the Site, and in the interest of resolving the matter and avoiding expensive and time-consuming administrative or judicial proceedings. Except as provided in Paragraphs 81 and 82, Respondents do not waive and specifically reserve any and all rights that each Respondent, and Respondents as a group, may have as to other Respondents, the EPA, and any and all other potentially

responsible parties, including the right to seek contribution or any other reimbursement from other potentially responsible parties with respect to the Site.

4. Respondents have had an opportunity to confer with EPA to discuss the terms of this Order, and agree to its issuance and to its terms and to perform all work called for herein.

II. STATEMENT OF PURPOSE

5. In entering into this Consent Order, the mutual objectives of EPA and the Respondents are to provide for the Respondents to: (1) conduct a Remedial Investigation (hereinafter the "RI") to determine fully the nature and extent of the release and threatened release of hazardous substances, pollutants or contaminants from the Site; and (2) perform a Feasibility Study ("FS") to identify and evaluate alternatives for remedial action to prevent or mitigate the release or threatened release of hazardous substances, pollutants or contaminants from the Site. The activities conducted pursuant to this Order are subject to approval by EPA and shall be consistent with the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, as amended ("National Contingency Plan" or "NCP"), and with the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA Office of Solid Waste and Emergency Response directive 9355.3-01, October 1988 (Appendix III of this Order), or with such more recent version of such guidance as EPA shall make available.

III. FINDINGS OF FACT

Based upon information available to EPA on the effective date of this Order, EPA makes the following findings of fact:

6. The Red Oak Landfill is located in a former limestone quarry in a rural area, approximately 1.5 miles north-northwest of the City of Red Oak, Iowa. The Site is bounded on the east by the East Nishnabotna River and on the west by the Park West Road, and is located in the NW1/4 of the SW1/4 of Section 17, Township 72N and Range 38W, Montgomery County, Iowa.

7. The Site was owned and operated by the City of Red Oak, Iowa, a municipal corporation, as a sanitary landfill between the years 1962 and 1974.

8. In August of 1981, the City of Red Oak sold the Site to Lowell and Blanche Kinnison (hereinafter "the Kinnisons"), husband and wife, who are the present owners thereof. Effective January 1, 1986, the Kinnisons leased the Site to Pipe and Piling Supplies (U.S.A.), Ltd., a corporation, for the storage of pipe and pipeline materials and equipment; said lease may be automatically extended from year to year through December 31, 1995, and has been extended through December 31, 1989.

9. Uniroyal, Inc., a corporation, formerly operated a hose plant in Red Oak, Iowa, and disposed of lead filter cake at the Site, from approximately mid-1973 until March 1974. Uniroyal, Inc., has been liquidated and Uniroyal Holding, Inc., a corporation, is a successor in interest to Uniroyal, Inc., with respect to this Site and this Consent Order.

10. The Union Carbide Corporation manufactured batteries at a plant in Red Oak, Iowa, until 1986; in connection with those operations, the Union Carbide Corporation disposed of hazardous substances, including toluene, tetrachloroethylene, diacetone alcohol, mineral spirits, methyl isobutyl ketone and laminated paper containing three percent (3%) mercurous chloride by weight. The former battery division of Union Carbide Corporation was acquired in June 1986 by Ralston Purina Co., and was given the name Eveready Battery Company, Inc. The latter company is now a wholly owned subsidiary of Ralston Purina Co. Ralston Purina Company is a successor in interest to Union Carbide Corporation with respect to this Site and this Consent Order.

11. Starcraft Agri Products (herein "SAP") Division of Bangor Punta Operations, Inc., disposed of paint wastes, containing volatile organic chemicals including toluene, at the Site. This disposal arose out of spray painting operations conducted at the SAP plant between approximately mid-July, 1973 and the closure of the Red Oak Landfill in March, 1974. In January, 1975, Universal Cooperatives, Inc. acquired a substantial portion of the assets of SAP. Universal Cooperatives, Inc. and Bangor Punta Diversified Holdings Corp. (a successor to Bangor Punta Operations, Inc.) are successors in interest to SAP with respect to this Site and this Consent Order.

12. Douglas & Lomason Company, a corporation, manufactured bagging equipment and automobile seats in Red Oak, Iowa, and disposed of paint wastes which contained hazardous substances at the Site.

13. In September 1984, samples were collected and analyzed, by or at the direction of EPA as part of its preliminary site investigation at the Site. Analysis of these samples disclosed the presence of the following hazardous substances:

A. Seep samples obtained at two locations on and near the Site contained chlorobenzene in concentrations up to 26.0 micrograms per liter ("µg/l"); 1,1,1-trichloroethane in concentrations up to 13.0 µg/l; methylene chloride in concentrations up to 37.0 µg/l; toluene up to 34.0 µg/l; trichloroethylene up to 8.0 µg/l; xylene up to 8.0 µg/l; barium up to 3,400 µg/l; chromium up to 97.0 µg/l; and lead up to 320 µg/l;

B. Sediment samples taken from the East Nishnabotna River contained toluene at a concentration of 1,600 milligrams per kilogram ("mg/kg"); and

C. Surface water samples from the East Nishnabotna River contained 1,1,2,2-tetrachlorethane in concentrations up to 6.0 µg/l; styrene to 6.0 µg/l; xylene up to 6.0 µg/l; barium up to 120 µg/l; and chromium up to 8.0 µg/l. Surface water samples taken from the water-filled quarry pit lying to the west of the Site (herein "the West Quarry Pit") revealed the presence of mercury in a concentration of 0.39 µg/l.

14. The Site is underlain by fill materials (natural overburden removed prior to quarrying) which were replaced in the quarry pit following removal of the limestone. Bedrock is thought to underly the fill and is believed to consist of limestone and shale units of the Oread formation. Ground water in these formations is expected to be discharged to the East Nishnabotna River.

15. The Site lacks a leachate collection system, runon and runoff control, a liner or cap, or other engineering or natural structures which would securely contain or prevent the release of hazardous substances from the Site into the environment. The soil cover over the Site is thin and sparse and waste materials are exposed at the surface in the eastern areas of the Site. Fifty-five gallon drums of waste materials are exposed near the Site's southern boundary.

16. The principal migration pathways, if any, of hazardous substances released from the Site are surface water and ground water. Ground water beneath and near the Site lies in unconsolidated sediments of loess, glacial till and alluvial deposits. Wells near the Site draw drinking water from these unconsolidated deposits. Seeps on the Site indicate a perched water-bearing unit may be present between the quarry fill materials and the waste deposits. Hydrostatic mounding in the fill area could provide a risk of transport of substances radially outward from the landfill; this risk needs to be assessed.

17. The eastern boundary of the Site is the East Nishnabotna River; the Site is subject to undercutting by the river and erosion by both the river and surface water runoff. Releases of hazardous substances from the Site into ground water and from free-flowing seeps on the Site, or through erosion, are likely to be discharged into said river.

18. Both the river and West Quarry Pit are used for recreational activities such as swimming, fishing and boating. Human exposure to hazardous substances released from the Site may result from these activities. Moreover, human exposure to hazardous substances released from the Site may occur by drinking water from contaminated geological structures; direct contact with potentially contaminated surface waters; or the consumption of contaminated fish taken from the river or West Quarry pit.

19. Chromium, particularly in its hexavalent form, and compounds of hexavalent chromium, mercury and mercury compounds, lead and lead compounds, styrene, chlorobenzene, 1,1,1-trichloroethane, trichloroethylene, tetrachloroethylene, 1,1,2,2- tetrachloroethane, methylene chloride, xylene and toluene are hazardous substances as defined in Section 101(14) of CERCLA, 42 U.S.C. §9601(14). Each of these substances may cause adverse effects on the health of persons, of other organisms, and may adversely affect the environment. Trichloroethylene, 1,1,1-trichloroethane, and 1,1,2,2-tetrachloroethane are known or suspected human carcinogens.

IV. CONCLUSIONS OF LAW

Based upon the above Findings of Fact, the EPA makes the following Conclusions of Law:

20. The Site is a "Facility" as defined in Section 101(9) of CERCLA, 42 U.S.C. §9601(9).

21. Each of the above captioned respondents is a "person" as defined in Section 101(21) of CERCLA, 42 U.S.C. §9601(21).

22. The wastes previously described in Paragraphs 9 through 12 and the constituents thereof, transported to or disposed of at the Site, contained "hazardous substances" as defined in Section 101(14) of CERCLA, 42 U.S.C. §9601(14).

23. Each substance previously described in Paragraph 13 and found in free-flowing seeps, sediments and surface water samples at or near the Site, is a "hazardous substance" as defined in Section 101(14) of CERCLA, 42 U.S.C. §9601(14).

24. There is a release, as defined by Section 101(22) of CERCLA, 42 U. S. C. §9601(22), of hazardous substances at the Site, and there is a threat of future releases of such substances at the Site.

25. EPA has concluded that: Respondents Lowell and Blanche Kinnison are "owner[s] and operator[s] of a . . . facility" (as "facility" is defined in Section 101(9) of CERCLA, 42 U.S.C. §9601(9)), within the meaning of Section 107(a)(1) of CERCLA, 42 U. S. C. §9607(a)(1). Respondent City of Red Oak is a former owner and operator of a facility at the time of disposal of hazardous substances, within the meaning of Section 107(a)(2) of CERCLA, 42 U.S.C. §9607(a)(2). All other Respondents captioned

above are persons who arranged for disposal, or arranged for transport for disposal, at the site, and/or are otherwise within the class of persons described by Section 107(a)(3) of CERCLA, 42 U.S.C. §9607(a)(3), with respect to this Site.

26. Each Respondent captioned above is a "potentially responsible party," as that term is used in Section 122(d)(3) of CERCLA, 42 U.S.C. §9622(d)(3).

V. DETERMINATIONS

Based upon the Findings of Fact and Conclusions of Law set forth above, the EPA has determined that:

27. A release of hazardous substances at the Site has occurred and continues to occur, and there exists a substantial threat of a further releases from the Site into the environment.

28. The actual and threatened release of hazardous substances from the Site may present an imminent and substantial endangerment to the public health and welfare and to the environment.

29. The actions required by this Order are consistent with the National Contingency Plan and are necessary to protect the public health and welfare and the environment.

30. The EPA has determined that the Respondents are qualified, within the meaning of Section 104(a) of CERCLA, 42 U.S.C. §9604(a), to conduct the activities required by this Order.

31. Each Respondent is jointly and severally liable for the implementation of the activities required by this Order.

VI. ORDER

Remedial Investigation and Feasibility Study

32. Based upon the foregoing Findings of Fact and Conclusions of Law, it is hereby ORDERED AND AGREED that Respondents shall conduct a Remedial Investigation and Feasibility Study (RI/FS) in accordance with CERCLA, the National Contingency Plan as amended, and Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA Office of Solid Waste and Emergency Response directive 9355.3-01, October 1988, or such more recent version as EPA shall make available, by conducting the tasks set forth in the attached Appendix I (Work Plan and attachments) in accordance with the schedule in Appendix II (Table of Milestones), in compliance with the terms of this Order. All activities required by this Order shall be completed as soon as practicable even though maximum time periods for their completion are set forth herein.

Qualifications of Personnel

33. All work performed pursuant to this Order shall be under the direction and supervision of a qualified professional engineer or a like scientifically-trained professional with demonstrated expertise in hazardous waste site investigation and development of remedial actions. Prior to the initiation of the implementation of field work under this Order, the Respondents shall notify EPA in writing of the name, title and qualifications of each such professional and of any contractors, consultants and

subcontractors to be used in carrying out the terms of this Order, and supply EPA with a copy of their curricula vitae or resumés.

34. All activities required of Respondents under this Order shall be performed only by well-qualified persons, who moreover possess all necessary professional licenses required by federal and state law.

Reports

35. The Respondents shall provide a Preliminary RI Report in accordance with the requirements of Paragraph 32 of this Order, by conducting the tasks set forth in Appendix I of this Order, in accordance with the schedule given in Appendix II hereof (Table of Milestones). Such report shall also include a Preliminary Endangerment Assessment, which shall be developed in accordance with the EPA Risk Assessment Guidance for Superfund and the Superfund Exposure Assessment Manual which are currently in effect at the time that said Assessment is prepared and submitted. EPA will make these documents available to Respondents upon request.

36. EPA will review and comment on the Preliminary RI Report, and will transmit its comments in writing to Respondents, and will notify the Respondent of EPA's approval or disapproval of the report or any part thereof. In accordance with the timetable given in Appendix II, Respondents shall amend the report as required by those comments, and submit the amended report to EPA; or, EPA may determine, after the submission of said Preliminary RI Report, that a second phase of Remedial

Investigation is necessary. If so, EPA will notify Respondents, and Respondents shall prepare and provide a Preliminary Phase II work plan in accordance with the schedule contained in Appendix II of this Order. Said Phase II Work Plan shall contain a proposed schedule for such work. The Phase II Work Plan shall be subject to EPA approval; EPA shall be the final arbiter of the contents of any such work plan and the schedule contained therein, and may modify them unilaterally. After EPA has approved the plan, Respondents shall conduct the work called for in the approved Phase II Work Plan.

37. EPA may request that Respondents perform further studies and/or conduct further work beyond the Phase II activities called for in Appendix I of this Order, and EPA may make, or require Respondents to make, additional changes to the Preliminary RI Report(s), and to the Revised RI Report(s). All work conducted by Respondents shall be conducted in accordance with CERCLA, the National Contingency Plan as amended, and Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA Office of Solid Waste and Emergency Response directive 9355.3-01, October 1988, or such more recent version as EPA shall make available, and shall be done in accordance with standards, specifications and schedules determined or approved by EPA.

38. Upon completion of any additional studies or revisions done by Respondents under this Order, Respondents shall submit a revised Preliminary RI Report, in accordance with the timetable in Appendix II, or such other timetable as is subsequently approved by EPA under this Order.

39. Subject to the dispute resolution procedures set forth in Paragraphs 67-70 of this Order, EPA remains the final arbiter in any dispute regarding the sufficiency of the Preliminary RI Report and the Final RI Report, including the Endangerment Assessment and any additional submissions referred to in the preceding Paragraph, and EPA may modify them unilaterally. At such time as EPA determines that the Preliminary RI Report is acceptable, EPA will transmit to Respondents a written statement to that effect, and upon such approval, the Preliminary RI Report will be deemed the Final RI Report for the work undertaken.

40. The Respondents shall provide a Preliminary FS Report in accordance with the requirements of Paragraph 32 of this Order, by conducting the tasks set forth in the attached Appendix I in accordance with the schedule in Appendix II (Table of Milestones), in compliance with the terms of this Order.

41. EPA will review and comment on the Preliminary FS report, and will transmit its comments in writing to Respondents, and will notify the Respondents of EPA's approval or disapproval of the report or any part thereof. In accordance with the timetable given in Appendix II, Respondents shall revise or amend

the report as required by those comments, and submit the revised or amended report to EPA. Upon completion of the required revisions, a revised Preliminary FS Report shall be submitted.

42. Subject to the dispute resolution procedures set forth in Paragraphs 67-70 of this Order, EPA remains the final arbiter in any dispute regarding the sufficiency of the FS Report and EPA may modify it unilaterally at any time. At such time as EPA determines that the Preliminary FS Report is acceptable to be submitted for public comment, EPA will transmit to Respondents a written statement to that effect. Upon such approval by EPA, the Preliminary FS Report will be deemed the Final Draft FS Report, which will be made available for public comment along with the Final RI Report.

43. EPA retains the right to amend the RI and FS reports at any time, and, subject to the notice provision contained in Paragraph 75, to perform any additional or modified work found reasonably necessary by EPA and to conduct the complete RI/FS, or any portion thereof, pursuant to its authority under CERCLA, and/or undertake any judicial or other remedy available to it by law.

44. EPA will make the final selection of the remedial alternative(s) to be implemented with respect to the Site.

45. Beginning with the month following the effective date of this Order, the Respondents shall send to the EPA Project Manager whose address appears in Paragraph 50, written monthly progress reports. These reports shall be received no later than the 10th day of the following month. At a minimum, these reports

shall: (1) describe the actions, progress, and status of projects which have been taken toward achieving compliance with this Order, (2) include (in table form, or assembled in some other convenient manner) all results of sampling and other tests and other data received by Respondents, (3) include all plans and procedures completed during the past month, (4) identify any requirements under this Order due to have been completed in the previous month which were not completed, and any problem areas and anticipated problem areas in complying with this Order, and indicate any difficulties encountered which could affect the quality of the field and/or laboratory data and adherence to the RI/FS schedule, (5) include all actions, data and plans which are scheduled for the next month, and (6) in the event of any delay, include the actions (including pertinent dates) that Respondents have taken and/or plan to take to minimize that delay. A letter format highlighting the major points may be used for such reports.

Correspondence; EPA Project Manager and Respondents' Project Coordinator

46. Documents, including reports, comments thereon, approvals, disapprovals, notices and any other correspondence to be submitted pursuant to this Order, shall be sent by certified mail, return receipt requested, or express mail, return receipt requested, or by a reliable overnight courier service providing documentary evidence of delivery, to the designated Project Coordinator for Respondents and the designated Project Manager

for EPA, as set forth in Paragraphs 50 and 51 hereof. Delivery to Respondents' Project Coordinator in accordance with the terms of this Paragraph shall constitute notice to all Respondents.

47. On or before the effective date of this Order, Respondents shall designate a Project Coordinator. Respondents' Project Coordinator shall be a qualified professional engineer or geologist or a like scientifically-trained professional with expertise in hazardous waste site investigation and development of remedial actions, and may be the person under whose supervision this work is conducted pursuant to Paragraph 33. Respondents' Project Coordinator shall be responsible for overseeing the implementation of the provisions of this Order. Communications between the Respondents and EPA and all documents, including reports, approvals and other correspondence, concerning the activities performed pursuant to the terms of this Order, shall be directed through Respondents' Project Coordinator and the EPA Project Manager.

48. EPA shall have the right to change its Project Manager at any time, and will notify Respondents if it does so. Respondents shall have the right to change their Project Coordinator, subject to the qualifications required of Respondents' Project Coordinator in the preceding Paragraph and in Paragraph 33 of this Order. If there is a change in Respondents' Project Coordinator, Respondents shall notify EPA in writing at least ten (10) calendar days prior to such change.

49. All decisions of EPA under this Order, including approvals, disapprovals, grants or denials of requests for extensions of time, and requests for modifications of reports, work plans, specifications, schedules and other work outputs shall be communicated in writing to Respondents by EPA's Project Manager. Extensions of time may be granted in writing by EPA's Project Manager.

50. A copy of each document required to be produced under this Order, including each monthly progress report, the Preliminary RI Report, the Preliminary FS Report, the Preliminary Phase II RI/FS Work Plan, and any revised versions of the foregoing documents, and all sampling and analysis and other data collected pursuant to this Order shall be sent to the current EPA Project Manager, or to her successor, at the following address:

Attention: Red Oak Project Manager (Dana Trugley)
Superfund Remedial Section
U.S. Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101
(913) 236-2856

51. All correspondence and documents sent by EPA to Respondents under this Order, after it has been executed, will be sent to Respondents' Project Coordinator, who is designated as follows:

Brad J. Berggren, P.E.
Geraghty & Miller, Inc.
322 E. Michigan Street, Suite 600
Milwaukee, Wisconsin 53202

Quality Assurance

52. The Respondents and all laboratories used by them in connection with this Agreement shall use quality assurance, quality control, chain of custody and other procedures in accordance with the documents entitled "NEIC Manual for Ground Water/Subsurface Investigations at Hazardous Waste Sites", Document No. EPA/330/9-81-0002; and "U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis" (October 1986; Revised August 1987); and "U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis" (July, 1987) (henceforth, "CLP Statements of Work"). Respondents shall follow the analytical methodologies and detection limits set forth in the CLP Statements of Work, and, whenever possible, shall use the reporting forms and provide the reports required to be given to EPA for analyses as set forth therein. In order to provide quality assurance and maintain quality control regarding all samples collected pursuant to this Agreement,

Respondents shall:

A. Ensure that EPA personnel and/or EPA authorized representatives shall be allowed access, at all reasonable times as well as during the hours that work under this Order is done, to the laboratory or laboratories used by Respondents for analyses under this Order, and shall be permitted to speak with personnel conducting analyses and sample collection and other field work under this Order.

B. Ensure that the laboratory or laboratories used by Respondents perform all analyses according to EPA approved methods and protocols.

C. Ensure that all sampling procedures, including the collection, handling and analysis of all samples are consistent with the quality assurance and quality control program set forth in Appendix I.

D. As part of such program and upon request by EPA, each laboratory used by Respondents or its contractors shall perform analyses of a reasonable number of test samples provided by EPA to demonstrate the quality of each laboratory's analytical data.

Site Access

53. EPA and EPA's representatives, including but not limited to their employees, agents, contractors and consultants, including the EPA Project Manager, shall have authority to observe the work being carried out pursuant to this Order, and shall be permitted to enter and move freely about the Site and any other premises upon which work under this Order may be performed at all times while work under this Order is being carried out. Respondents shall forthwith honor all requests for access by EPA or EPA's representatives.

54. In addition, EPA and EPA's authorized representatives, including employees and contractors, shall have full authority to inspect and copy all records and documents, operating logs and contracts related to the Site; to observe and inspect any work performed pursuant to this Order and to observe and review the

progress of Respondents in carrying out the terms of this Order; conduct such tests and take such samples as EPA, the designated EPA Project Manager, or any authorized EPA employee or representative may deem necessary; to use a camera, sound or video recording equipment or other equipment necessary or useful in carrying out its authority hereunder; verify all data submitted to EPA by Respondents; and do any or all other such things as may be useful or necessary to oversee the proper preparation of the RI/FS and the performance of the terms and conditions of this Order. Respondents shall permit such persons to inspect and copy all records, files, photographs, documents, computer storage media and other writings, including all sampling, analytical and monitoring data, in any way pertaining to the work undertaken pursuant to this Order. Notwithstanding the foregoing, EPA expressly retains all the inspection authority it may have under any federal law, including CERCLA and the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §6901-§6991i.

55. Respondents shall also allow EPA access to any other properties owned and/or operated by any Respondent in the vicinity of the Site to which access may be needed for work under this Order; and Respondents shall not interfere with EPA access to any other premises upon which work under this Order may be performed. To the extent practicable, Respondents shall support and assist EPA in obtaining access to other premises upon which work under this Order may be performed, and shall similarly

support and assist EPA in exercising its inspection and other authority under this provision, including, but not limited to review and copying of records.

56. Respondents represent that they have obtained, or will use their best efforts to obtain within 30 calendar days of the effective date of this Order, access agreements from those presently owning, or having control of, all locations at which work under this Order is expected to take place. In addition to Respondents, their consultants, and contractors, such agreement shall provide access to EPA, its authorized representatives, its contractors and their respective employees to these locations. In the event that such access agreements are not obtained within said 30 day period, Respondents shall notify EPA of their inability to obtain access, and shall advise EPA in writing of all efforts made to secure such access.

57. All parties having access to the Site for the purpose of conducting work or overseeing work under this Order, including EPA and its contractors or designated representatives entering the site, shall comply with a health and safety plan, which shall be consistent with applicable OSHA regulations, including those contained in 29 CFR Part 1910. EPA and its contractors and designated representatives entering the site may elect to prepare and adhere to their own health and safety plan or plans, which will be consistent with applicable OSHA regulations.

Availability of data and documents

58. The Respondents shall provide to the EPA Project Manager on a monthly basis all data from all samples, analyses, and tests and all other data generated by the Respondents, or on their behalf within the scope of this Order. All laboratory and field data, in its original form, as well as all tabulations, compilations and summaries, produced by Respondents or on their behalf, which are produced or validated in a given month, shall be sent, by the end of the following month, to the EPA Project Manager at the address given in Paragraph 50. All such data should be contained in a package clearly marked "Red Oak Project -- Raw and Compiled Data."

59. EPA will make available to Respondents the results of sampling, tests or analyses, or other data similarly obtained or generated by EPA or its contractors, after such data has passed EPA's quality assurance/quality control examination, if applicable, to the extent that disclosure of such data would not violate applicable Federal laws and regulations.

60. At the request of EPA, Respondents shall allow split or duplicate samples to be taken by EPA and its authorized representatives or contractors, of any samples collected by the Respondents pursuant to the terms of this Order. The Respondents shall notify EPA not less than five business days in advance of any on-site or off-site sampling activities and not less than five business days in advance of drilling, installation and testing of any monitoring well.

61. EPA may make any data resulting from analysis of samples taken at the site, and/or any other environmental measurements taken at the site, available to the public (normally after the data has been validated by quality control/quality assurance procedures, where these are applicable), unless such information demonstrably contains or consists of confidential business information, or unless disclosure is otherwise prohibited by law. Respondents may, if desired, assert a business confidentiality claim covering part or all of the information submitted to, or reviewed by, EPA. Such a claim may be made by placing on (or attaching to) the information, at the time of its submittal to, or review by, EPA, a cover sheet, stamped or printed legend, or other suitable form of notice employing language such as "trade secret," "proprietary," or "company confidential." Allegedly confidential portions of otherwise non-confidential documents should be clearly identified and may be submitted separately to facilitate identification and handling by EPA. If confidential treatment is sought only until a certain date or until the occurrence of a certain event, the request should so state. No sampling and monitoring data, analytical data, or hydrological or geological data shall be claimed as confidential by any Respondent to this Order. Information submitted for which a claim of confidentiality is made will be treated in accordance with 40 CFR Part 2, Subpart B and Section 104(e)(7) of CERCLA, 42 U.S.C. §9604(e)(7). If no

such claim is made when information is received by EPA, the information may be made available to the public without further notice.

Record Preservation

62. Respondents shall preserve, during the pendency of this Order and for a minimum of six (6) years after its termination, at least one (1) copy of all records and documents in the possession of any Respondent, or in the possession of any of Respondents' employees, agents, accountants, consultants, contractors or attorneys which relate in any way to the Site, to the work performed pursuant to this Order, or to hazardous waste management and disposal at the Site. At the conclusion of said six year period, Respondent(s) shall notify EPA at least 30 days prior to the destruction of any such documents. Upon request by EPA, such Respondent or Respondents shall make available to EPA such records or copies of any such records. EPA may require, by written notice to Respondents, that all or any portion of such records be preserved for any specified additional period of time, and Respondents shall comply with such notice. Respondents may elect to maintain a single repository for some or all of the aforementioned records and documents.

Notification of Delays

63. Respondents shall use their best efforts to avoid or minimize any delay or prevention of performance of their obligations under this Order. Respondents shall provide written notification to EPA of any circumstances which have caused or are likely to cause a delay in performance. Such written notice:

(a) shall be provided as soon as possible, but not later than seven (7) calendar days after the date when Respondents learned or should have learned of the occurrence of such circumstances; (b) shall be accompanied by all available pertinent documentation, including, but not limited to, third-party correspondence; and (c) shall include (i) a description of the circumstances causing or potentially causing the delay; (ii) the actions (including pertinent dates) that Respondents have taken and/or plan to take to minimize any delay; and (iii) the date by which or time period within which Respondents propose to complete the delayed activities. Such notification does not relieve Respondents of any of their obligations under this Order.

Force Majeure and Excusable Delay

64. Respondents shall perform the requirements under this Order within the time limits set forth or approved or established herein, unless the performance is prevented or delayed primarily by events which constitute a force majeure. For purposes of this Order, a "force majeure" is defined as an event arising from causes beyond the control of Respondents, including their consultants and contractors, which they could not have reasonably foreseen, which delays performance of any obligations required by this Order. Increases in costs, normal inclement weather, the financial inability of one or more Respondents, and the inability of Respondents' contractor to complete the work shall not be considered to be an event or circumstances beyond the reasonable control of the Respondents and their consultants and contractors; however, unusually severe winter weather at the site may be a

force majeure where Respondents have shown that the effects of such weather on work at the site cannot be overcome by the exercise of reasonable diligence on the part of Respondents and/or their consultants and contractors.

65. Respondents must notify EPA in writing seven (7) calendar days after it becomes aware of events which it knows or should know constitute a force majeure. Such notice shall estimate the anticipated length of delay, the cause or causes of the delay, the measures taken and to be taken to minimize the delay and the timetable for implementation of these measures. Respondents shall adopt all reasonable measures to avoid and minimize the delay. Respondents shall have the burden of demonstrating that the event is a force majeure. Failure to comply with the notice provision of this Paragraph shall be grounds for EPA to deny Respondents an extension of time for performance.

66. If Respondents demonstrate to EPA that the delay has been or will be caused by circumstances beyond the reasonable control of Respondents, their consultants and contractors, the time for performance for that element of the Work Plan shall be extended for a period equal to the delay resulting from such circumstances. Such an extension of time does not alter the periods of time for performance or completion of other tasks required under this Order. In the event that EPA and Respondents cannot agree that a force majeure has occurred or if there is no agreement on the length of the resulting extension, EPA will be

the final arbiter in any such dispute and will make the final determination as to any extension that will be granted. EPA will render such determination in writing to Respondents.

Dispute Resolution

67. In the event that Respondents, or any of them, disagree in good faith with EPA's comments or EPA's required revisions to any Preliminary or Revised RI or FS submitted by Respondents, or to any part thereof, including any Preliminary or Revised Endangerment Assessment, or to any Work Plan prepared under this Order, including the Preliminary Phase II Work Plan, said Respondents shall notify EPA in writing of their objections and the reasons therefor within 14 calendar days of receipt of such comments or revisions.

68. After such notification is received by EPA, EPA shall make its best efforts to respond in writing within 30 calendar days of receipt of such notice, explaining its decision and the basis therefor. In addition, within 15 calendar days of receipt of such notification by Respondents, EPA shall afford Respondents an opportunity for a conference to discuss the matter in question, and shall seek to reach agreement on the issues in dispute. If an agreement can then be promptly reached and reduced to writing and signed by representatives of both parties, it shall be incorporated into this Order.

69. However, if no written agreement can be reached, EPA shall provide a written statement of its decision to Respondents by the Chief of EPA's Superfund Branch, setting forth in writing EPA's decision and an explanation of the basis for that decision.

EPA's written decision shall then be incorporated into this order and become a part thereof. EPA remains the final arbiter in any dispute under this Order, including any dispute concerning the sufficiency of the RI or FS and of all work associated therewith.

70. If the pendency of the dispute and its resolution cause a delay that prevents Respondents from meeting a deadline set forth in, or established pursuant to this Order, then that deadline shall be extended by a period of time not to exceed the delay directly attributable to the dispute and EPA's decision, PROVIDED, that Respondents shall not be entitled to any such extension of time if EPA determines that Respondents' disagreement with EPA's comments or revisions is not in good faith or otherwise lacks a reasonable basis.

General Provisions

71. All work conducted pursuant to this Order shall be performed in accordance with prevailing professional standards.

72. Except as set forth in this Paragraph, nothing contained in this Order shall constitute or be construed as an admission by any Respondent of any fact or any legal determination, including any determination of legal liability, which may be contained herein. However, Respondents agree not to contest the authority or jurisdiction of the EPA to issue this Order, and also agree not to contest the validity or terms of this Order in any action to enforce its provisions. This Order shall not be offered or received in evidence in any action or proceeding in any court or other tribunal, whether that action or proceeding is initiated by the EPA or by any other person or

entity, as an admission or confession of fact or liability or wrongdoing of any kind on the part of Respondents; PROVIDED, however, that this Order can be used or introduced in any proceeding to enforce the terms of this Order.

73. The attachments and appendices to this Order referenced herein are deemed to be a part of this Order. All reports, work plans and other writings required under the terms of this Order, upon approval by EPA, shall be deemed to be incorporated into this Order.

EPA's Reservation of Rights

74. Nothing herein shall constitute or be construed as a release from liability for Respondents, nor any of them, nor for Respondents' officers, directors, officials, employees, agents, contractors, consultants, receivers, trustees, successors or assigns, nor for any other individual or entity.

75. Notwithstanding any other provision of this Order, EPA reserves the right to perform any portion of the work consented to herein and/or any additional site characterization, feasibility study, and response actions and/or corrective actions as it deems necessary. EPA may exercise its authority under CERCLA to undertake any removal actions or remedial actions. EPA reserves its right to seek reimbursement from Respondents for the costs of such response actions and any other response actions taken by EPA notwithstanding compliance with the terms of this Order. Before performing any of the work which Respondents have agreed to undertake pursuant to this Order, EPA agrees to give

three (3) business days written advance notice to Respondents, except where the need for prompt emergency action renders such advance notice impracticable.

76. Notwithstanding any other provision of this Order, EPA reserves its right to bring or pursue any action against Respondents (or any other responsible parties) pursuant to Section 107 of CERCLA, 42 U.S.C. §9607, for recovery of any costs incurred in oversight of Respondents' implementation of this Order, and any other past or future costs incurred by the United States government with respect to this Site or which relate to areas affected by a release from this Site or work conducted under this Order.

77. Notwithstanding any other provision of this Order, EPA reserves its right to take enforcement actions against Respondents or any other person including, but not limited to, actions for monetary penalties for any violation of law or this Order and any other enforcement or other legal action pursuant to CERCLA, RCRA, or any other legal authority, including without limitation, an action or actions for injunctive relief, including actions to compel compliance with this Order, an action or actions for cost recovery, for monetary penalties, and for punitive damages. Enforcement actions may also include, though need not be limited to, actions pursuant to Sections 106(b)(1), 107(c)(3) and/or 109 of CERCLA, 42 U.S.C. §§9606(b)(1), 9607(c)(3), 9609.

Reimbursement of Costs

78. After the date of this Order, and thereafter, after the end of each fiscal year quarter, EPA will submit to Respondents a statement of all oversight costs incurred after the effective date of this Order, which have been recorded as disbursed by the United States or the Hazardous Substance Superfund prior to the date of such statement, excluding any costs which have already been reimbursed by Respondents. The statement will also include any interest due on said costs pursuant to Section 107(a) of CERCLA. Oversight costs include, but are not limited to, direct costs of oversight of work under this order as well as any associated costs incurred by EPA in providing operations, management, sampling, analysis, as well as the compilation, maintenance and updating of the administrative record required by Section 113 of CERCLA. In addition, Respondents agree to pay interest on such sums as required by Section 107(a) of CERCLA, 42 U.S.C. §9607(a), beginning thirty days after the date of presentation of said statement. The Respondents shall, within thirty (30) days of receipt of said statement, remit a cashier's or certified check for the amount of said costs, and any interest, made payable to the Hazardous Substance Superfund. Such remittance shall be accompanied by a letter referencing the name of this Site, Red Oak Landfill, and the EPA site number (Site number X4), and shall be sent to:

Hazardous Substance Superfund
U.S. Environmental Protection Agency
Attention: Superfund Accounting
P.O. Box 360748M
Pittsburgh, PA 15251

A copy of the transmittal letter accompanying each such check shall be sent to EPA's Project Manager, at the address given in Paragraph 50. Payments made will be applied first to any interest due, with the remaining amount applied to outstanding principal.

79. Respondents may review any summary of costs and disbursements submitted to it by EPA at a mutually convenient time at the offices of EPA Region VII, and may verify all expenditures made by EPA by review of relevant financial or payment records in the possession of Region VII of EPA provided that such disclosure is made in accordance with applicable laws and would not reveal information whose confidentiality is protected by law. The pendency of such review shall not excuse Respondents from making any payment required under this Order at the time such payment becomes due. Any EPA-approved adjustments or reimbursement resulting from such review shall be made at the time of next payment under this Order. Further, under CERCLA, Respondents are liable for costs incurred by EPA in providing and preparing for such a review, and can be billed for such costs.

Other Claims

80. Nothing contained in this Order shall affect any right, claim, interest, defense, or cause of action of any party hereto with respect to any person or entity not a party to this Order.

81. Respondents agree not to make any claims pursuant to Sections 106(b)(2), 111 and/or 112 of CERCLA, 42 U.S.C. §§9606(b)(2), 9611, 9612, either directly or indirectly, against the Hazardous Substance Superfund, for costs incurred by them in complying with this Order.

82. Nothing in this Order shall be construed to authorize or pre-authorize any claim by any party against the Hazardous Substance Superfund under Section 111 of CERCLA, 42 U.S.C. §9611, or 40 CFR §300.25.

Other Applicable Laws; Permits

83. All actions required to be taken pursuant to this Order shall be undertaken in accordance with the requirements of all applicable local, State and Federal laws and regulations, unless an exemption from such requirements is specifically provided; except that, pursuant to Section 121(e)(1) of CERCLA, 42 U.S.C. §9621(e)(1), no local, state or federal permit shall be required for activities conducted entirely onsite. Respondents and their consultants and contractors shall be responsible for obtaining any necessary permits, licenses and other authorizations.

Liability of the United States

84. Respondents agree to indemnify and save and hold EPA and the United States Government, its agencies, departments, agents and employees harmless from any and all claims or causes of action, damages and costs of any type or description arising from or on account of acts or omissions of the Respondents, or any of them, or their officers, directors, officials, employees, receivers, trustees, agents, contractors, subcontractors,

successors or assigns, in carrying out any activities pursuant to this Order. EPA is not and shall not be represented to be a party to any contract entered into by Respondents to carry out activities pursuant to this Order. EPA shall not be liable for any work carried out under this Order, whether or not conducted in accordance with the provisions of this Order. Subject to the above provisions of this Paragraph, the liability of the United States, if any, for matters related to this Order, shall be governed by applicable federal laws, including CERCLA and the Federal Tort Claims Act.

Public Comment

85. It is understood and agreed that after the approval of a Feasibility Study report, EPA will make both the Remedial Investigation final report and the Draft Feasibility Study report available to the public for review and comment.

Effective Date and Subsequent Modification

86. This Order shall be effective five (5) business days after the date that notification of execution of the Order by EPA has been mailed to the Respondents. This Order may be amended by mutual agreement of EPA and the Respondents. Such amendments shall be in writing and shall be effective on the seventh day after receipt by Respondents' Project Coordinator unless a different date is specified therein.

87. No informal advice, guidance, suggestions, or comments by EPA regarding reports, plans, specifications, schedules, and any other writing submitted by the Respondents will be construed

as relieving the Respondents of any of their obligations under this Order, including but not limited to the obligation to obtain formal approvals from EPA as required by this Order.

Parties Bound

88. This Order shall apply to and be binding upon the Respondents, their officers, directors, officials, employees, agents, trustees, receivers, successors, and assigns and upon all persons, contractors, and consultants acting under or for Respondents. By signature below, EPA likewise agrees to this Order, and agrees to direct'its employees, agents and contractors to adhere to its terms.

89. No change in ownership or corporate or partnership status relating to the Site will in any way alter the status of any Respondent or in any way alter such Respondent's responsibility under this Order.

90. The Respondents shall provide a copy of this Order to each contractor, subcontractor, laboratory and consultant retained to conduct any portion of the work performed pursuant to this Order within 14 calendar days of the effective date of this Order or on date of retention of the contractor, subcontractor, laboratory or consultant, whichever is later.

Penalties for Delay and Non-Compliance

91. If Respondents fail, without prior EPA approval, to comply with any of the time limits set forth in or established pursuant to this Order, including the time limits set forth in Appendix II, and such failure is not excused under Paragraph 66 of this Order, nor permitted by an extension of time granted

pursuant to Paragraph 49 or 70, Respondents shall pay a stipulated penalty to EPA in the amount indicated below for each calendar day of noncompliance.

Days After Required Date	Stipulated Penalty
1 to 6 days	$ 0 per day
7 to 14 days	$ 1,000 per day
15 days or more	$ 1,500 per day

Any such penalty shall accrue as of the date that the applicable deadline has passed, and shall continue to accrue until the noncompliance is corrected. Such penalties shall be due and payable on earliest of the following two dates: the thirtieth day following the date the penalty accrues, or ten (10) days following receipt of a written demand by EPA. Payment of any such penalty to EPA shall be made by directing a cashier's or certified check made payable to the "Hazardous Substance Superfund," to the address set forth in Paragraph 78 above. A letter stating the basis for the penalties, and giving the name of the Site, and the EPA site number (Site number X4) shall accompany each such payment; and a copy of the letter shall be mailed to the EPA Project Manager at the address given in Paragraph 50 above.

92. Any penalties due and payable under the preceding Paragraph, or otherwise due under law or under this Order, which are incurred because of failure of Respondents, without prior EPA approval, to comply with any of the intermediate time limits set

forth in Appendix II, shall be reimbursed to Respondents if paid, and/or forgiven if not paid, if the final completion of work under this Order is not delayed by such failure.

93. In addition, willful violation of failure or refusal to comply with this Order, or any portion thereof, may also subject the Respondents to civil penalties under Sections 106(b) and 109(b) of CERCLA, 42 U.S.C. §§ 9606(b) and 9609(b). Moreover, failure to comply with this Order or any portion thereof, without sufficient cause, may subject the Respondents, under Section 107(c)(3) of CERCLA, 42 U.S.C. §9607(c)(3), to liability for punitive damages in an amount up to three times the amount of any costs incurred by the government as a result of the Respondents failure to take required action.

Notice to the State

94. EPA has notified the State of Iowa pursuant to the requirements of Section 106(a) of CERCLA, U.S.C. §9606(a).

Termination and Satisfaction

95. The provisions of this Order shall be deemed satisfied upon the Respondents receipt of written notice from EPA that all of the terms of this Order, including any additional work, have been completed. Following Respondent's completion of the requirements of this Order, Respondent may apply to the Regional Administrator, EPA Region VII, for acknowledgement that the requirements of this Order have been completed in compliance with applicable laws and regulations. EPA will not unreasonably withhold such acknowledgement.

IT IS SO AGREED AND ORDERED:

U.S ENVIRONMENTAL PROTECTION AGENCY

Date: 11/24/89

By: Alan L Wehmeyer
for David A. Wagoner, Director
Waste Management Division
U.S. Environmental Protection Agency
Region VII

Date: 11/24/89

By: Jonathan S Kahn
Jonathan Kahn
Assistant Regional Counsel
U.S. Environmental Protection Agency
Region VII

SIGNATURE PAGE
ADMINISTRATIVE ORDER ON CONSENT
DOCKET NO. VII-89-F-0016
RED OAK LANDFILL

CONSENT

Respondent hereby consents to the issuance of this Order and to its terms.

EVEREADY BATTERY COMPANY, INC.

DATE: November 13, 1989

BY: S.W. Perry
Signature

S. W. PERRY
Print or type name of person signing

General Manager - Production
Print or type title

SIGNATURE PAGE
ADMINISTRATIVE ORDER ON CONSENT
DOCKET NO. VII-89-F-0016
RED OAK LANDFILL

CONSENT

Respondent hereby consents to the issuance of this Order and to its terms.

BANGOR PUNTA DIVERSIFIED HOLDING CORP.

DATE: Nov. 13, 1989

BY: ______________________
Signature

Gerald G. Tighe
Print or type name of person signing

Senior Vice President
Print or type title

SIGNATURE PAGE
ADMINISTRATIVE ORDER ON CONSENT
DOCKET NO. VII-89-F-0016
RED OAK LANDFILL

CONSENT

Respondent hereby consents to the issuance of this Order and to its terms.

UNIROYAL HOLDING, INC.

DATE: November 10, 1989 BY: ______________________________
Signature

David J. O'Boyle
Print or type name of person signing

Assistant Secretary
Print or type title

SIGNATURE PAGE
ADMINISTRATIVE ORDER ON CONSENT
DOCKET NO. VII-89-F-0016
RED OAK LANDFILL

CONSENT

Respondent hereby consents to the issuance of this Order and to its terms.

UNIVERSAL COOPERATIVES, INC.

DATE: November 15, 1989 BY: ______________________
Signature

Floyd E. Grabiel
Print or type name of person signing

Vice President Law and
Administrative Services
Print or type title

SIGNATURE PAGE
ADMINISTRATIVE ORDER ON CONSENT
DOCKET NO. VII-89-F-0016
RED OAK LANDFILL

CONSENT

Respondent hereby consents to the issuance of this Order and to its terms.

CITY OF RED OAK, IOWA

DATE: November 7, 1989 BY: ____________________
Signature

Ray Gustafson
Print or type name of person signing

Mayor
Print or type title

APPENDIX II
TABLE OF MILESTONES

Item	Deadline
Initiation of field investigation	Initiate 2 weeks from effective date of Order.
First Preliminary RI Report Including Preliminary Endangerment Assessment	Submit to EPA 18 weeks after required date for initiation of field investigation.
Revised RI Report following Phase I, including Endangerment Assessment	Submit to EPA 30 days after receipt of comments from EPA.*
Preliminary Phase II RI/FS Work Plan	Submit to EPA 30 days after receipt of notification from EPA that Phase II Work will be necessary.
Revised Phase II RI/FS Work Plan	Submit to EPA 15 days after receipt of comments from EPA.
Subsequent Revised Preliminary RI Report which includes Phase II Work.	To be submitted in conformance with EPA-approved schedule in Phase II RI/FS Work Plan.
Preliminary FS Report	Submit to EPA 13 weeks after EPA approves the final RI report, or 13 weeks after EPA sends a letter telling Respondents to proceed with the FS, whichever occurs first.**

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* This requirement can be waived by EPA if a Phase II study is required.

** EPA will not send such a letter to Respondents unless Respondents have submitted at least one of the following: Preliminary RI Report, Revised RI Report, Subsequent Revised Preliminary RI Report which includes Phase II Work. If EPA requires a second phase of work, EPA will not send such a letter unless Respondents have submitted a Subsequent Revised Preliminary RI Report which includes Phase II Work.

TABLE OF MILESTONES, continued:

Item	Deadline
Revised FS Report	Submit to EPA 30 days after receipt of EPA comments on Preliminary FS Report.
Each monthly report	Submit to EPA by 10th day of each month following the effective date of this Order.

GERAGHTY & MILLER, INC.

RECEIVED
SEP 05 1989
REMD SECTION

Work Plan Remedial Investigation/ Feasibility Study of the Red Oak Landfill Red Oak, Iowa

September 1, 1989

Prepared for

RED OAK LANDFILL PRP GROUP
Mr. Frank H. Hackmann
Ralston Purina Company
Checkerboard Square
St. Louis, Missouri 63164

Prepared by

GERAGHTY & MILLER, INC.
GROUND-WATER CONSULTANTS
322 E. MICHIGAN STREET
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(414) 276-7742

Brad J. Berggren, P.E.
Associate/Principal Engineer

Edward R. Rothschild
Vice President/Senior Consultant

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APPENDICES

1.0 INTRODUCTION

The purpose of this Remedial Investigation/Feasibility Study (RI/FS) is to investigate the nature and the extent of the release or substantial threat of release of hazardous substances at the Red Oak Landfill Site, assess the potential risk to human health and the environment, and develop and evaluate the potential remedial alternatives. This RI/FS shall be conducted in accordance with CERCLA, the National Contingency Plan and all applicable EPA guidance documents.

This work plan contemplates a phased approach in regard to conducting a RI/FS at the site. This work plan presents the preliminary scope of work needed to fill the data gaps identified in the RI/FS Scope Report Document, September 2, 1987, prepared by Woodward-Clyde on behalf of the USEPA. The data acquired during this initial phase of the RI will be used to identify the scope of work for a second phase of RI activities, if necessary. An additional work plan or work plan amendment will be prepared for any second phase of the RI for EPA's review, comment and approval.

The goals of the first phase RI are to: 1) identify the major waste disposal areas including the location of buried materials or objects which could interfere with the installation of monitoring wells, 2) estimate the lateral and vertical extent of the waste disposal areas, 3) investigate the potential for migration of contaminants through surface runoff and/or airborne dust 4) assess the potential or actual migration of contaminants from the waste material to the adjacent soils, 5) acquire information pertaining to subsurface site conditions, 6) investigate the ground-water flow direction and quality in the vicinity of the site and within the former quarry area, 7) evaluate the interconnection between seeps and the saturated zone beneath the landfill, 8) acquire information on the quality of the water and sediment samples collected from the East Nishnabotna River, 9) acquire preliminary information on the sediment and water quality samples collected from on-site surface waters, the tributary north and the pond south of the landfill and the quarry pond west of the landfill, 10) identification of potential receptors and 11) evaluate the impact of the East Nishnabotna River dynamics on the integrity of the landfill.

2.0 BACKGROUND

The Red Oak Landfill site (Figure 1) encompasses 40 acres and is a former municipal landfill which accepted wastes from 1962 to 1974. The contents of the landfill reportedly include municipal wastes, industrial wastes, construction/demolition wastes, and tree trimmings. The landfill site was previously a limestone quarry which operated from 1947 to 1953-1954. The site was purchased by the City of Red Oak, and the quarry pit adjacent to the East Nishnabotna River was operated as a landfill from 1962 to 1974. The water supply well field for the City of Red Oak is located in the highlands approximately 2 miles to the east/southeast.

The Red Oak Landfill Site is located on the cutting bank of the East Nishnabotna River. The topography of the landfill consists of a topographic high located in the southwest corner. The land north of the topographic high slopes to the north/northeast while the land south of the high dips to the south. Slopes within the landfill range from nearly flat terrain to slopes of approximately 10°, with the exception of the eastern edge of the landfill, adjacent to the East Nishnabotna River, where the slope is nearly vertical in places. Erosion appears related to slope instability caused by the proximity of the landfill to the East Nishnabotna River and is greatest in the east central portion of the landfill where junked cars, rusted drums, and other solid wastes are presently exposed.

Soils, loess (wind derived silt and clay) and glacial till reportedly overlie the bedrock in much of the local area. Underlying the loess are glacial till deposits which consist of a clay matrix with occasional silt and sand layers and boulders. These unconsolidated glacial deposits are typically underlain by Dakota Sandstone. However, in the landfill area the sandstone has been removed by pre-glacial stream erosion, and these glacial deposits overlie the Pennsylvanian-age Plattsmouth Limestone, which was the material quarried from the present landfill site. Beneath the Plattsmouth Limestone is the Heebner Shale.

In 1984, the USEPA collected 12 sediment samples and six water samples in and around the landfill area as part of its preliminary investigation. These samples were analyzed for metals, volatile organic compounds, and several other organic compounds. Two leachate seeps displayed relatively high concentrations of metals and organic compounds. Elevated concentrations of metals in the central leachate seep may be associated with municipal wastes (iron, zinc, etc.) and solid industrial wastes (lead and mercury).

Metals of greatest concern detected at the site include lead, mercury, barium and cadmium. Toluene was the only VOC found in the sediment samples. The sediment sample from the northeast leachate seep had a toluene concentration of 1200 parts per billion (ppb). However, the upstream background sediment sample had a higher concentration of 1600 ppb, suggesting the possibility that the sample location is misidentified or the possible existence of an ungradient source.

Water sampled from the central leachate seep had the highest concentrations of metals. The highest VOC concentrations were found in the water sample from the northeast leachate seep. Of the organic compounds suspected to have been disposed of in the landfill, only toluene was detected in this sample. Additional organic compounds detected were chlorobenzene, 1,1,1-trichloroethane, methylene chloride, trichloroethene and xylene.

3.0 REMEDIAL INVESTIGATION TASKS

3.1. TASK 1 - PLANNING AND MANAGEMENT

3.1.1. Planning

The objectives of this task are to obtain and evaluate data for use in planning RI/FS activities efficiently and effectively, to obtain current survey and mapping information, to acquire the permits, easements, and authorizations necessary to perform the work, and to prepare the supporting plans. Geraghty & Miller will perform and manage all tasks related to this RI/FS. The project managers, officers and coordinators are defined in the QAPP and DMP. Management and coordination of all RI/FS work tasks identified in this work plan is also included in this task.

Three sub-tasks are included:

- Pre-Investigation Evaluation
    - Existing and Historical Information
    - Surveying and Mapping
    - Permits, Easements, Authorizations
    - Review of Potential Remedial Technologies
- Preparation of Plans
    - Sampling and Analysis Plan
    - Quality Assurance Project Plan
    - Health and Safety Plan
    - Data Management Plan
- Management and Coordination

3.1.1.1. Pre-Investigation Evaluation

3.1.1.1.1. Existing and Historical Information

Prior to performing the RI fieldwork, records were searched to obtain historical and existing data pertaining to the Red Oak Landfill Site. This search included historical aerial photography, topographic maps, existing USEPA file information; geologic, hydrogeologic and environmental studies previously performed in close proximity to the site; and residential well logs. This information was used during preparation of the sampling and quality assurance project plans. The information search also included summarizing the types and quantities of materials reportedly placed in the landfill and the past history of response actions at the site.

3.1.1.1.2. Surveying and Mapping

This subtask includes performing the surveying and mapping necessary for the preparation of a site topographic map (Figure 2) to National Map Accuracy Standards, prepared at a horizontal scale of 1"=50' with a 1-foot contour interval. The map will show the pertinent planimetric and topographic features; and property boundaries. The planimetric features will include water bodies, trees, roads, utilities and fences. The limits of the map will extend beyond the landfill limits for assessment of site surface water runoff.

Prior to surveying and mapping the site and obtaining aerial photography, the horizontal and vertical datums will be field established. The horizontal datum will be a local recoverable datum; the vertical datum will be Mean Sea Level Datum of 1929. The altitude of the flights will be compatible with mapping the site for a 1-foot contour interval accuracy.

After the aerial photography is obtained, control surveys will be performed to control the stereoscopic models during compilation. Legal descriptions will be researched at the courthouse and the property lines will be drafted on the topographic map. The final map will be drafted and will become the basis for other information to be overlayed in the RI report.

3.1.1.1.3. Permits, Easements, and Authorizations

Efforts to secure access to property upon which work is intended to be performed and all permits, easements and authorizations needed in order to perform the remedial investigation fieldwork is the responsibility of the PRPs. These efforts may include, but are not limited to:

- Authorizations to cut trees and vegetation necessary to gain access to locations where monitoring wells will be located,
- Permits or easements needed to perform work in public rights-of-way, and
- Authorizations to gain access to residential, private, commercial, or industrial wells for sampling.

3.1.1.1.4. Review of Potential Remedial Technologies

Prior to initiating the actual field investigations and preparing the SAP, DMP, and QAPP, a review of pertinent Applicable or Relevant and Appropriate Requirements (ARARs) and potential remedial technologies will be performed to ensure that the proposed plans and investigations will support the RI/FS decision-making process. These technologies will include, but not be limited to:

- No Action
- Limited Action
- Capping
- Containment (barriers)
- Source Removal
- Treatment (soils and water)

The PRPs will prepare a draft list of suggested applicable or relevant and appropriate Federal and State requirements along with the proposed basis for such list, which shall be submitted to the USEPA for review and comment.

3.1.1.2. Plans

As part of this work plan, four additional plans will be prepared. These plans include a Sampling and Analysis Plan, Quality Assurance Project Plan, Health and Safety Plan, and a Data Management Plan. The purpose of each of these plans and their descriptions follow:

3.1.1.2.1. Sampling and Analysis Plan

A SAP will be prepared to ensure that the necessary data are acquired to determine the nature and extent of site described constituents, to identify contaminant migration pathways and evaluate potential hazards to the public health and the environment, and to support the development and evaluation of remedial alternatives during the feasibility study. The Sampling and Analysis Plan (Work Plan, Appendix A) includes descriptions of the sampling locations, the numbers and types of samples to be collected, and the laboratory analyses to be performed on each sample.

3.1.1.2.2. Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) will be prepared to ensure the laboratory and sampling procedures used will not detract from the quality of the results, and to ensure that all findings and results are documented. The QAPP (Work Plan, Appendix B) will include field and laboratory quality assurance procedures. USEPA guidance documents will be followed during the preparation of the QAPP.

3.1.1.2.3. Health and Safety Plan

A site specific Health and Safety Plan (Work Plan, Appendix C) will be developed using Standard Operating Safety Guides (USEPA), and the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. The plan is developed to ensure that characteristics of identified site constituents are understood prior to entering the site, and that proper protective clothing and gear is worn by all personnel involved to any extent in the RI/FS project.

3.1.1.2.4. Data Management Plan

A Data Management Plan (Work Plan, Appendix D) will be prepared to ensure that all information and data necessary to the completion of the RI are properly recorded, preserved and made available for convenient use.

3.1.1.3. Management and Coordination

This task consists of the management and coordination of the day-to-day work identified in the various work plan tasks. The PRP Coordinator will at all times have knowledge of the task development and the schedule for completion of the individual tasks.

The project coordinator will have control of the budget, the scope of work, and the schedule, including those of the subcontractors, subject to the requirements of this Consent Order and its attachments.

3.2. TASK 2 - COMMUNITY RELATIONS

The USEPA's Region VII Community Relations Coordinator will be responsible for the development of the community relations plan for the Red Oak Landfill Site. The PRPs, or their consultants (at the request of the PRPs), will provide support and assistance to the USEPA Remedial Project Manager as required by the USEPA. This assistance may include attendance at public meetings or preparation of graphics for use at public meetings.

3.3. TASK 3 - FIELD INVESTIGATION

This task includes the activities necessary to gather the information and data for implementing the actual Phase I field investigations, and to perform these investigations. The sub-tasks consist of an information gathering phase, and a technical investigation phase.

3.3.1. Information Gathering

This subtask includes collecting available information regarding private, industrial, commercial, and public drinking water supply wells within a one-mile radius of the site. This information will be tabulated and summarized for use in selecting those wells to sample if sampling becomes necessary. Based on the ground-water flow regime and available information regarding ground water as a possible contaminant pathway, a sampling plan will be developed to sample selected off-site wells.

In addition, historic data will be collected regarding wind patterns, temperature, and rainfall events. This information will be used in correlating the information during the data evaluation phase of the project.

3.3.2. Technical Investigations

The environmental media to be sampled at the site, including locations and numbers of samples, and protocol for sampling are described and presented in Work Plan Appendices A and B (SAP and QAPP). The field sampling will be performed based on the procedures and methods described in the approved QAPP and Sampling and Analysis Plan.

The surveying to be performed in this task consists of obtaining elevations at both the top of the riser pipe and the ground surface adjacent to the well to the nearest 0.01 foot on the installed monitoring wells for use in evaluating ground-water flow directions; obtaining elevations of features pertinent to surface water runoff, including leachate seeps and culvert and ditch inverts, manholes, basins, and water bodies (west quarry pit and east Nishnabotna River); and locating the installed monitoring wells to the nearest 1-foot.

During well installation and soil sampling (as per the sampling plan), organic vapors will be monitored using an organic vapor analyzer.

3.4. TASK 4 - DATA EVALUATION AND SITE INVESTIGATION ANALYSIS

This task will include the analysis and summary of data and information collected in Tasks 1 through 3, and will also contain a contamination assessment and an endangerment assessment.

The contamination assessment will include the quantities, types, forms, and concentrations of identified constituents found at the site, citing both historical and RI-developed data. Tabulations of the laboratory results will be provided with comparisons of this data to background levels.

The endangerment assessment will be developed in accordance with the USEPA guidance documents entitled Risk Assessment Guidance for Superfund (RAGS), OSWER Directive 9285.7-01, March 1989 which is a two manual set. One manual, the Environmental Evaluation Manual provides guidance for ecological assessment at Superfund sites; the other, the Human Health Evaluation Manual provides guidance for human health risk assessment at these sites. A companion guidance document to be used in conjunction with RAGS in the development of the endangerment assessment is the USEPA guidance document entitled Superfund Exposure Assessment Manual, OSWER Directive 9285.5-1, April, 1989. The endangerment assessment will include information regarding the hazardous substances which may have been, or may be in the future, released to the environment and the properties of the chemicals, concentrations and exposure levels of the hazardous substances identified, routes of exposure, and the present and future risks of the exposure. This assessment, including the contaminant sources and migration pathways, will become the basis for identifying technologies and assembling alternatives for site remediation.

3.5. TASK 5 - LABORATORY AND BENCH-SCALE STUDIES

This task consists of a literature review of applicable treatment technologies and telephone interviews with potential vendors experienced in the considered technologies identified in Task 1. The results of the literature review and vendor interviews will be used during the Feasibility Study Phase of the project. If evaluations made during the FS indicate the need for bench-scale studies, a testing plan will be developed by the PRPs. This plan will be transmitted to the USEPA for their review, comment and approval.

3.6. TASK 6 - REPORTS

3.6.1. Preliminary Remedial Investigation Report

A Preliminary Remedial Investigation Report will be prepared summarizing the Phase I field activities and will include a preliminary risk assessment based on the information available to date. This report will be provided to the USEPA as a formal deliverable in draft form for their review, comment and approval.

Phase I activities will include: 1) the completion of 12 shallow soil borings within the landfill and one shallow soil boring completed within the quarry backfill material away from areas potentially affected from the landfilling activities. Standard penetration tests and visual classification of the soils will also be conducted, 2) the installation of five shallow monitoring wells to be located in the saturated zone, ground-water samples collected from these monitoring wells will be analyzed for VOCs, acids, base/neutral compounds and metals including cyanide as defined in the USEPA Contract Laboratory Program Statement of Work for Organic Analysis (October, 1986 revised August 1987), and the USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis (July 1987), hereinafter the CLP SOW for Organic/Inorganic analysis; slug tests will be performed on the wells, 3) the collection of 13 sediment and 11 surface water samples from the perennial ponds and drainageways adjacent to the Site and from the East Nishnabotna River. Sediment and surface water samples will be analyzed for VOCs, acids, base/neutrals and metals including cyanide as defined in the CLP SOW for Organic/Inorganic analysis,

4) the collection of a minimum of five leachate samples from the landfill seeps. These samples will be analyzed for VOCs, acids, base/neutrals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis, 5) the collection of six composite soil samples from the landfill cover material at major waste disposal areas. These samples will be analyzed for VOCs, acids, base/neutral including cyanide compounds as defined in the CLP SOW for Organic/Inorganic Analysis, 6) conduct geophysical survey using GPR or EM, 7) survey and map the vicinity of the site; and 8) the collection of information regarding the private, industrial, commercial and public water supply wells located within a one mile radius of the Site.

The scope of activities to be conducted during the second phase of the RI are dependent upon the results acquired during the first phase of the RI. The scope of the second phase RI will consist of activities that when combined with existing file information and results from Phase I activities will enable the EPA, with support from the PRP group, to define the extent of the contamination in sufficient detail to assess the threat or potential threat to human health and the environment, develop remedial action objectives, and complete the Feasibility Study (FS). To support and complete the FS, sufficient data will be collected to 1) adequately characterize the waste and surrounding soils in order to evaluate containment/treatment/disposal technologies, 2) evaluate the necessity and applicability of hydrogeologic barriers/interceptors or withdrawal techniques for ground water and seep control, and 3) evaluate the necessity and suitability of surface waters/sediments for containment/treatment/disposal. An additional work plan or work plan amendment will be prepared by the PRPs for the second phase of the RI, for the USEPA's review, comment and approval, and the EPA approved plan will then be carried out according to the EPA approved schedule contained in that plan.

If Phase II activities are necessary, a separate work plan or work plan amendment will be prepared and submitted to USEPA for review and comment.

3.6.2. Remedial Investigation Report

A draft remedial investigation report including a draft endangerment assessment report will be prepared covering the entire investigation. This report will be developed consistent with the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, as amended ("National Contingency Plan" or "NCP"), and with the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA OSWER Directive Number 9355.3-01, October 1988 or such more recent version as the USEPA shall make available. The draft remedial investigation and endangerment assessment reports will be transmitted to the USEPA for their review, comment and approval. Upon receipt of the USEPA comments, the report will be revised as per the USEPA comments and resubmitted to the USEPA.

The report will contain information used in the planning, implementation, evaluation and assessment of the Remedial Investigation, including but not limited to:

- Existing site information gathered during the pre-investigation analysis including historical aerial photographs, topographic maps, reports of previous studies surrounding the area, file information, and interviews with personnel having knowledge of the site,

- The history of response actions relating to the landfill and the reported types and quantities of materials presently in the landfill,
- Results of soil, sediment, surface water, leachate, and ground-water chemical analysis, and
- A determination of the nature and extent of site-derived constituents at the landfill site, and
- An evaluation of identified potential migration pathways,
- An assessment of potential public health and environmental risks.

Copies of each of the draft and revised reports will be sent to the USEPA for review, comment and approval.

4.0 FEASIBILITY STUDY TASKS

Tasks 7 through 9 include the work necessary to perform a Feasibility Study for the Red Oak Landfill Site. The contaminant sources and migration pathways identified in the risk assessment become the basis for identifying applicable technologies and screening the alternatives for use in remediating the site.

4.1. TASK 7 - REMEDIAL ALTERNATIVES SCREENING

This task consists of efforts needed to select the alternatives which undergo full detailed evaluation. A list of these alternatives which will be screened for detailed evaluation including the reason(s) for their being dropped or retained for detailed evaluation shall be sent to the USEPA for review, comment and approval. The alternatives will be developed in conformance with the National Contingency Plan, CERCLA and with the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA OSWER Directive Number 9355.3-01, October 1988, or such more recent version as the USEPA shall make available. The subtasks incorporated in Task 7 include:

- preliminary identification of ARARs subject to EPA review, comment and approval,
- identification and screening of technologies, and
- development and screening of alternatives.

4.1.1. Identification and Screening of Technologies

Based on the contaminant sources and migration pathways defined in the risk assessment, potentially feasible response technologies will be identified which may be considered for the Red Oak Landfill site including both on-site and off-site remedies. The identified technologies will be screened in accordance with the requirements of CERCLA, the National Contingency Plan and the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, October 1988, or such more recent version as the Agency shall make available.

4.1.2. Development and Screening of Technologies

Based on the technologies retained from Task 7, a limited number of remedial alternatives will be assembled and screened according to the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, October 1988, or such more recent version as the Agency shall make available. The alternatives developed will include alternatives for source control or source elimination that would eliminate the need for long term management, and alternatives involving treatment to reduce toxicity, mobility, or waste volume.

A no-action alternative shall be developed as a baseline for comparison with other alternatives. Current plans also call for the development of an alternative involving the containment of waste with little or no treatment, seeking to provide protection by preventing potential exposure or reducing the mobility of the waste.

If ground-water response actions are identified, a limited number of proposed remedial alternatives will be developed which will effectively remediate the site to the levels required under CERCLA, the National Contingency Plan, and the nine criteria given above and identified in the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, October 1988, or such more recent version s the Agency shall make available.

The assembled alternatives will be screened consistent with CERCLA, the National Contingency plan and the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OWSER Directive 9355.3-01, October 1988, or such more recent version as the Agency shall make available.

4.2. TASK 8 - REMEDIAL ALTERNATIVES EVALUATION

This task includes evaluation of the alternatives remaining after the initial screening in Task 7, and comparison of the remaining alternatives to one another using the nine criteria set forth in the "RI/FS Guidance" document. The final step in this task is to arrive at a recommended remedy.

4.2.1. Evaluation of the Alternatives

The PRPs will suggest action-specific Federal and State ARARs and other regulatory standards to be considered during EPA's selection of the remedy, and will consult with the USEPA concerning any additional advisories and guidance to be followed during the Feasibility Study. The alternatives will be evaluated consistent with CERCLA, the NCP, and the "RI/FS Guidance" document.

4.2.2. Comparison of Alternatives

This sub-task includes comparing the alternatives to one another using the following nine criteria identified in the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, October, 1988, or such more recent version as the Agency shall make available.

1. Overall Protection: How the alternative achieves and continues to protect human health and the environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): How the alternative complies with ARARs or if a waiver is required and how the waiver is justified. How the alternative complies with advisors, criteria, and guidance that EPA and State must follow under Section 121 of CERCLA.

3. Long-Term Effectiveness and Permanence: The long-term effectiveness of alternatives in protecting human health and the environment after response objectives have been met.

4. Reduction of Toxicity, Mobility, or Volume: The anticipated performance of the specific treatment technologies.

5. Short-Term Effectiveness: The effectiveness of alternatives in protecting human health and the environment during the construction and implementation period until response objectives have been met.

6. <u>Implementability:</u> The technical and administrative feasibility of alternatives, including the availability of goods and services needed to implement the alternative.

7. <u>Costs:</u> The capital and O & M costs of each alternative.

8. <u>State Acceptance:</u> The preferences or concerns of the support agency about the alternatives in the RI/FS report and Proposed Plan and ARARs or any waivers to them.

9. <u>Community Acceptance:</u> Community preference or concerns about alternatives.

4.2.3. Selection of a Preferred Remedy

Beginning with input and support from the PRP group, the preferred remedy will be selected by the USEPA, to be consistent with the requirements of CERCLA, the National Contingency Plan and consistent with the "nine criteria" presented in Section 4.2.2 and identified in the <u>Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA,</u> OSWER Directive 9355.3-01, October, 1988, or such more recent version as the Agency shall make available.

4.3. TASK 9 - FEASIBILITY STUDY REPORT

Two separate reports will be prepared under this task, a preliminary draft report and a draft report which incorporates the USEPA comments. The preliminary draft Feasibility Study report and any subsequent revisions will be prepared consistent with CERCLA, the National Contingency Plan and the <u>Guidance for Conducting</u>

<u>Remedial Investigations and Feasibility Studies Under CERCLA,</u> OSWER Directive 9355.3-01, October, 1988, or such more recent version as the Agency shall make available. The report will present the results of Tasks 7 and 8 and will be submitted to the USEPA for review, comment and approval.

5.0 SCHEDULE

An approximate schedule for completion of the work tasks identified in this work plan is presented in Figure 3. The schedule presented in Figure 3 indicates two rounds of ground-water sampling. The second round of ground-water sampling is shown to occur approximately two weeks after the initial round of sampling. The schedule presented in Figure 3 is for illustrative purposes only. Actual RI/FS schedule requirements are presented in Appendix II of the Consent Order (Table of Milestones).

#RedOak#3\WORKPLAN

FIGURE 3
APPROXIMATE RED OAK LANDFILL RI/FS SCHEDULE

	SCHEDULE AFTER NOTICE TO PROCEED OR EFFECTIVE DATE OF THE CONSENT ORDER					
	1st QUARTER	2nd QUARTER	3rd QUARTER	4th QUARTER	5th QUARTER	6th QUARTER
PLANNING						
Prepare site topographic map	*****					
Permits and easements	***					
FIELD INVESTIGATION						
Technical Investigations						
Soil Borings	****					
Leachate, Surf Water, Sed Samples	**					
Laboratory Analyses	****					
Monitoring Well Installations	***					
Ground-water sampling	* *					
Laboratory Analyses	****	****				
Water Level Measurements	* *	*	*	*		
Geophysical Survey (EM and/or GPR)	**					
DATA EVALUATION						
		Phase	II			
Endangerment Assessment	******	******------	--****			
REPORTS						
Preliminary RI Report	**	******				
Agency Draft Review		****				
Resubmittal		**	**			
Remedial Investigation Report	*****	******------	--*****			
Agency Draft Review		Activities	****			
Resubmittal		(see note)	*	***		
Agency Final Review				****		
FEASIBILITY STUDY						
Remedial Alternatives Screening	*	* * * * * *	* * * ******	****		
Remedial Alternatives Evaluation				*********		
Prepare Preliminary Draft Report					****	
Agency Prelim Draft Review					****	
Resubmittal					**	
Agency Draft Review					**	**
Public Comment Period						****
Agency Final Review						****
Final Submittal						**
MANAGEMENT	************	************	************	************	************	************

NOTE: This schedule incorporates initial Phase I field activities and assumes a two month period (after submittal of the draft preliminary RI report) for definition and perforamnce of any additional feildwork (Phase II). When the scope of any additional or Phase II activities is defined the schedule will be adjusted accordingly.

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GERAGHTY & MILLER, INC.

WORK PLAN
APPENDIX A

Sampling and Analysis Plan

Red Oak Landfill
Red Oak, Iowa

Red Oak Landfill
Red Oak, Iowa

WORK PLAN
APPENDIX A
Sampling and Analysis Plan

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1.0 OBJECTIVES

This Sampling and Analysis Plan presents the procedures to be used in performing soil borings, installing monitoring wells, and the collection of ground water, surface water, sediment and soil samples from the Red Oak Landfill Site. The goals of this Sampling and Analysis Plan are 1) identify the major waste disposal areas including the location of buried materials or objects which could interfere with the installation of monitoring wells, 2) estimate the lateral and vertical extent of the waste disposal areas, 3) investigate the potential for migration of contaminants through surface runoff and/or airborne dust, 4) assess the potential or actual migration of contaminants from the waste material to the adjacent soils, 5) acquire information pertaining to subsurface site conditions, 6) investigate the ground-water flow direction and quality in the vicinity of the site and within the former quarry area, 7) evaluate the interconnection between seeps and the saturated zone beneath the landfill, 8) acquire information on the quality of the water and sediment samples collected from the East Nishnabotna River, 9) acquire preliminary information on the sediment and water quality samples collected from on-site surface waters, the tributary north and the pond south of the landfill and the quarry pond west of the landfill, 10) identify potential receptors and 11) evaluate the impact of the East Nishnabotna river dynamics on the integrity of the landfill.

Consistent with the scope of activities outlined by the RI/FS Scoping Report Document prepared by Woodward-Clyde Inc., in September 1987 on behalf of the USEPA, the following activities will be conducted during the initial phase of the Remedial Investigation: 1) the completion of 12 shallow soil borings within the landfill and one shallow soil boring completed within the quarry backfill material away from areas potentially affected from the landfilling activities. Standard penetration tests and visual classification of the soils will also be conducted, 2) the installation of five shallow monitoring wells to be located in the saturated zone; ground-water samples collected from these monitoring wells will be analyzed from VOCs, acids, base/neutral compounds and metals including cyanide as defined in the USEPA Contract Laboratory Program Statement of Work for Organic Analysis (October 1986 revised August 1987), and the USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis (July 1987), hereinafter the CLP SOW for Organic/Inorganic Analysis; slug tests will be performed on the wells, 3) the collection of 13 sediment and 11 surface water samples from the perennial ponds and drainageways adjacent to the Site and from the East Nishnabotna River. Sediment and surface water samples will be analyzed for VOCs, acids, base/neutrals and metals including cyanide as defined in the CLP Sow for Organic/Inorganic Analysis, 4) the collection of a minimum of five leachate samples from the landfill seeps. These samples will be analyzed for VOCs, acids, base/neutrals including cyanide as defined in the CLP SOW for Organic/Inorganic analysis, 5) the collection of six composite soil samples from the landfill cover materials at major waste disposal areas. These samples will be analyzed for VOCs, acids, base/neutral including cyanide compounds as defined in the CLP SOW for Organic/Inorganic Analysis, 6) conduct geophysical survey using GPR or EM, 7) survey and map the vicinity of the Site; and 8) the collection of information regarding the private, industrial, commercial and public water supply wells located within a one mile radius of the Site.

Field blanks and replicate samples (1 for each 10 samples) will be collected from each media to meet QA/QC objectives. Table A-1 summarizes the estimated number of samples, replicates, and field blanks to be collected during this initial RI phase, the analyses to be conducted on the various samples collected, and the analytical level as defined in Data Quality Objectives for Remedial Response Activities (EPA 540/G-871003A).

TABLE A-1
SUMMARY OF THE SAMPLING AND ANALYSIS PROGRAM AT RED OAK LANDFILL (1)

SAMPLE MATRIX	FIELD MEASUREMENTS	LABORATORY PARAMETERS (2)	DQO (3) ANALYTICAL LEVEL	NO.	SAMPLES FREQ.	TOTAL	FIELD REPLICATES NO.	FREQ.	TOTAL	FIELD BLANKS (4) NO.	FREQ.	TOTAL	TRIP BLANKS NO.	FREQ.	TOTAL	MATRIX TOTAL
GROUNDWATER	pH Specific Conductance	TCL VOCs (5) Consistent with CLP Protocols Unfiltered Samples	IV	5	2	10	1	2	2	1	2	2	1	2	2	16
	Temperature	TCL Metals Consistent with CLP Protocols Filtered Samples	IV	5	2	10	1	2	2	1	2	2	--	--	--	14
	Static Water Levels	TCL Metals Consistent with CLP Protocols Unfiltered Samples	IV	5	2	10	1	2	2	1	2	2	--	--	--	14
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols Unfiltered Samples	IV	5	2	10	1	2	2	1	2	2	--	--	--	14
SURFACE WATER	pH Specific Conductance	TCL VOCs Consistent with CLP Protocols Unfiltered Samples	IV	11	1	11	2	1	2	1	1	1	1	1	1	15
	Temperature	TCL Metals Consistent with CLP Protocols Unfiltered Samples	IV	11	1	11	2	1	2	1	1	1	--	--	--	14
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols Unfiltered Samples	IV	11	1	11	2	1	2	1	1	1	--	--	--	14
SEDIMENT	HNu Screening (6)	TCL VOCs Consistent with CLP Protocols	IV	13	1	13	2	1	2	1	1	1	1	1	1	17
		TCL Metals Consistent with CLP Protocols	IV	13	1	13	2	1	2	1	1	1	--	--	--	16
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols	IV	13	1	13	2	1	2	1	1	1	--	--	--	16
LEACHATE (7)	HNu Screening	TCL VOCs Consistent with CLP Protocol Unfiltered Samples	IV	5	1	5	1	1	1	1	1	1	1	1	1	8
		TCL Metals Consistent with CLP Protocol Filtered Samples (if possible, otherwise unfiltered)	IV	5	1	5	1	1	1	1	1	1	--	--	--	7
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols Unfiltered Samples	IV	5	1	5	1	1	1	1	1	1	--	--	--	7

TABLE A-1
SUMMARY OF THE SAMPLING AND ANALYSIS PROGRAM AT RED OAK LANDFILL (1)

SAMPLE MATRIX	FIELD MEASUREMENTS	LABORATORY PARAMETERS (2)	DQO (3) ANALYTICAL LEVEL	SAMPLES			FIELD REPLICATES			FIELD BLANKS (4)			TRIP BLANKS			MATRIX TOTAL
				NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	
SURFACE SOIL	HNu Screening	TCL VOCs Consistent with CLP Protocols	IV	6	1	6	1	1	1	1	1	1	1	1	1	9
		TCL Metals Consistent with CLP Protocols	IV	6	1	6	1	1	1	1	1	1	--	--	--	8
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols	IV	6	1	6	1	1	1	1	1	1	--	--	--	8
BACKGROUND SOIL BORING (B13) (Discrete Samples)	HNu Screening	TCL Metals Consistent with CLP Protocols	IV	5	1	5	1	1	1	1	1	1	1	1	1	8

Notes:

(1) The analysis program will follow the analytical methodologies, prepare the requied deliverables and analyze for the parameters listed in USEPA Contract Laboratory Program Statment of Work for Organic Analysis (October 1986 revised August 1987), and the USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, (including cyanide, July 1987).

(2) See Attachment 1 of the QAPP (Work Plan, Appendix B) for a complete list of Contract Lab Program (CLP) parameters.

(3) Analytical levels are defined in "Data Quality Objectives for Remedial Response Activities, Volume 1" EPA 540/G-87-003A.

(4) This is an estimated number of field blank samples. The actual number collected or prepared is a function of the number of samples collected per day. At a minimum one blank will be prepared each day.

(5) TCL denotes Target Compound List.

(6) The HNu Screening will provide qualitative information on the level of VOC contaminaiton and provide information for health and safety purposes.

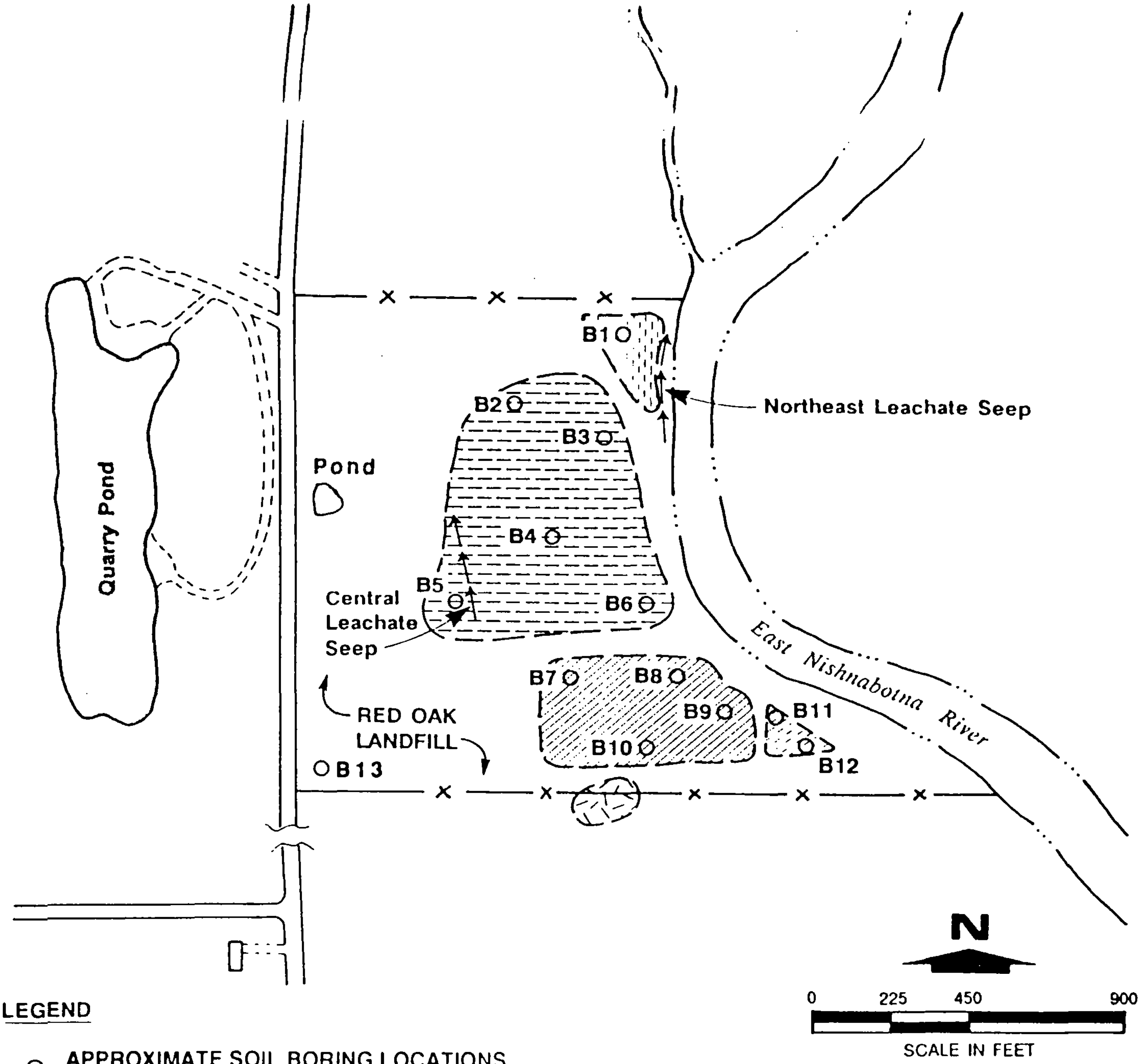
(7) Five is the minimum number of leachate (seep) samples to be collected. Additional samples may be collected if field conditions warrant.

2.0 SAMPLING LOCATIONS

The approximate locations for monitoring well installations, soil borings and environmental media sampling stations are identified in Figures A-1 through A-4. The rationale for the selection of these locations is provided below.

2.1. Soil Boring Locations

Split-spoon samples will be obtained from subsurface materials obtained from soil borings drilled through the landfill. Twelve borings shall be drilled until no more waste material is encountered. Soil samples will be collected continuously using split-spoon techniques (ASTM 1586 and 1587). Theses soil borings will provide visual information on the extent of the landfilled materials. The lithologic description will include information pertaining to soil type, grain size distribution, gradation, plasticity, color, odor, moisture content, consistency, density, grain shape and lithology, structure, unconfined compressive strength and genetic origin. The samples will be screened in the field for the presence of volatile organic compound (VOC) contaminants using an organic vapor analyzer (OVA), photoionization meter (HNu) and/or a Photovac Total Ionizable meter (TIP). The screening will provide qualitative information on the level of VOC contaminants. In the event that a "high" positive reading is obtained, the EPA may collect that sample and analyze it for VOCs, acids, base/neutral compounds and metals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis. The PRPs may choose to split such samples and perform such analyses. One soil boring will be drilled to bedrock located within the quarry backfill material away from areas potentially affected by



LEGEND

○ APPROXIMATE SOIL BORING LOCATIONS (SUBJECT TO EPA APPROVAL IN THE FIELD)

REPORTED WASTE TYPES

░ TREE TRIMMINGS

▤ MUNICIPAL WASTES

▦ INTERMITTENT POND

▨ INDUSTRIAL SOLID WASTES

▒ INDUSTRIAL ORGANIC LIQUID WASTES

NOTE:
SIGNIFICANT LEACHATE SEEPS AND DRAINAGE AREAS LOCATED ON MAP.
WASTE LOCATIONS ARE APPROXIMATE

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FIGURE A-1
APPROXIMATE SOIL BORING LOCATIONS
RED OAK LANDFILL
RED OAK, IOWA

landfilling activities. Samples will be collected from this soil boring and will be analyzed for VOCs, acids, base/neutral compounds and metals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis. The described locations for installation of the borings are:

- within the area of the tree trimmings (B1);
- within the area of municipal wastes fill (B2-B6);
- within the area of industrial solid waste fill (B7-B10);
- within the area of industrial organic liquid wastes fill (B11-B12); and
- within the area of quarry backfill soils, but in an area unaffected by landfilling activities (B13). The intent of this sampling effort is to collect representative samples of the quarry backfill soil materials that are unaffected by landfill disposal activities. The analytical results from these samples will provide an indication of unaffected quarry backfill soil conditions for comparison to analytical results from soil samples collected on the landfill area. Comparisons between the quarry backfill soils and soils samples collected on the landfill areas are considered appropriate, since the wastes were reportedly buried in and subsequently covered with those backfill soils.

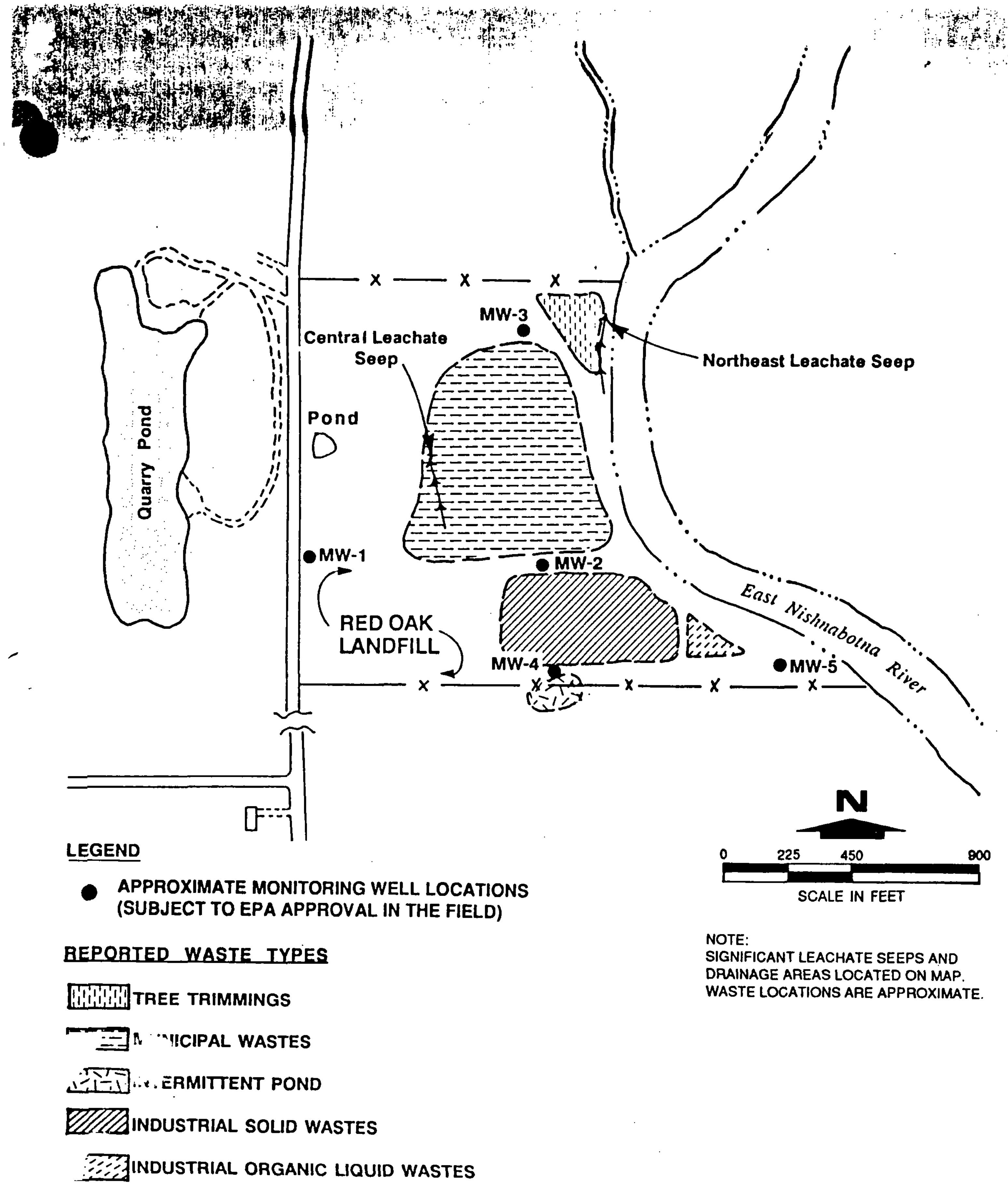
Exact soil boring locations and sample collection points shall be subject to USEPA approval in the field.

2.2. Monitoring Well Locations

Two rounds of ground-water samples will be collected from the five monitoring wells to be installed in the saturated unconsolidated deposits in the site. Approximate locations for the monitoring wells are shown in Figure A-2. The described locations for installation of these monitoring wells are:

- MW1: Upgradient of the reported landfill areas.
- MW2: Close to the center of the reported waste disposal areas at the site, but avoiding the actual waste to the maximum extent possible.
- MW3 and MW4: Immediately to the north and south of the reported landfilled waste areas in such a way to be able to evaluate the potential for lateral ground-water movement into the Plattsmouth Limestone located toward the north and south ends of the site (which may results for example, from hydrogeologic mounding at the site).
- MW5: Downgradient of the reported industrial waste disposal areas.

Ground water samples collected from these monitoring wells will be analyzed for VOCs, acids, base/neutral compounds and metals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis. Slug tests will also be performed on each of these wells. Visual classification of the soil collected from installation of the monitoring wells will include information pertaining to soil type, grain size distribution, gradation,



NOTE:
SIGNIFICANT LEACHATE SEEPS AND DRAINAGE AREAS LOCATED ON MAP. WASTE LOCATIONS ARE APPROXIMATE.

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FIGURE A-2
APPROXIMATE MONITORING WELL LOCATIONS
RED OAK LANDFILL
RED OAK, IOWA

plasticity, color, odor, moisture content, consistency, density, grain shape and lithology, structure, unconfined compressive strength and genetic origin. The samples will be screened in the field for the presence of volatile organic compound (VOC) contaminants using an organic vapor analyzer (OVA), photoionization (HNu) meter and/or photovac meter (TIP). The screening will provide qualitative information on the level of VOC contaminants. In the event that a "high" positive reading is obtained, the EPA may collect that sample and analyze it for VOCs, acids, base/neutral compounds and metals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis. The PRPs may chose to split such samples and perform such analyses.

The exact well location, well construction, and screen elevation will be subject to the USEPA approval in the field.

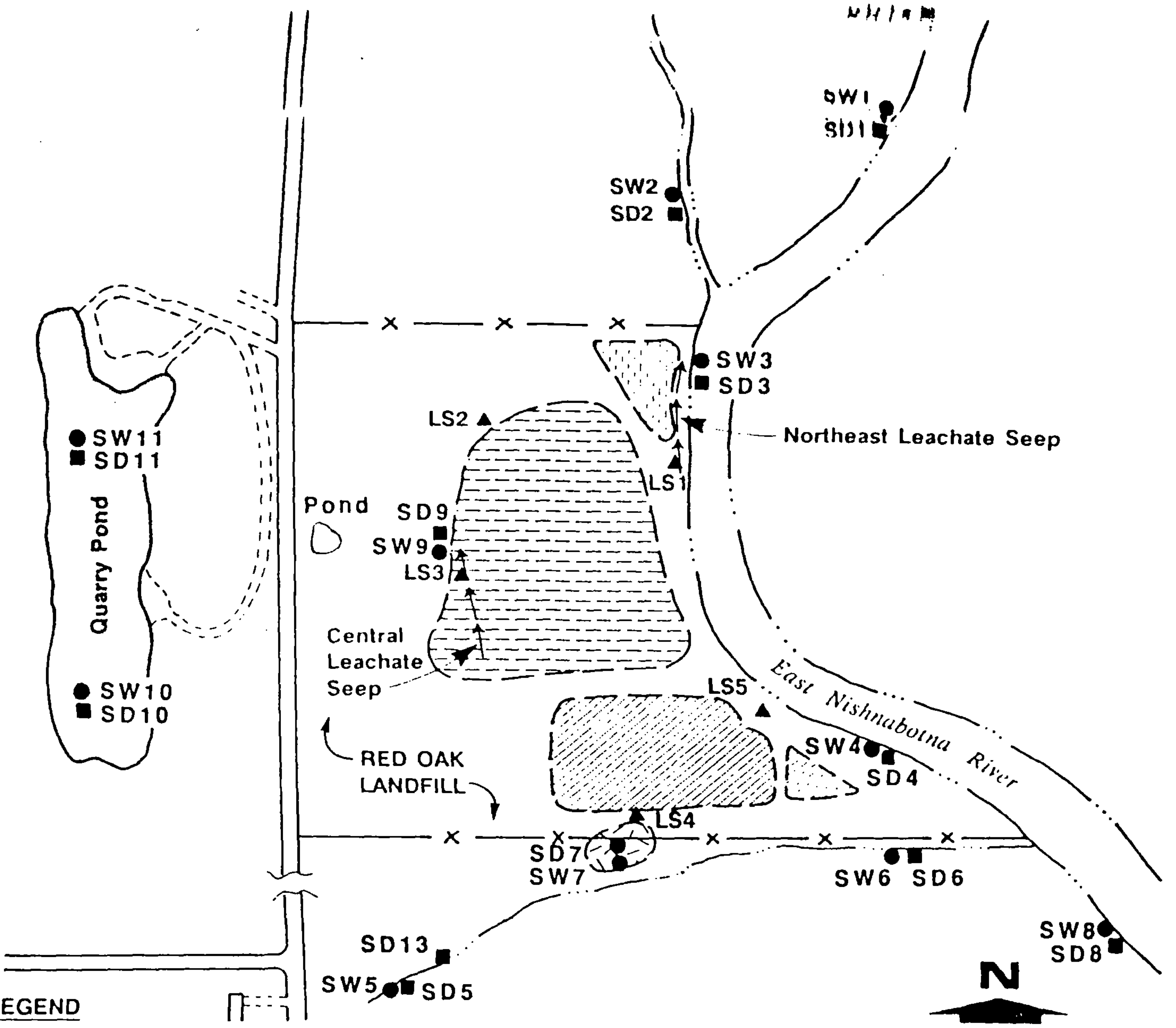
2.3. Surface Water Sampling Locations

Eleven surface water grab samples will be collected from areas upgradient and downgradient of the Red Oak Landfill site. The approximate locations of the surface water sampling locations are provided on Figure A-3. The described locations of these surface water grab samples are:

- in the East Nishnabotna River (SW1), upgradient of the landfill area,
- in the stream channel (SW2), upgradient of the landfill area,
- East Nishnabotna River adjacent to the northeast leachate seep (SW3),

- East Nishnabotna River east of the industrial organic liquid wastes area (SW4),
- upgradient of the landfill area, along the intermittent stream channel flowing adjacent to the southern site boundary (SW5),
- downgradient of the landfill area, along the intermittent stream channel flowing along the southern boundary of the site (SW6),
- pond south of the site (SW7),
- downgradient of the landfill area, along the East Nishnabotna River (SW8),
- perennial pond on-site (SW9) and
- within the quarry pond (SW10 and SW11).

The approximate locations of the surface water samples are shown in Figure A-3; these locations are subject to final EPA approval in the field. These samples will be analyzed for VOCs, acids, base/neutrals and metals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis. The sample locations will be staked and flagged along the bank of the river prior to initiating field activities. Distance and direction to a permanent feature will also be recorded in the event the stake is destroyed. Approximate elevations of the sample locations will be estimated from available topographic maps.



LEGEND

▲ POTENTIAL LEACHATE SEEP SAMPLING LOCATIONS

● APPROXIMATE SURFACE WATER SAMPLING LOCATION

■ APPROXIMATE SEDIMENT SAMPLING LOCATION
(ALL SAMPLING SUBJECT TO EPA APPROVAL IN THE FIELD)

REPORTED WASTE TYPES

▨ TREE TRIMMINGS

▨ MUNICIPAL WASTES

▨ INTERMITTENT POND

▨ INDUSTRIAL SOLID WASTES

▨ INDUSTRIAL ORGANIC LIQUID WASTES

0 225 450 900

SCALE IN FEET

NOTE:
SIGNIFICANT LEACHATE SEEPS AND DRAINAGE AREAS LOCATED ON MAP. WASTE LOCATIONS ARE APPROXIMATE.

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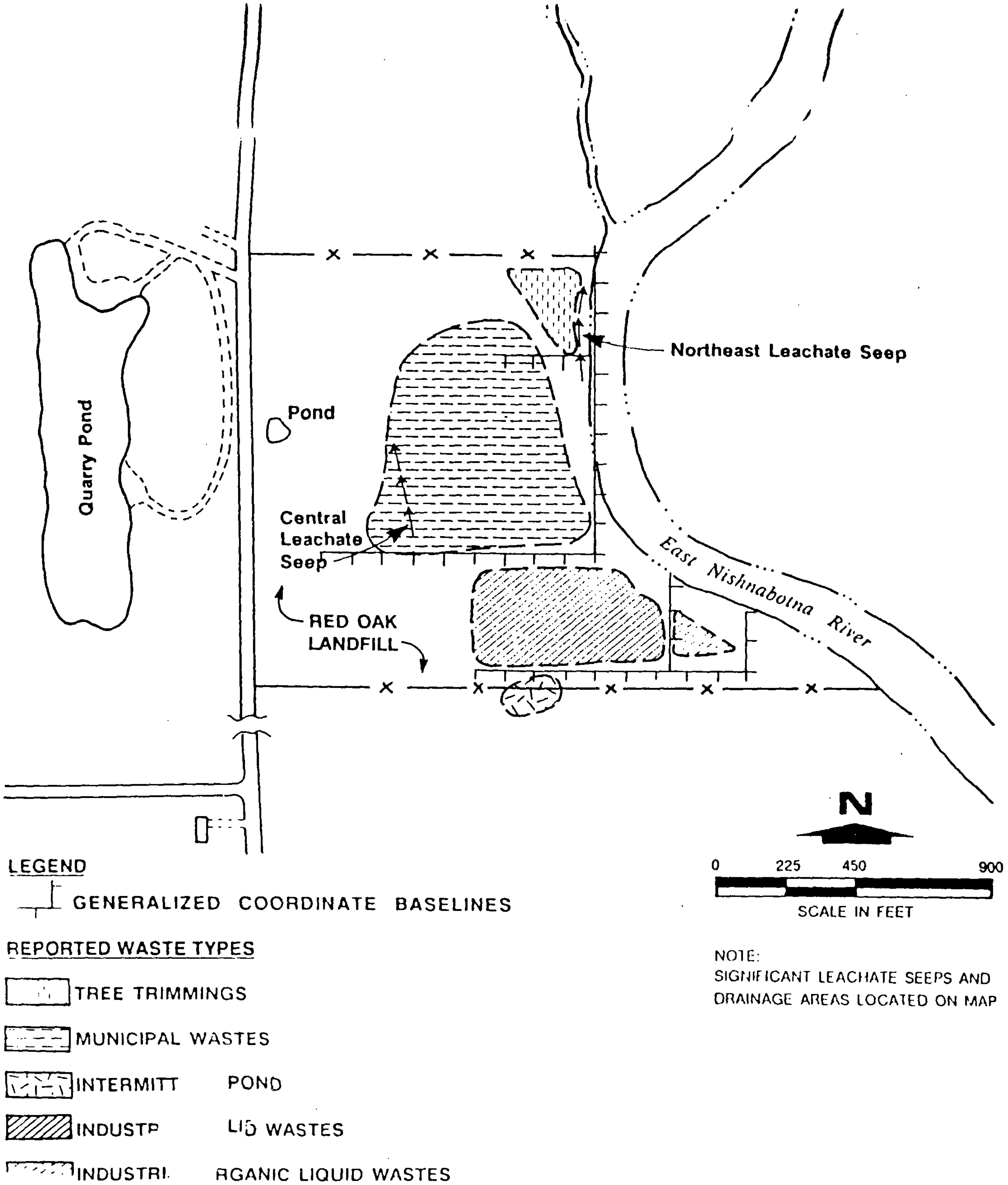
FIGURE A-3
APPROXIMATE SURFACE WATER, SEDIMENT AND LEACHATE SAMPLING LOCATIONS
RED OAK LANDFILL
RED OAK, IOWA

2.4. Surface Soil Sampling Locations

Six composite soil samples (one sample from each of the reported tree trimmings and industrial organic liquid wastes fill areas and two from each of the two other reported waste fill areas) will be collected from the landfill cover soils. A coordinate system (two baselines at right angles to each other and intersecting at the southeast corner of each of the four reported waste type fill areas as shown in Figure A-4) will be established for the landfill. Each baseline will extend far enough for the entire reported waste type area to fall within the quadrant. The baselines will be scaled off in feet. Locations for sample collection will be randomly identified by drawing pairs of random numbers from a random number table. These number pairs will be used to locate points along each baseline. The intersection of two lines drawn perpendicular to the baselines through these points on the baseline represent one randomly selected location for sample collection. If this point is outside the sampling area (e.g., irregular shaped areas may have encountered this situation) or intersects a point where pipeline materials are stored, the point will be disregarded and the selection procedure repeated. This procedure will be used to select twelve random sampling locations from the entire landfill cover; four sampling locations in the reported area of industrial solid wastes, four sampling locations in the reported area of municipal wastes, two sampling locations in the reported area of industrial organic liquid wastes, and two sampling locations in the reported area of tree trimmings. These samples will be composited to six samples (two from each of the reported industrial solid waste and municipal waste areas and one from each of the reported industrial organic liquid waste and tree trimming areas) and analyzed for VOCs, acid, base/neutral compounds and metals



NOTE:
SIGNIFICANT LEACHATE SEEPS AND
DRAINAGE AREAS LOCATED ON MAP

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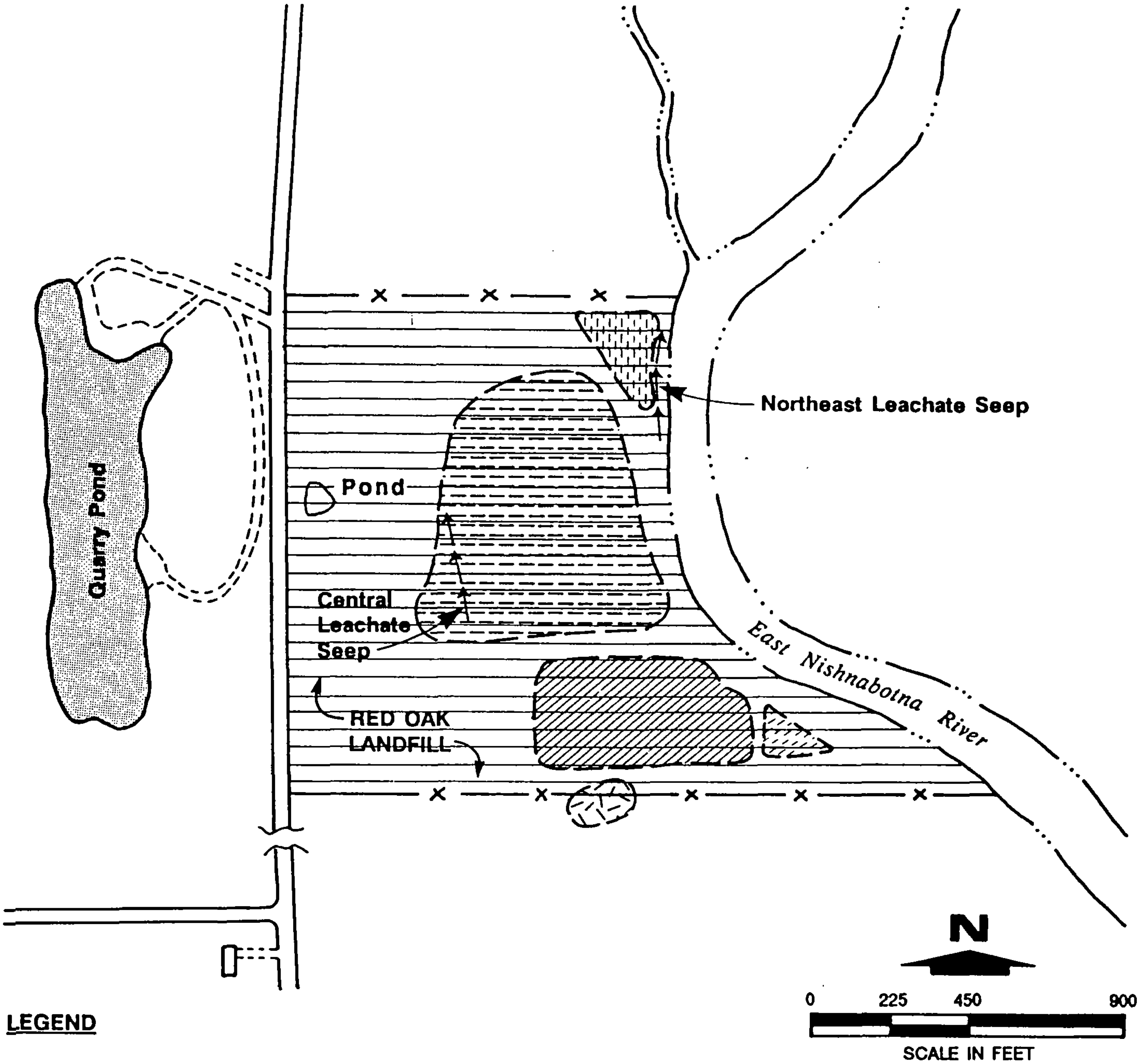
FIGURE A-4
GENERALIZED GRID COORDINATE
SYSTEM BASELINES FOR
SURFACE SOIL SAMPLING
RED OAK LANDFILL
RED OAK, IOWA



LEGEND

☰ APPROXIMATE GEOPHYSICAL SURVEY LINES

REPORTED WASTE TYPES

▦ TREE TRIMMINGS

▤ MUNICIPAL WASTES

▧ INTERMITTENT POND

▨ INDUSTRIAL SOLID WASTES

▧ INDUSTRIAL ORGANIC LIQUID WASTES

NOTE:
SIGNIFICANT LEACHATE SEEPS AND DRAINAGE AREAS LOCATED ON MAP. WASTE LOCATIONS ARE APPROXIMATE.

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FIGURE A-5
APPROXIMATE GEOPHYSICAL SURVEY LINES
RED OAK LANDFILL
RED OAK, IOWA

including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis. The samples for VOC analysis will not be composited. All sample locations will be approved by the USEPA in the field. Samples for VOC analysis will be selected from the sample location pairs to be composited, based on the portable photoionization detector readings from each sampling location. The sample from the sampling location with the highest photoionization detector reading among the pair of samples to be composited, will be submitted as a discrete sample for VOC analysis (a total of six discrete samples will be submitted for VOC analysis).

2.5. Sediment Sampling Locations

Thirteen sediment samples will be collected, one at each of the eleven surface water sampling locations described previously (SW1 - SW11) and two additional locations. Sampling locations are provided on Figure A-3. All sample locations will be approved by the USEPA in the field. These samples will be analyzed for VOCs, acids, base/neutrals and metals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis.

Samples will be collected from the upper 1 to 2 feet of sediment at each location. The locations will be documented as described above for surface water samples.

2.6. Leachate Sampling Locations

The site will be surveyed for active leachate seeps, and a minimum of five seep samples will be collected for laboratory analysis. The approximate leachate seep sampling locations are provided on Figure A-3, and are described below:

- the northeast leachate seep in the tree trimmings fill area (LS1);
- the north central leachate seep (LS2) and the central leachate seep (LS3) located along the western edge of the municipal waste fill area;
- the south leachate seep located along the industrial solid waste area (LS4); and,
- the river bank seep located at the northeast corner of the industrial solid waste area and the East Nishnabotna River (LS5).

The seep sample locations are subject to final USEPA approval in the field. These samples will be analyzed for VOCs, acids, base/neutrals and metals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis. If additional seeps are identified at the site during field activities, additional sample collection will be considered. However, whenever possible, efforts shall be made to reduce the number of samples submitted for analysis while retaining an accurate impression of leachate character. This could be effectively accomplished by collecting samples from points of leachate seep convergence. This "composite" sample will provide the necessary information for evaluation of remedial alternatives in the FS. The actual number of seep samples collected will be based on a joint decision between the PRPs and the USEPA during the field activities, with a recommended maximum of 12 samples. If more than 12 seeps are identified during the field activities, the 12 priority seeps should be sampled and the analytical results evaluated within the context of the projected data uses for the FS before any additional leachate sampling is proposed.

Significant landfill seeps identified and sampled during the field investigations will be mapped and documented. Elevations will be obtained on all identified seeps to aid in defining ground water/surface water interactions. Sampled seeps will also be marked for future reference.

2.7. Geophysical Survey Grid Location

An Electromagnetic Resistivity (EM) survey will be completed across the 40-acre landfill site provided that the abandoned pipeline material is removed. This survey will serve to define the areas of waste disposal and determine the landfill area boundaries. The EM survey will consist of collecting continuous information regarding conductivity of the underlying area. The survey grid pattern (Figure A-5) will extend east-west across the site; grid lines will be spaced approximately 50 feet apart. Geophysical survey lines will transect individual soil boring locations to provide visual confirmation to support the geophysical survey interpretations. The approximate Geophysical survey lines are provided in Figure A-5. The exact location of the geophysical survey grid lines will be determined in the field and will be subject to USEPA approval.

If the abandoned pipeline material remains on site, Ground Penetrating Radar (GPR) techniques will be employed in order to avoid potential interference with the EM survey measurements and evaluate the vertical and lateral extent, and nature (drums, refuse, etc.) of the material.

3.0 SAMPLE DESIGNATION

A sample numbering system will be used to identify each sample for chemical or physical analysis, including replicate samples and field blanks. A listing of sample identification numbers will be maintained in the logbook by the Sample Team Leader. Each sample number will consist of two components as described below.

3.1. Sample Location

Each sample location will be identified by an alpha-code corresponding to the sample type, followed by a two-digit sample location number. The alpha-codes are as follows:

GMMW--monitoring well, ground water
GMSW--surface water
GMSB --soil boring
GMLS--leachate seep
GMSD--sediment
GMSS--surface soil
GMFB--field blank

Field blanks will have an FB followed by the alpha code for the type of blank (i.e., a surface water blank will be GFBSW).

3.2. Sample Identifier

All samples will have a two-digit number as the last component of the sample identifier. If multiple sampling events or depths are necessary, the event or depth identifier will start with 01 and progress sequentially with additional sampling events or depth.

3.3. Sample Number Examples

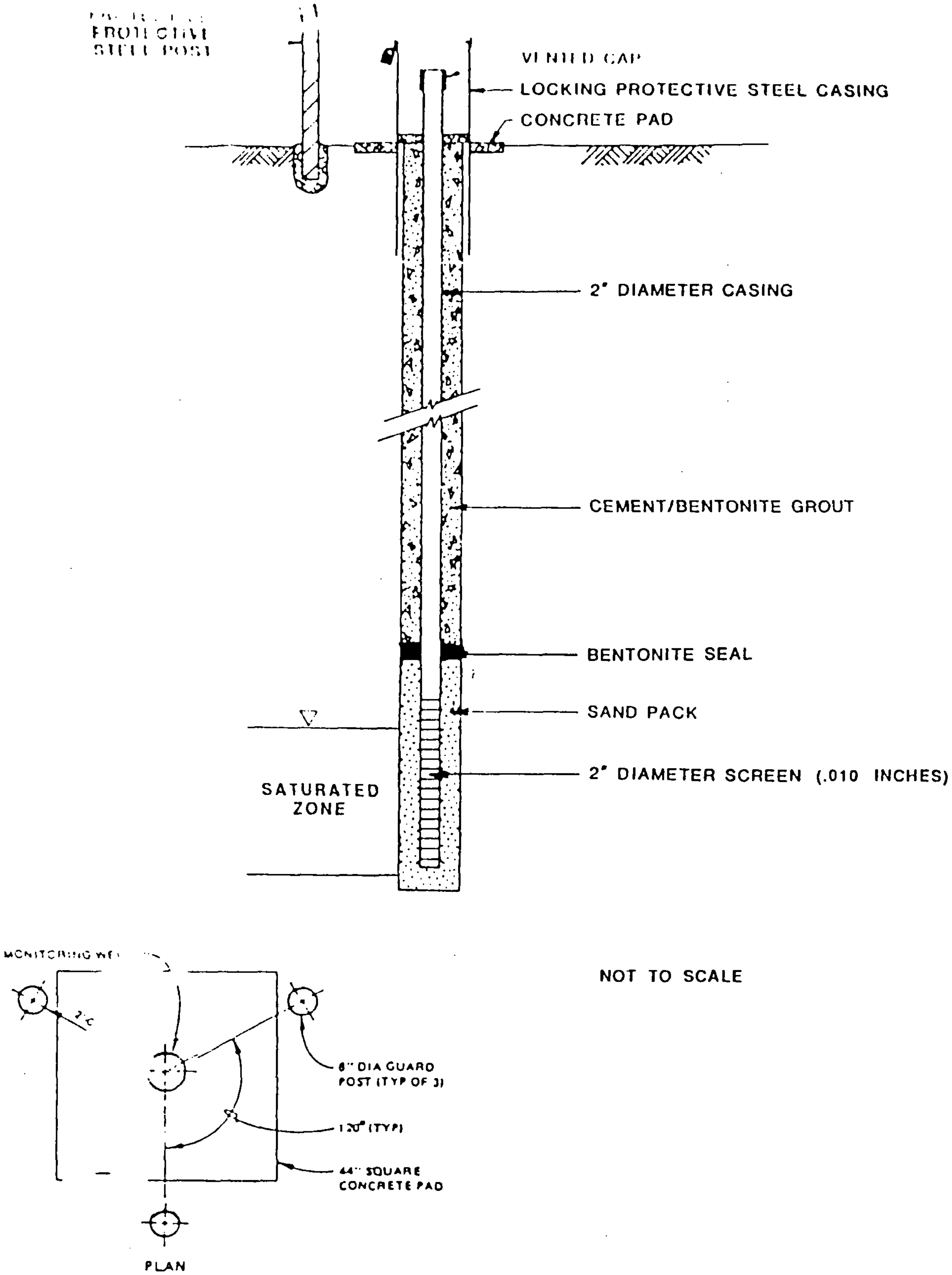
GMMW01-02
Ground water sample from monitoring well from MW01 during sampling event No. 2

GMSW02-01
Surface water sample during sampling event No. 1 from location SW02

GMLS01-01
Leachate seep sample during sampling event No. 1 from location LS01

GMSB08-04
Soil boring sample 4 (split-spoon 4) from boring 8, depth to be noted in logbook

GMSS01-01
Surface soil sample during sampling event No. 1 from location SS01



NOT TO SCALE

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FIGURE A-6
GENERALIZED
MONITORING WELL CONSTRUCTION DETAIL
RED OAK LANDFILL
RED OAK, IOWA

4.0 SAMPLING EQUIPMENT AND PROCEDURES

This section presents the procedures and equipment for performing the planned RI field activities at the ROL site. The estimated number of samples and analyses to be conducted on the various samples are summarized in Table A-1. Sample container, preservation, shipping, and packing requirements are presented in Table A-2.

4.1. Soil Borings

Soil borings will be drilled using hollow-stem auger techniques (ASTM 1452). Soil samples or waste samples will be collected continuously to a depth of 20 feet, then every five feet thereafter until native soil is encountered, using split barrel sample techniques (ASTM 1586 and 1587). The borings will penetrate the fill and terminate five feet into native soil. Boring B13 will be drilled in the background or native soil material. Soil samples for this boring will be collected continuously for 20 feet then collected every five feet until bedrock is encountered. All downhole equipment will be steam-cleaned prior to drilling each borehole. The split spoon sampler will be washed with trisodium phosphate (TSP) and double rinsed with distilled water between consecutive samples.

The soil/waste sampling procedure described below has been developed to obtain representative lithologic and waste quality information for the materials encountered and will be used during the drilling of all soil borings. The procedure provides information on sampling, data recording and equipment decontamination techniques.

1. Record borehole location and intended sample (depth) intervals on data sheet (example in Appendix D).

2. Prior to sampling each interval, label all necessary sample containers with the project number, borehole number, depth interval, date, time and analysis to be performed.

3. Drill to the start of the designated sampling depth and obtain soil samples using a split-spoon sampler. When a split-spoon sampler is driven into the unconsolidated deposits to recover the sample, record the number of blow counts over each six inch interval.

To investigate the horizontal and vertical extent of landfilled materials, 12 borings will be drilled through the landfill wastes and one boring in the background soil material. Soil samples will be collected to determine the vertical extent of the material. Boring B13 will terminate when bedrock is encountered.

The cores recovered in each split-spoon will be screened in the field for the presence of contaminants through visual examination and portable volatile organic detection equipment (i.e. HNu, OVA and/or Photovac TIP). The purpose of the screening is to provide qualitative information on the level of VOC contaminants, and to provide information for health and safety purposes.

General procedures to be followed for collecting soil/waste samples at the site will be:

1. Following the retrieval of the split-spoon sample, the sample will be immediately screened with the PID equipment.

2. The soil/waste samples will then be described in the field by a G&M hydrogeologist. The lithology of the soil will be described using visual observations made of the soil core. The lithologic description will include information pertaining to soil type, grain size distribution, gradation, plasticity, color (Munsell notation when possible), odor, moisture content, consistency, density, grain shape and lithology, structure, unconfined compressive strength, photoionizable constituent content, genetic origin, and group symbol. An example of a geologic log is shown in Appendix D.

3. Visual observations will be made of the materials encountered during the soil boring activities. Split-spoon samples from these borings will be retained for possible analysis.

4. A portion of all soil/waste samples will then be sealed in glass jars and retained in secure containers with chain of custody seals attached and stored at the Eveready Battery Company plant in Red Oak, Iowa for possible future analysis.

5. All sampling equipment will be decontaminated using a trisodium phosphate (TSP) solution wash and rinse with deionized water. A sufficient number of split-spoons

TABLE A-2
SAMPLE CONTAINERS, PRESEVATION, SHIPPING AND PACKAGING REQUIREMENTS

ANALYSIS	CONTAINER/SAMPLE	RESERVATION	HOLDING TIME	SHIPPING	PACKAGING
GROUND WATER/ SURFACE WATER AND LEACHATE					
Semi-volatiles	Two glass amber (teflon-lined caps). Fill bottle to neck.	Must be iced to 4° C. One sampling shuttle will be used per sampling location. This will prevent cross contamination.	5 days	Overnight Carrier	#1 foam liner or vermiculite
Volatiles	Two 40 ml volatile organic analyses/ VOA vials with teflon-lined septum. Fill completely, no air bubbles.	Must be iced to 4° C. One sampling shuttle will be used per sampling location. This will prevent cross contamination.	10 days	Overnight Carrier	In baggies nad surrounded by vermiculite
Metals, unfiltered	One liter high density polyethylene bottle. Fill to shoulder of bottle.	Unfiltered samples HNO_3 to PH<2. One sampling shuttle will be used per samling loction. This will prevent cross contamination.	26 days	Overnight Carrier	No. 2 foam line or vermiculite
Metals, filtered	One liter high density polyethylene bottle. Fill to shoulder of bottle.	Unfiltered samples HNO_3 to PH<2. One sampling shuttle will be used per samling loction. This will prevent cross contamination.	26 days	Overnight Carrier	No. 2 foam line or vermiculite
Cyanide	One liter high density polyethylene bottle. Fill to shoulder of bottle.	Unfiltered sample. .6 gm ascorbic acid, only of residual chlorine is present. Must be iced to 4° C. Add NaOH until PH>12. One sampling shuttle will be used per smapling location. This will prevent cross contamination.	14 days	Overnight Carrier	No. 2 foam line or vermiculite

TABLE A-2
SAMPLE CONTAINERS, PRESEVATION, SHIPPING AND PACKAGING REQUIREMENTS

ANALYSIS	CONTAINER/SAMPLE	RESERVATION	HOLDING TIME	SHIPPING	PACKAGING
SOIL AND SEDIMENT					
Semi-volaitles	One 8 oz. wide-mouth glass jar filled 3/4 full.	Must be iced to 4° C. One sample shuttle will be used per sampling location. This will prevent cross contamination.	5 days	Overnight Carrier	In baggies and foam liner #3.
Volatiles	Two 120 ml wide-mouth glass vials with a teflon-lined spetum.	Must be iced to 4° C. One sample shuttle will be used per sampling location. This will prevent cross contamination.	10 days	Overnight Carrier	In baggies and foam liner #3.
Metals and Cyanide	One 8 oz. wide-mouth glass jar filled 3/4 full.	Must be iced to 4° C. One sample shuttle will be used per sampling location. This will prevent cross contamination.	26 days	Overnight Carrier	In baggies and foam liner #3.

redoak #3/tablea2.wk1

will be kept in the field to ensure uninterrupted sampling.

6. The sampling tool will be reassembled to collect the next sample in the same manner.

Equipment for the soil sampling program will include:

- Three-foot long, two-inch diameter split-spoons made of stainless steel.
- Hollow stem auger drilling equipment with split-spoon sampling capabilities.
- Distilled and potable water.
- Personnel safety equipment.
- Organic Vapor Analyzer (OVA), photoionization (HNu) meter and/or Photovac TIP.
- Aluminum foil.
- Steam cleaner.

4.2. Monitoring Well Installation

Five monitoring wells will be installed to provide data on horizontal components of ground-water flow direction within the unconsolidated deposits. Sampling of these monitoring wells will provide ground-water quality information from the unconsolidated glacial deposits. In addition, testing will be performed on the wells to develop information on the hydraulic properties of the various water-bearing deposits.

In general, monitoring wells in the unconsolidated deposits will be constructed with two-inch diameter stainless steel 0.010 inches (10 slot) well screen and casing (Figure A-6). The exact screen elevation and well construction will be subject to EPA approval in the field.

Proposed locations of these wells are shown in Figure A-2. Well MW-1 is intended as a background well; necessary to determine conditions of soils and ground water upgradient of the site. Wells MW-2, 3, and 4 are designed to determine the extent and concentration of chemical constituents (if present) at shallow depths beneath the site. These wells will extend to a depth sufficient to monitor the saturated zone. The depth to the saturated zone will be determined through consideration of surveyed elevations of the water levels in the west quarry pond and the East Nishnabotna River and through field observations and measurements obtained during the drilling of the boreholes. The boreholes will be drilled and sampled to the required depth and allowed to stand overnight so that recovered water level measurements may be obtained to further define the saturated zone. Well MW-5 will be located southeast of the site, downgradient of the landfill area.

All wells will be drilled using the hollow stem auger techniques (ASTM 1452), through the fill area to the ground-water interface. A 10-foot screen will be installed to allow sampling of the upper zone of the water table.

Soil samples will be collected continuously using split-spoon techniques (ASTM 1586 and 1587). All samples will be described by the on-site hydrogeologist (fully trained in hazardous safety issues) be screened in the field for the presence of volatile organic compounds using a portable photoionization detector and then retained for possible future reference. The screening will provide qualitative information on the level of VOC contaminants and to provide information for health and safety purposes.

The length of the screen was selected to accommodate expected water table fluctuations. Screens will have a slot size of 0.010 inches (10 slot) and will contain a silica sand pack to two feet above the top of the screen. A two- to three-foot bentonite plug will be placed immediately above the sand pack. A bentonite/cement grout will be emplaced in the annulus above the bentonite plug using a tremie pipe. Both calculated and actual volumes of grout used will be recorded on the well construction log. A protective steel casing with a locking cap and well identification information (i.e., common identifier, well permit number, installation date, screen interval) will be cemented in place around each well immediately upon completion. After completion, each well will be developed prior to sampling to maximize yields and minimize the turbidity of water obtained during sampling. Well development will terminate when the water sample does not decrease in turbidity and has consistent pH, temperature, and specific conductivity values after repeated development or a minimum of ten well volumes have been removed. Ground water removed during development and pre-sampling purging will be placed in drums until test results demonstrate that the water can be discharged to the ground. In the event that water quality has been impacted by contaminants, the drummed water will be treated and disposed of appropriately.

All drilling and soil sampling/soil testing procedures performed for and during the installation of the monitoring wells screened in the unconsolidated deposits will be identical to those described under the previous soil boring section.

Water levels will be recorded from all the monitoring wells quarterly for one year to determine ground-water flow patterns and seasonal variations. Slug tests and/or specific capacity tests will also be performed on the monitoring wells to determine the hydraulic characteristics of the unconsolidated deposits. The slug tests will be performed and the data analyzed according to the procedures described in "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells" (Bouwer,H. and R.C. Rice, 1976, Water Resources Research, Vol. 12).

4.3. Ground-Water Sampling

The following protocol has been developed to obtain ground-water samples that provide representative chemical quality information, and is intended for use in sampling monitoring wells during the hydrogeologic field investigation.

Well evacuation procedures are as follows:

1. Identify the well and record its designation on a water sampling data sheet (See example in Appendix D).

2. Clean the top of the well with a clean rag to prevent loose particulate matter from falling into the well.

3. Remove the well cap or plug and wipe the inside of the casing with a clean cloth and monitor for organic vapor levels.

4. Clean the first five feet of the steel measuring tape or water-level probe with distilled water and measure the depth to water.

5. Compute the volume of water in a two inch diameter well (0.162 gallons/feet).

6. Remove five times the volume of standing water in the well using either a centrifugal or a submersible pump, depending upon the depth to water. If recovery of the water from the well is less than 50 percent within 15 minutes after complete evacuation, sampling will begin with the next appearance of water. However, the initial volume which eventually becomes available may not be sufficient to complete the sampling in the brief period of time normally desired. Low yielding wells will be evacuated using dedicated PVC bailers. The submersible pump will be cleaned internally and externally with a TSP solution, potable water and finally, distilled water, immediately before placement in the well. The pump will be running before it enters the water to prevent introduction of the remnants of the final distilled water rinse into the well.

7. Continuous monitoring of the air surrounding the environment of the well will be performed with an HNu or OVA in order to ascertain air quality for health and safety purposes.

The intake opening of the pump line or pump impellers should be positioned and maintained directly below the water surface to ensure that the well is properly flushed. If there is a decrease in a well's water level as a result of pumping, the intake line should be lowered as needed. This procedure is not directly applicable for poor yielding wells which exhibit a low specific capacity, as indicated by rapid and pronounced drops in the water level.

If the well has been pumped or recently developed, the water level (the volume of water in the casing) may not have recovered or returned to its normal state. This does not require a change in the evacuation procedures outlined above. Although the actual volume of water in the casing under such conditions is less than normally encountered, the removal of five times this volume is normally sufficient to provide samples for analysis that are representative of water from surrounding formations.

The well sampling procedures are as follows:

1. Water samples will be collected using bottom filling Teflon or stainless steel bailers. The bailer will be lowered into the well in a manner which minimizes disturbances to the water table. The bailer will be removed carefully and the water sample gently poured into sample containers to minimize the volatilization of organic compounds. The bailer cord will be replaced for each sample collected per well and the bailer will be decontaminated immediately prior to use with potable water, TSP solution, and a triple rinse with deionized water.

2. Split-samples will be collected directly from the bailer with each sample receiving equal amounts to ensure sample uniformity. If a well will not yield the volume of water necessary to immediately fill all of the split-sample containers, each container will receive an equal amount from each full bailer. During the sampling of such wells partially filled sample bottles will be tightly capped, kept out of the sunlight and cooled to 4°C, as the delays in obtaining adequate sample volume could otherwise jeopardize the representativeness of the samples. All VOA (Volatile Organic Analysis) vials will be completely filled initially, and not filled a portion at a time.

3. Once samples have been collected, they will be prepared and preserved in accordance with recommended USEPA procedures. Preparation and preservation procedures are outlined in Table A-2. Both filtered (dissolved) and unfiltered (total) water samples for metals analysis will be collected. Water samples designated for filtered (dissolved) heavy metal analysis will be filtered through a 0.45 micron membrane filter prior to acidification. The membrane may clog readily, so prefiltration through paper and/or fiberglass will expedite the filtration process for samples with more than slight turbidity. This is done to ensure that only metal ions initially in solution will be measured. Acidification can displace metal ions absorbed on particles in a sample that are not initially removed. Unfiltered samples, therefore, usually show much higher metal concentrations; the higher value corresponds to a "dissolved plus displaceable" metal ion concentration.

4. Temperature, pH, and specific conductance will be measured in the field.

For purposes of quality control, the field cleaning of bailers is considered preferable to laboratory precleaning for three reasons:

1. Contaminants present in the laboratory or wrapping materials may enter the bailer.
2. Residues may be introduced during transit to the site.
3. It is generally not possible for all interested parties to observe laboratory cleaning, wrapping and transport protocols.

The effectiveness of the field cleaning protocols will be monitored by the use of field blanks. Laboratory pure water will be run through newly cleaned bailers just prior to sampling to obtain a field blank.

The following field equipment is required for well evacuation and sampling:

- Field book, pens, marking pens, labels.
- Clean rags, disposable gloves.
- Steel tape, preferably marked in 100ths of a foot.
- Distilled water, plastic wash bottle.

- Trisodium phosphate.
- Centrifugal or submersible pumps and battery or generator.
- Polypropylene rope.
- Tools required for opening wells.
- Filter paper.
- Conical or Buchner funnels.
- Vacuum pumps.
- Side arm flask.
- Membrane filtration apparatus (Gelman Magnetic).
- 47 mm, 0.45 micron, pore size membranes.
- Pail (preferably graduated).
- Ice chest and ice.
- pH meter, electrode, standard buffer solutions, beakers, conductivity bridge, conductivity cell.
- Submersible pump.
- Generator.

- Clean 55-gallon drum.
- Bailers, Teflon.
- Bailer cord.
- Sample containers.

4.4. Surface Soil Sampling

Surface soil samples will be collected in order to evaluate potential for exposure through direct contact with surface soils, and potential soil treatment technologies.

Sampling locations will be established as previously described in Section 2.4 Surface Soil Sampling Locations.

The following procedures will be followed during surface soil sample collection:

1. At each sampling location, a sample will be collected from the upper 6 to 8 inches of soil using a clean stainless steel trowel or scoop. The sample will be placed in a clean 8-ounce glass wide-mouth jar. The sample collection point will be monitored with a portable volatile organic analyzer.

2. Samples to be composited will be mixed in a decontaminated glass or stainless steel container and then transferred to the appropriate glass containers for sample shipment. Samples for all analyses, other than

VOCs will be composited. The sample for VOC analysis will be a discrete sample from the location of the highest portable photoionization detector reading.

All sampling equipment and the mixing container used for compositing the soil will be decontaminated between samples using a trisodium phosphate (TSP) solution wash, trisodium phosphate solution rinse, and triple rinse with deionized water.

Equipment for the surface soil sampling program will include:

- Contaminant free bottles as provided by the analyzing laboratory
- Distilled/deionized water and potable water
- Trisodium phosphate
- Personnel safety equipment
- Organic Vapor Analyzer (OVA), photoionization (HNu) meter and/or Photovac TIP
- Cooler with ice
- Aluminum foil
- Eight ounce glass jars
- Stainless steel trowel or scoop for recovering, mixing, and transferring sample portions

- Glass or stainless steel container for compositing soil samples.

4.5. Surface Water Sampling

Surface water will be monitored to determine water quality and to evaluate interactions with the shallow ground-water system.

Sampling stations will be established at eleven locations along the East Nishnabotna River, quarry pit, pond and drainageways adjacent to the site. Samples will be analyzed for the same constituents analyzed for in the ground water (Table A-1). Surface-water elevations at each station will be estimated from the topographic map prepared for the site.

The following procedures will be followed during surface-water sample collection

1. Record sampling station number,

2. Measure the depth of water at the sampling location,

3. Rinse the collection container three times with stream water,

4. Where possible, the sample should be collected by lowering the collection container from the surface to the bottom of the stream at the location of greatest velocity so that filling occurs at all depths. The collection container should be moved at a constant speed, wherever possible, to collect a uniformly composited (vertically) sample,

5. Transfer the sample to the prelabeled sample bottles and immediately store the samples at approximately 4°C in a cooler. Samples for total metal analyses will not be filtered in the field prior to being placed in the acidified sample containers. Whether samples are filtered or unfiltered will be noted on the sample log,

6. Transference of the sample from the collection container into the narrow neck sample containers will be done carefully such that the sample does not bubble. Samples for VOC analysis will be collected in standard 40 ml vials with teflon lined septum seals.

7. Measure and record the temperature, pH, and specific conductance of the water sample (decontaminated with deionized water), and

8. Decontaminate the collection container with potable water, TSP solution and a triple rinse with deionized water.

The following equipment will be required for surface-water sampling:

- Conductivity meter
- pH meter
- Thermometer
- Cooler/ice
- Portable filtration unit
- Collection container
- Sample bottles

- Trisodium phosphate, potable water/distilled or deionized water
- Rubber gloves/waders
- 0.45 micron filters
- Tape measure

4.6. Sediment Sampling

Soil sediment samples will be collected at thirteen locations. The following procedures will be followed to collect stream sediment samples for laboratory analysis:

1. Begin sampling at farthest downstream station and work upstream,

2. Identify and record the sampling station location,

3. Collect the sample by driving a core barrel (either split-spoon or sleeved sediment sampler) to a maximum attainable depth. Record the water depth at each sample location,

4. Recover the core barrel and remove the sample by sliding the contents into the appropriate sample containers using a stainless steel spatula,

5. Identify the sample container(s) in terms of the designation and the distance from the bank where the sample was taken,

6. Place the sample on ice and out of direct sunlight,

7. Decontaminate the core tube with potable water, TSP solution, trisodiumphosphate solution and a triple rinse with deionized water,

8. Reassemble the core barrel and sample the next location, and

9. At the conclusion of sample collection activities at each station, describe the lithologic characteristics of the collected sediments.

Sediment sampling equipment will include the following:

- Bottles as provided by the analyzing laboratory
- Trisodium phosphate
- Lab brush
- Screwdrivers(2)
- Sledge hammer
- Steel tape
- 30-inch long split-spoon core barrel with retainer clip or a Wildco stainless steel sediment sampler
- 24-inch long "A" rod (2)
- Rubber gloves
- Waders
- Pipe wrenches
- Tap water and distilled water
- Stainless steel spatula
- Shovel

4.7. Leachate Sampling

A minimum of five leachate samples will be collected from seeps. In addition, the locations of the seeps will be mapped. The purpose of the sampling is to provide data for assessment of potential impacts. Leachate samples will be collected using a stainless steel laboratory beaker and transferred to an appropriate sample container. Samples collected for metals analysis will be filtered in the field using the procedures described for groundwater samples. If however, the leachate seep samples contain sediment in sufficient quantities to forestall filtering, total metal samples will be obtained in place of dissolved metals. The temperature, pH, and specific conductance of the sample will be measured and recorded. The sampling beaker will be decontaminated with potable water, TSP solution, trisodiumphosphate solution, and a triple rinse with deionized water. Elevations of all surface seeps will be obtained at this time.

An attempt will be made to obtain the flow rate of the seeps. This procedure will entail confining and damming the flow of the seep through a pipe. Sufficient room at the exit of the flow from the pipe will be provided so that a calibrated container can be positioned to catch the flow. Through the use of a stop watch and calibrated container, an approximation of flow can be made.

If the slope of the seep forestalls the use of the above described method, estimates will be made of the width, depth and rate of the seep; for an approximation of the flow rate.

Leachate sampling involves the use of the following equipment:

- Conductivity meter

- pH meter
- Thermometer
- Cooler/ice
- Portable filtration unit
- Stainless steel beaker
- Sample bottles
- Trisodium phosphate, potable water/distilled or deionized water
- Rubber gloves
- 0.45 micron filters
- Tape measure

4.8. Geophysical Survey

An Electromagnetic Resistivity (EM) survey will be completed across the 40-acre landfill site provided that the abandoned pipeline material is removed. This survey will serve to define the areas of waste disposal and determine the landfill area boundaries. The EM survey will consist of collecting continuous information regarding conductivity of the underlying area. The survey grid pattern will extend east-west across the site; grid lines will be spaced approximately 50 feet apart.

If the abandoned pipeline material remains on site, Ground Penetrating Radar (GPR) techniques will be employed in order to avoid potential interference with the EM survey measurements and evaluate the vertical and lateral extent, and nature (drums, refuse, etc.) of the fill material.

The geophysical survey, either EM or GPR, will be conducted by G&M or a experienced and qualified geophysical subcontractor. Specific equipment used to conduct the survey will depend upon the equipment preferences of the selected geophysical contractor, but in general will involve equipment typical of the industry and will provide appropriate data to allow interpretations regarding the extent of the landfilled wastes at the site.

5.0 DOCUMENTATION

All locations for soil borings and monitoring wells will be identified with surveyors stakes. The top portion of the stake will be painted orange and labeled for identification. The label will contain either the soil boring or monitoring well number.

A field notebook will be used to record all daily activities performed at the site. Entries will be written in sufficient detail so that a particular situation can be reconstructed. This field notebook will be a bound, field survey book. Notebooks will be assigned to field personnel, but will be stored securely in the office when not in use. After project completion, the Project Manager will maintain custody of these documents.

Entries into the notebook will contain a variety of information including the date, start time, weather, all field personnel present, level of personnel protection being used on site, and the signature of the person making the entry. The names of visitors to the site, all field sampling team personnel and the purpose of their visit will be recorded in the field notebook.

G&M water sampling data sheets will be used to describe the sampling process for the collection of ground- water samples and landfill seep samples. Sample/core logs will be used to describe site lithology. Wherever a sample is collected or a measurement is made, a detailed description location of the station will be recorded. All equipment used to make measurements will be identified. All sample collection procedures will be documented on the appropriate forms. Sample numbers will be assigned prior to the start of data collection activity. Replicates, which will receive an entirely separate sample number, will be clearly identified in the project sample records.

6.0 SCHEDULE

The approximate schedule for the soil, ground-water, surface water, and leachate sampling along with other Phase I RI Tasks is presented in the Work Plan for the ROL site. The schedule of required milestones is presented in the Consent Order (Appendix II, Table of Milestones). Site surveying and mapping activities will be performed to document sampling locations and provide data regarding areas and quantities for the FS. Surface water samples will be collected prior to sediment samples to avoid collecting contaminants possibly released by disturbing the sediment. Also, surface water and sediment sampling will begin at the most downstream location and progress upstream to avoid collecting contaminants possibly released by previous stream sampling activities. Ground-water sampling will begin a minimum of 10 days after well installation and development activities have been completed.

RedOak#3\sampplan.

GERAGHTY & MILLER, INC.

WORK PLAN
APPENDIX B

Quality Assurance Project Plan

Red Oak Landfill
Red Oak, Iowa

APPENDIX B
Quality Assurance Project Plan
Red Oak Landfill
Red Oak, Iowa

Prepared for
Red Oak Landfill Potentially Responsible Party Group

Prepared by
Geraghty & Miller, Inc.

	Approval:	Date:
Geraghty & Miller, Inc. Project Manager	______________________	________
Geraghty & Miller, Inc. Quality Assurance Control Officer	______________________	________
Red Oak Landfill PRP Group Project Coordinator	______________________	________
Environmental Protection Agency Quality Assurance Officer	______________________	________

APPENDIX B
Quality Assurance Project Plan

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1. ETC/Toxicon's Generic Quality Assurance Plan Specific for Contract Laboratory Program
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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) was prepared for the Red Oak Landfill PRPs in response to a request by the USEPA. The QAPP presents the policies, organization, objectives, functional activities and QA/QC activities that will be utilized to ensure that all data collected during and reported by this Remedial Investigation/Feasibility Study (RI/FS) at the Red Oak Landfill site are representative of existing conditions. It is designed to achieve the specific data quality goals of this RI/FS.

The analytical procedures, QA/QC, and chain of custody methodologies, as well as forms for reporting results, will conform to those set forth in The USEPA Contract Laboratory Program Statement of Work for Organic Analysis (October, 1986 revised August 1987), and USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis (July, 1987).

2.0 PROJECT DESCRIPTION

2.1. Background

The Red Oak Landfill site is located northwest of the City of Red Oak, Iowa (Figure 1). The 40-acre site is bordered by the East Nishnabotna River to the east, and a N-S road and quarry pond to the west. Naturally hilly topography surrounds the area.

The water supply wells for the City of Red Oak are located 2 to 2-1/2 miles in the highlands east/southeast of the Red Oak Landfill site. Residents living south of the landfill site rely upon shallow private wells which utilize glacial and alluvial aquifers for their domestic water supplies.

The landfill site was previously a limestone quarry which was in operation from 1947 to 1953-1954. The City of Red Oak purchased the site and operated a portion of the backfilled quarry pit (adjacent to the East Nishnabotna River) as a landfill from 1962 to 1974. Materials reportedly disposed of in the landfill include municipal wastes, industrial wastes, construction/demolition wastes and tree trimmings.

The topography of the landfill includes a topographic high located in the southwest corner. The land north of the topographic high slopes to the north/northeast while the land south of the high dips to the south. Slopes within the landfill range from nearly flat terrain to slopes of approximately 10° with the exception of the eastern edge of the landfill, adjacent to the East Nishnabotna

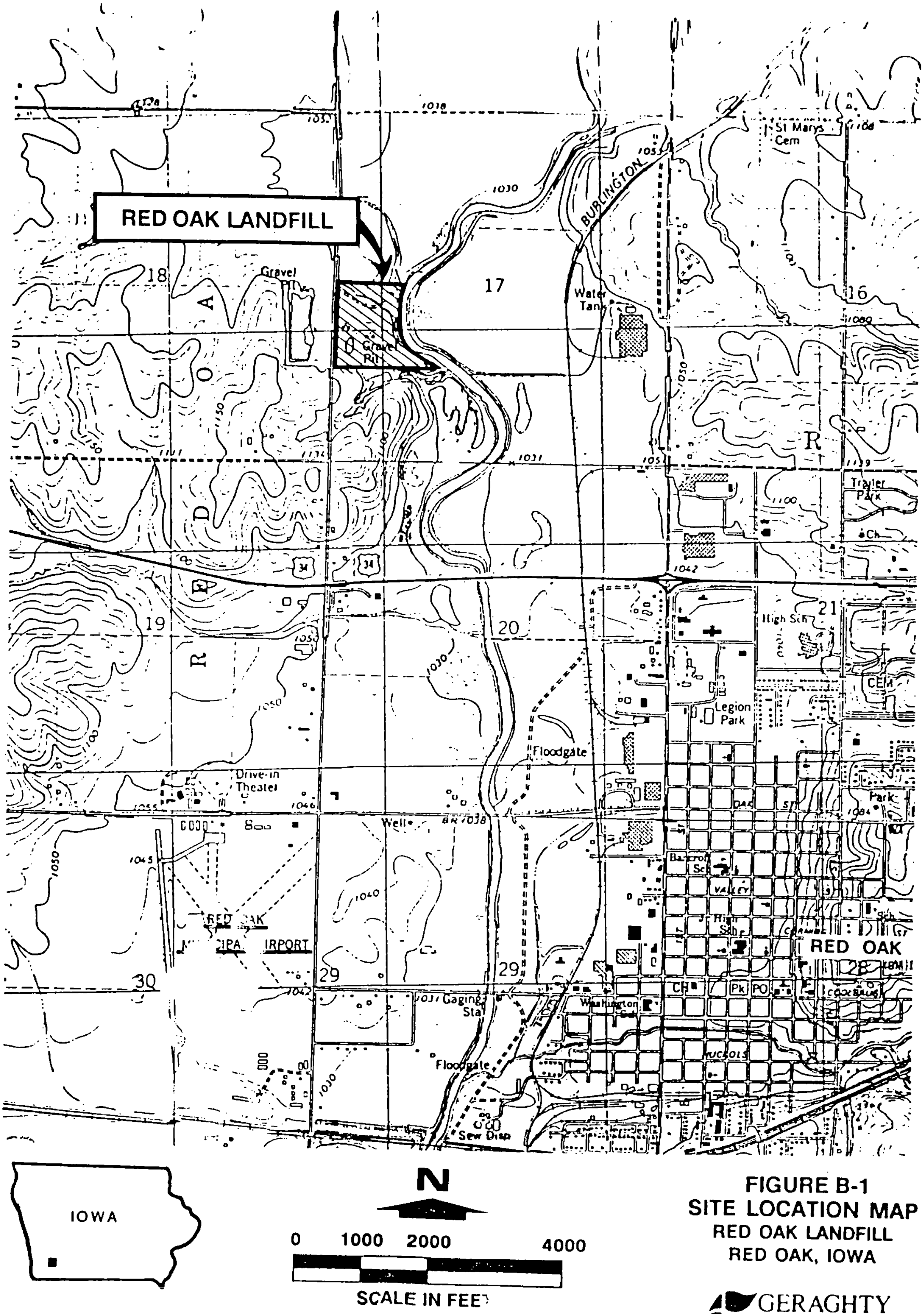


FIGURE B-1
SITE LOCATION MAP
RED OAK LANDFILL
RED OAK, IOWA

GERAGHTY
& MILLER, INC.
Ground Water Consultants

River, where the slope is nearly vertical in places. Erosion due to surface runoff is greatest in the east central portion of the landfill where junked cars, rusted drums, and other solid wastes are presently exposed.

Soils, loess (wind derived silt and clay) and glacial till reportedly overlie the bedrock in much of the local area. Underlying the loess are glacial till deposits which consist of a clay matrix with occasional silt and sand layers and boulders. These unconsolidated glacial deposits are typically underlain by Dakota Sandstone. However, in the landfill area the sandstone has been removed by pre-glacial stream erosion, and these glacial deposits overlie the Pennsylvanian-age Plattsmouth Limestone, which was the material quarried from the present landfill site. Beneath the Plattsmouth Limestone is the Heebner Shale.

2.2. Data Quality Objectives

The Data Quality Objectives (DQOs) to address the data needs and data uses for the Red Oak Landfill Phase I RI include, but are not limited to:

- To quantitatively identify any environmental media contamination from landfill waste constituents for remedial needs, and to support the risk assessment.

- To analytically confirm and document levels of constituents present in sediments and surface water of the East Nishnabotna River and adjacent tributaries and in ground water.

- To support selection of remedial alternatives in the FS.

To meet these three DQOs, proposals in the Work Plan include the use of analytical techniques in accordance with the analytical levels defined in the following USEPA documents: "The USEPA Contract Laboratory Program Statement of Work for Organic Analysis" (October, 1986 revised August, 1987), and "USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis (July, 1987).

3.0 PROJECT ORGANIZATION

Geraghty & Miller will be responsible for the overall management of the project, including field supervision of all drilling and sampling activities.

3.1. General Organization

Geraghty & Miller will perform the field investigations and prepare the RI report. Subsequently, Geraghty & Miller will prepare the Feasibility Study. Primary responsibility for project management is with the project coordinator. Responsibility for all QA/QC review is with the Quality Assurance Officer. The review of all environmental and hydrogeologic data will be conducted by the Quality Assurance Officer, the Project Coordinator and the Project Geologist. Where quality assurance problems or deficiencies requiring special attention are identified, the Project Officer, Project Coordinator and Project QA/QC Officer will identify the appropriate corrective action. Ultimate authority for the matters discussed above rest with the EPA. Work will be conducted subject to the requirements of this Consent Order and its attachments.

The following responsibilities have been assigned for the project:

- Remedial Project Manager (RPM)
  Dana Trugley (USEPA Region VII)
- Project Manager
  Brad Berggren (Geraghty & Miller, Inc.)

- Project Administrator
  Ed Rothschild (Geraghty & Miller, Inc.)
- Quality Assurance Officer
  Charles Warren Ankerberg (Geraghty & Miller, Inc.)
- Off-site Laboratory Operations
  Environmental Testing and Certification/Toxicon
  (ETC/Toxicon, Section 2.2 of Attachment 1)

3.2. Field Organization

The Geraghty & Miller field investigation team will be organized according to the sampling activity to be undertaken. For on-site sampling work, the actual sampling team make-up will depend on the type and extent of sampling and will consist of a combination of the following:

- Project Manager; Brad Berggren
  (Geraghty & Miller, Inc.)

- Project Geologist; To be identified
  (Geraghty & Miller, Inc.)

- Quality Assurance/Quality Control Officer;
  Charles Warren Ankerberg (Geraghty & Miller, Inc.)

- Site Health and Safety Officer; Tony Pirelli
  (Geraghty & Miller, Inc.)

- Sampling Coordinator; To be identified

- o Preparation Area Technician; To be identified

The Project Manager will be responsible for the coordination of all personnel on site and for providing technical assistance when required. The Project Manager or his designee will be present whenever sampling occurs and will also keep a general site log describing activities conducted on site, identifying personnel entering the site, and noting general observations regarding site activities.

The Project Geologist will be responsible for providing technical supervision of the drilling subcontractor during the installation and development of the monitoring wells. In addition, the Project Geologist will be responsible for the geologic logging to be performed during the installation of the monitoring wells and the drilling of soil borings.

The Quality Assurance/Quality Control Officer will be responsible for the adherence of all QA/QC guidelines as defined in the QA/QC plan. Strict adherence to these procedures is critical to the collection of acceptable/representative data.

The Site Health and Safety Officer will be responsible for assuring that all team members adhere to the site health and safety requirements. Additional responsibilities of the Site Health and Safety Officer are as follows:

- o Updating equipment or procedures based upon new information gathered during the site inspection.

- Modifying the levels of protection based upon site observations.

- Determining and posting locations and routes to medical facilities, including poison control centers, and arranging for emergency transportation to medical facilities.

- Notifying local public emergency officers, including police and fire departments, of the nature of the team's operations and posting their telephone numbers.

- Examining work-party members for symptoms of exposure or stress.

- Providing emergency medical care and first aid as necessary on-site. He also has the responsibility to stop any field operation that threatens the health or safety of the team or the surrounding populace.

The Sampling Coordinator will be responsible for the coordination of all sampling efforts and will assure the availability and maintenance of the necessary shipping/packing materials and sampling equipment. The responsibilities include: 1) supervise the completion of all sampling documentation; 2) ensure the proper handling and shipping of the samples; 3) be responsible for the accurate completion of the field notebook; and 4) provide close coordination with the Project Manager.

The Preparation Area Technician will assume custody of all ground-water and surface-water samples from the sampling team. These responsibilities also include: 1) the completion of all chain-of-custody forms; 2) maintaining communication with on-site personnel; 3) logging all communications; and 4) site entries and departures during sampling.

3.3. Laboratory Organization

The laboratory organization is separated along lines of responsibility; laboratory operations, QA functions (Charles Warren Ankerberg, Geraghty & Miller) and project management. The operations organization of ETC/Toxicon Corporation, is summarized in Figure 2.2.1 of Attachment 1.

4.0 QUALITY ASSURANCE OBJECTIVES

The general quality assurance objective is to ensure that environmental monitoring data of known and acceptable quality is provided. Environmental data collection efforts will adhere to the QA/QC procedures developed by Geraghty & Miller, Inc. for the collection and preservation of environmental samples. Laboratory analysis efforts by ETC/Toxicon Corporation (a participant in the USEPA's Contract Laboratory Program) will adhere to the QA/QC procedures developed for the USEPA's Contract Laboratory Program (CLP) and are described in more detail in Attachment 1. CLP data deliverables generated by the laboratory will be submitted to the USEPA for review. The QA objectives for the chemical analyses of this project are to achieve the QC criteria stated in the CLP Invitation for Bid (IFB), number WA-87-J003/K236/J238 for organic chemical analyses and number WA-87-J003/K026/K027 for inorganic analyses. Detection limits provided by the CLP for low and medium level soil and water are provided in Attachment 1. QA objectives for field measurements, such as pH and specific conductance, includes proper operation of the field equipment based on the operator's manual instructions included in Attachment 2.

4.1. Precision

The QA/QC aim in testing the precision is to demonstrate the reproducibility of the data. The precision of analytical project measurements will be evaluated and reported along with the method reference number in a manner consistent with previously published data on precision. Moreover, precision measurements will be done with high purity materials, knowledgeable laboratory personnel, internal quality controls and following consistent scientific practice. Precision objectives will be consistent with those of the USEPA's CLP and are discussed in Attachment 1.

4.2. Accuracy

Accuracy is the relationship of the reported data to the "true" value, and will be: (a) reported with the data; (b) attained by independent audits using standards which are different from those used during routine operations; and (c) consistent with any previously published accuracy data from the applicable literature, and Federal and State regulations and guidelines. Accuracy objectives will be consistent with those of the USEPA's CLP and are discussed in Attachment 1.

4.3. Completeness

Completeness is a measure of the amount of valid data obtained from a measurement program, compared to the amount that would be expected to be obtained under correct normal conditions. The data base will be routinely assessed on the basis of expected versus actual data and will be developed to a point where it is capable of supporting statistical analyses for interpretational purposes.

4.4. Representativeness

All data should be representative of the actual conditions at the sampling location. Considerations in evaluating the representativeness of the data include, but are not limited to the location being sampled, the methods used to obtain environmental samples at the site, and the appropriateness of the analytical method to the type of sample obtained.

4.5. Comparability

All data will be reported in units consistent with both Federal and State regulations, methods, and guidelines. Comparability between data bases will also be achieved by citing standardized sampling and analysis methods and data formats. Any deviation from the standard operating procedures will be noted and data will be qualified for comparative purposes.

5.0 SAMPLING PROCEDURES

All sampling for this field investigation will be performed in accordance with the project sampling procedures and equipment as described in the project Sampling and Analysis Plan (Work Plan, Appendix A).

6.0 SAMPLE CUSTODY

Sample custody procedures are designed to comply with USEPA and National Enforcement Investigation Council (NEIC) requirements for sample control. An example of the chain-of-custody form which will be used during this investigation is presented in the project Data Management Plan (Work Plan, Appendix D).

Samples collected during the site investigation will be the responsibility of identified persons from the time they are collected until they or their derived data are incorporated into the final report. Stringent chain-of-custody procedures will be followed to maintain and document sample possession.

6.1. Field Custody

The Preparation Area Technician is personally responsible for the care and custody of the samples collected until they are personally delivered to the analyzing laboratory or entrusted to a carrier.

Log books and other records will always be signed and dated on each page.

Chain-of-custody sample forms will be completed to the fullest extent possible prior to sample shipment. They will include the following information: sample number, time collected, data collected, source of sample (including type of sample), preservative and name of sampler. These forms will be filled out in a legible manner using water-proof ink and will be signed by the sampler. Similar information will be provided on the sample tag which is securely attached to the sample bottle.

6.2. Transfer of Custody and Shipment

The following procedure will be used when transferring custody of samples.

- Samples will always be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them will sign, date and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the laboratory.
- Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis with a separate custody record accompanying each shipment. Shipping containers will be sealed for shipment to the laboratory. The method of shipment, courier name and other pertinent information will be entered in the remarks section of the custody record.
- All shipments will be accompanied by the chain-of-custody record identifying its contents. The original record will accompany the shipment and a copy will be retained by the field sampler.

- Proper documentation will be maintained for shipments by common carrier.

6.3. Sample Shipment Procedures

The following procedures will be followed when shipping samples for laboratory analysis:

- Samples requiring refrigeration will be promptly chilled with ice or "Blue Ice" to a temperature of 4°C and packaged in an insulated cooler for transport to the analyzing laboratory.
- Only shipping containers which meet all applicable State and Federal standards for safe shipment will be used.
- The shipping containers will be sealed with tape in a manner that will allow the receiver to quickly identify any tampering which may have taken place during transport to the laboratory.
- The field chain-of-custody document will be placed inside the shipping container in a sealed plastic envelope after the courier has signed the document.
- Shipment will be by overnight courier.

6.4. Field Documentation Responsibilities

It will be the responsibility of the Project Geologist to secure all documents produced in the field (i.e. geologists' daily logs, lithologic and sampling logs, communications, etc.) at the end of each day's work.

The possession of all records will be documented; however, only the Project Geologist and Project Manager may remove field data from the site for reduction and evaluation.

6.5. Laboratory Custody

The chain-of-custody in the laboratory consists of two primary areas, receipt of samples and maintenance of internal custody of samples as they are transferred throughout the facility. Detailed descriptions of the procedures implemented by the laboratory to maintain the chain-of-custody of samples submitted to ETC/Toxicon for analyses are presented in Attachment 1.

7.0 EQUIPMENT CALIBRATION

Field equipment, such as the HNU, OVA and Photovac TIP meters, used during this field project, will be calibrated and operated in accordance with the manufacturer's instructions and manuals. Operating and calibration procedures for these instruments are included in the Sampling and Analysis Plan (Work Plan, Appendix A). Copies of all such instructions and manuals will be available at the site. Documentation of calibrations will be maintained in the project file.

Calibration procedures for laboratory equipment used in the analyses of the soil and ground-water samples are summarized in ETC/Toxicon Corporation's Generic Quality Assurance Plan (Attachment 1).

8.0 ANALYTICAL SERVICES

Water, soil and sediment samples collected during this field investigation will be analyzed by ETC/Toxicon in accordance with the analytical procedures followed within the USEPA's Contract Laboratory Program (CLP). Several field measurements will also be performed. QAPP elements for each are listed below and are documented in the references cited.

QAPP Element	ETC/Toxicon Analyses	Field Analyses
Calibration Procedures	Attachment 1	Attachment 2
Analytical Procedures	Attachment 1	Attachment 2
Internal QC	Attachment 1	Attachment 2
Data Reduction/Validation	Attachment 1	Attachment 2
Performance/System Audit	Attachment 1	Attachment 2
Data Assessment	Attachment 1	Attachment 2
Accuracy/Precision	Attachment 1	Attachment 2
Definitions	Attachment 1	Attachment 2
Corrective Action	Attachment 1	Attachment 2

8.1. ETC/Toxicon Analytical Services

8.1.1. Analytical and Calibration Procedures

All samples collected will be analyzed for VOCs, acid, base/neutral compounds and metals including cyanide as defined in the CLP SOW for Organic/Inorganic Analysis. Table B-1 summarizes the estimated number of samples, replicates, and blanks to be collected during this initial RI phase, the analyses to be conducted on the various samples collected, and the analytical level as defined in "Data Quality Objectives for Remedial Response Activities" (EPA 540/G-871003A). All testing of soil, leachate, ground water, surface water, and sediment samples will conform to the protocols of the USEPA's CLP as specified in IFB Nos. WA-87-J003/K236/J238 for organic chemical analysis and IFB Nos. WA-87-J003/K026/K027 for metals and cyanide). A more detailed discussion is presented in Attachment 1.

Computer-assisted library searches will be made to tentatively identify as many as 30 organic compounds in addition to those listed in the Sampling and Analysis Plan (Appendix A) and Attachment 1. However, no more than four hours per sample will be spent in the search for the identity of unknowns. The three most matched compounds will be reported via a computer mass spectral library search. Positive peak identification requires at least a five major-peak match including the base peak and molecular ion peak. The relative intensities of these peaks should not vary by ± 20 percent compared to the suspected compound. Compounds still unidentified after four hours are labeled as UNKNOWN #XXX, where XXX is the scan number where the unknown appears. Purity should also be included.

8.1.2. Data Reduction, Validation and Reporting

All raw data collected from project sampling tasks, including trip blank results, will be summarized, validated and reported by the testing laboratory (ETC/Toxicon) as described in Attachment 1. The Quality Assurance Manager of Geraghty & Miller, Inc. will review all geochemical data received from the analytical

TABLE B-1
SUMMARY OF THE SAMPLING AND ANALYSIS PROGRAM AT RED OAK LANDFILL (1)

SAMPLE MATRIX	FIELD MEASUREMENTS	LABORATORY PARAMETERS (2)	DQO (3) ANALYTICAL LEVEL	SAMPLES			FIELD REPLICATES			FIELD BLANKS (4)			TRIP BLANKS			MATRIX TOTAL
				NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	
GROUNDWATER	pH Specific Conductance	TCL VOCs (5) Consistent with CLP Protocols Unfiltered Samples	IV	5	2	10	1	2	2	1	2	2	1	2	2	16
	Temperature	TCL Metals Consistent with CLP Protocols Filtered Samples	IV	5	2	10	1	2	2	1	2	2	--	--	--	14
	Static Water Levels	TCL Metals Consistent with CLP Protocols Unfiltered Samples	IV	5	2	10	1	2	2	1	2	2	--	--	--	14
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols Unfiltered Samples	IV	5	2	10	1	2	2	1	2	2	--	--	--	14
SURFACE WATER	pH Specific Conductance	TCL VOCs Consistent with CLP Protocols Unfiltered Samples	IV	11	1	11	2	1	2	1	1	1	1	1	1	15
	Temperature	TCL Metals Consistent with CLP Protocols Unfiltered Samples	IV	11	1	11	2	1	2	1	1	1	--	--	--	14
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols Unfiltered Samples	IV	11	1	11	2	1	2	1	1	1	--	--	--	14
SEDIMENT	HNu Screening (6)	TCL VOCs Consistent with CLP Protocols	IV	13	1	13	2	1	2	1	1	1	1	1	1	17
		TCL Metals Consistent with CLP Protocols	IV	13	1	13	2	1	2	1	1	1	--	--	--	16
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols	IV	13	1	13	2	1	2	1	1	1	--	--	--	16
LEACHATE (7)	HNu Screening	TCL VOCs Consistent with CLP Protocol Unfiltered Samples	IV	5	1	5	1	1	1	1	1	1	1	1	1	8
		TCL Metals Consistent with CLP Protocol Filtered Samples (if possible, otherwise unfiltered)	IV	5	1	5	1	1	1	1	1	1	--	--	--	7
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols Unfiltered Samples	IV	5	1	5	1	1	1	1	1	1	--	--	--	7

TABLE B-1
SUMMARY OF THE SAMPLING AND ANALYSIS PROGRAM AT RED OAK LANDFILL (1)

SAMPLE MATRIX	FIELD MEASUREMENTS	LABORATORY PARAMETERS (2)	DQO (3) ANALYTICAL LEVEL	SAMPLES			FIELD REPLICATES			FIELD BLANKS (4)			TRIP BLANKS			MATRIX TOTAL
				NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	NO.	FREQ.	TOTAL	
SURFACE SOIL	HNu Screening	TCL VOCs Consistent with CLP Protocols	IV	6	1	6	1	1	1	1	1	1	1	1	1	9
		TCL Metals Consistent with CLP Protocols	IV	6	1	6	1	1	1	1	1	1	--	--	--	8
		TCL Acid,Base / Neutral Extract Consistent with CLP Protocols	IV	6	1	6	1	1	1	1	1	1	--	--	--	8
BACKGROUND SOIL BORING (B13) (Discrete Samples)	HNu Screening	TCL Metals Consistent with CLP Protocols	IV	5	1	5	1	1	1	1	1	1	1	1	1	8

Notes:

(1) The analysis program will follow the analytical methodologies, prepare the requied deliverables and analyze for the parameters listed in USEPA Contract Laboratory Program Statment of Work for Organic Analysis (October 1986 revised August 1987), and the USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, (including cyanide, July 1987).

(2) See Attachment 1 of the QAPP (Work Plan, Appendix B) for a complete list of Contract Lab Program (CLP) parameters.

(3) Analytical levels are defined in "Data Quality Objectives for Remedial Response Activities, Volume 1" EPA 540/G-87-003A.

(4) This is an estimated number of field blank samples. The actual number collected or prepared is a function of the number of samples collected per day. At a minimum one blank will be prepared each day.

(5) TCL denotes Target Compound List.

(6) The HNu Screening will provide qualitative information on the level of VOC contaminaiton and provide information for health and safety purposes.

(7) Five is the minimum number of leachate (seep) samples to be collected. Additional samples may be collected if field conditions warrant.

RO314/TBLb-1.WK1

laboratories prior to its release in a public document to verify that it reasonably reflects known or expected conditions.

Quality control of data will involve the collection of field replicates, the preparation of field blanks and the thorough use of trip blanks. In addition, internal quality control procedures for ground water, surface water, and sediment samples will follow the protocols of the USEPA's CLP for organic chemical and inorganic chemical analyses.

8.1.3. Performance and System Audits

Performance and systems audits are considered an essential part of a quality control program. A performance audit independently collects measurement data using performance evaluation samples. A systems audit consists of a review of the total data production process which includes on-site inspections of field and laboratory operational systems and physical facilities for sampling, calibration and measurement protocols.

A systems audit of the field procedures will be conducted by the Quality Assurance/Quality Control Officer and additional staff, as may be necessary. At least one unscheduled field audit will be performed during the course of the investigation and sampling program. The Project Manager and Project QA/QC Officer will ensure that the field project is performed in accordance with approved procedures. The audit will review sampling methodology and sample chain-of-custody, as well as review all data reporting methods and data files.

Trip blanks for VOCs will be shipped along with the sample bottles and will be analyzed at the same time as all other samples. Field blanks will be prepared using site sampling equipment and will be analyzed to determine whether the procedures may be biasing the data.

8.1.4. Preventative Maintenance

The maintenance of laboratory equipment will be performed by the appropriate laboratory according to specified equipment calibration, operation and maintenance procedures. Preventive maintenance procedures for ETC/Toxicon are described in Attachment 1.

8.1.5. Data Assessment Procedures

Analytical data will be assessed by the analytical lab in accordance with standard operating procedures and will include the analysis of reference samples and performance audits.

The Quality Assurance Manager of Geraghty and Miller, Inc. will review all water and soil chemical data. The chemical data will be reviewed to determine if they are consistent with known or anticipated hydrogeologic conditions and accepted hydrogeologic principles. The physical data will be reviewed in a similar manner by the QA/QC officer.

8.1.6. Corrective Action Procedures

If the quality control audit results in the detection of unacceptable conditions or data, the Project Manager and Project QA/QC Officer are responsible for developing and initiating corrective action procedures. Corrective action may include:

- Reanalyzing the samples if the holding time criteria permit.
- Resampling and analyzing.
- Evaluating and amending sampling and analytical procedures.
- Accepting data while acknowledging a level of uncertainty.

8.2. Field Analytical Services

8.2.1. Analytical and Calibration Procedures

Ground water and surface water samples will be analyzed for pH, specific conductance, and temperature. Specific operating and calibration procedures for the pH and conductivity meters to be used in the field are contained in Attachment 2.

8.2.2. Internal Quality Control

Field analyses are performed on-site and do not involve samples that are collected and retained. The primary QA/QC objective is to obtain reproducible measurements to a degree of accuracy consistent with limits imposed by analytical methodologies used and with the intended use of the data. Quality control procedures will be limited to checking the reproducibility of measurements by taking multiple readings and by calibration of instruments (where appropriate).

8.2.3. Data Reduction/Validation

All field recording sheets, instrument outputs, and work-sheets for calculating results will be retained. Summarized raw data will be appropriately identified in reports and included in a separate appendix of the final RI report.

8.2.4. Performance/System Audit

All instruments used in making field measurements will be regularly calibrated (where appropriate) as specified in Attachment 2.

8.2.5. Data Assessment

The Sample Team Leader will assess data to assure QA/QC objectives are met.

8.2.6. Accuracy/Precision Definitions

No quantitative levels are specified.

8.2.7. Corrective Actions

If variability among multiple readings at a single site is judged excessive, instruments will be recalibrated (if appropriate) and the measurement repeated. If variability remains unacceptably high and instruments fail to properly calibrate, the SM will be notified.

#RedOak#3\QAPP.1chpy

Red Oak Landfill
Red Oak, Iowa

WORK PLAN
QUALITY ASSURANCE PROJECT PLAN
(APPENDIX B)

ATTACHMENT 1

ETC/Toxicon; Generic Quality Assurance Plan Specific for Contract Laboratory Program

ETC

QUALITY ASSURANCE PLAN FOR THE DETERMINATION OF THE CONTRACT LABORATORY PROGRAM (CLP) INORGANIC TARGET ANALYTE LIST (TAL) PARAMETERS

SUBMITTED TO:

PREPARED BY:

ETC/TOXICON
3213 MONTERREY BOULEVARD
BATON ROUGE, LOUISIANA 70814
(504) 925-5012

DECEMBER, 1987

APPROVAL:

ETC/TOXICON
QUALITY ASSURANCE OFFICER ____________________

ETC/TOXICON
PROJECT MANAGER ____________________

QUALITY ASSURANCE OFFICER ____________________

PROJECT OFFICER ____________________

ETC

TABLE OF CONTENTS

Document Distribution

Title	Individual
Project Officer:	______________________
Quality Assurance Officer:	______________________
ETC/Toxicon Project Manager:	______________________
ETC/Toxicon Quality Assurance Officer:	______________________

1.0 PROJECT DESCRIPTION

The objective of this project is to provide the determinations of the Contract Laboratory Program (CLP) Inorganic Target Analyte List (TAL) Parameters in multi-media at multi-concentration levels.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Effective organization and management is crucial to successfully complete the analytical characterization in a timely manner.

The organizational structure proposed for this work is presented in Figure 2.1.

Project Manager

The Project Manager is responsible for the day-to-day management of the total project staff and provides the primary avenue of communication with the Project Officer. The Project Manager is responsible for maintaining technical performance, meeting schedules, meeting budgets and approving all analytical and quality assurance/quality control procedures to be used in the course of the project.

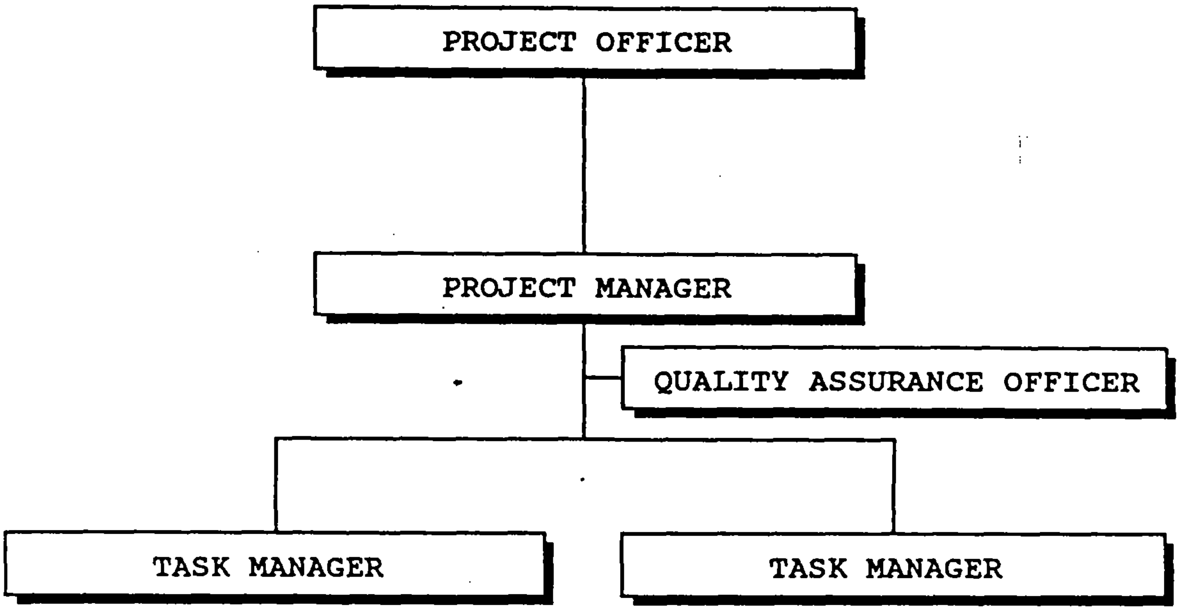
Quality Assurance Officer

The Quality Assurance Officer is responsible for developing the Quality Assurance Project Plan and verifying its proper implementation.

Task Manager

The assigned Task Manager is responsible for the technical aspects of the task and the principal investigator in the task and/or supervises the activities of each task team member.

FIGURE 2.1
PROPOSED ORGANIZATIONAL STRUCTURE



3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA IN TERMS OF PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

The quality assurance objectives for measurement data in terms of precision, accuracy, and completeness are presented in Table 3.1.

The measurements will be made such that the results are representative of the sample matrix being characterized.

All analytical concentration results will be reported in ug/L for aqueous samples, in mg/kg dry weight basis for soil samples, and in mg/kg wet weight basis for nonaqueous samples with substantial organic content. Soil moisture content will be reported in percent.

TABLE 3.1 PRECISION, ACCURACY AND COMPLETENESS OBJECTIVES

Measurement Parameters

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc
Cyanide

Methods	Inductively Coupled Plasma (ICP) Optical Emission Spectroscopy Atomic Absorption (AA) Spectroscopy Spectrophotometric Determination of Cyanide and/or Titrimetric Determination of Cyanide Gravimetric Determination of Soil Percent Solid
Reference	Contract Laboratory Program, Statement Of Work Inorganic Analysis Multi-Media, Multi-Concentration, SOW No. 787, U.S. Enviromental Protection Agency-July, 1987.
Experimental Conditions	Spiked and unspiked field samples
Precision Relative Percent Difference	± Twenty (20) Percent provided both original sample and duplicate measurements are greater than or equal to five (5) times the Contract Required Detection Limits (CRDLs) specified in Table 6.2. ± CRDL provided either of the original sample or duplicate measurements are less than five (5) times the CRDLs specified in Table 6.2.

Accuracy Percent Recovery	Seventy-five (75) Percent to One Hundred and Twenty-five (125) Percent provided the original sample concentration does not exceed the spike concentration level by a factor of four (4) or greater.
Completeness	Ninety-five (95) Percent

4.0 SAMPLING PROCEDURE

The primary consideration of sample collection is to obtain a sample that is representative of the whole and to store the sample such that its integrity is maintained.

Polyethylene or polypropylene sample containers with screw caps will be employed as the primary sampling containers for the collection of all field samples. Alternately, glass sample containers with teflon-lined screw caps will be employed.

All metals sample containers and screw caps will be rinsed sequentially with dilute nitric acid and deionized water and allowed to air dry.

All cyanide sample containers and screw caps will be washed with a non-phosphate detergent, rinsed sequentially with tap water and deionized water, and allowed to air dry.

The cleaned containers will be stored sealed until opened in the field for sample collection.

Water samples for metals will be preserved with nitric acid to a pH of 2 or less immediately on sample collection. Should dissolved metals be required, the samples will be filtered onsite prior to the addition of the nitric acid.

Water samples for cyanide will be preserved with sodium hydroxide to a pH of 12 or greater and cooled to 4°C or at wet ice temperature immediately on sample collection. In the presence of residual chlorine, ascorbic acid will be added at the level of 0.6 g/L.

All soil/sediment samples will be preserved at 4°C or at wet ice temperature immediately on sample collection.

The samples will be stored in a dry area at ambient temperature or at 4°C, as appropriate. Nitric acid preserved water samples will be stored at ambient temperature or at 4°C, as convenient, while all nonaqueous samples will be stored at 4°C.

The sample holding times for mercury are twenty-six (26) days, metals other than mercury one hundred and eighty (180) days, and cyanide fourteen (14) days.

5.0 CHAIN-OF -CUSTODY AND DOCUMENT CONTROL

Sample custody is an important part of any laboratory or field operation. In order to maintain and document sample custody, the following chain-of-custody procedures will be strictly followed. A sample is said to be under custody if:

1. It is in actual possession of the responsible person, or;
2. It is in view, following physical possession, or;
3. It was in possession of said personnel and was locked and sealed to prevent tampering, or;
4. It is in a secure area.

The sampling episode will be documented in the field at the time of sample collection using water resistant ink and sample tags such as presented in Figure 5.1 and chain-of-custody records such as presented in Figure 5.2.

FIGURE 5.1. SAMPLE TAG.

Laboratory ID ______________________________
Field ID ______________________________
Sample Description ______________________________
____
Site ______________________________
Station ______________________________
Location ______________________________
Date ______________ Time ______________
Sampler ______________________________
Organization ______________________________
Comments ______________________________
____
____
____

CHAIN-OF-CUSTODY RECORD

PROJECT No.	PROJECT NAME

SAMPLERS: (Printed Name & Signature)

SITE

ADDRESS

STATION	STATION LOCATION	DATE/TIME	COMP or GRAB	NUMBER CONTAINERS													REMARKS

Relinquished by: (Printed Name & Signature)	DATE/TIME	Received by: (Printed Name & Signature)	Relinquished by: (Printed Name & Signature)	DATE/TIME	Received by: (Printed Name & Signature)
REMARKS			REMARKS		
Relinquished by: (Printed Name & Signature)	DATE/TIME	Received by: (Printed Name & Signature)	Relinquished by: (Printed Name & Signature)	DATE/TIME	Received
REMARKS			REMARKS		

Figure 5.2. Chain-of-Custody Record.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

The analytical instrumentation will be calibrated daily to provide acceptable performance.

Major instrumentation and typical operating conditions are presented in Table 6.1.

The highest quality calibration standards readily available commercially will be utilized to provide an initial instrument calibration. These standards will consist of single component and/or multi-component standards, as appropriate.

The initial calibration will be verified employing a certified solution obtained from the U.S. Environmental Protection Agency as available. Otherwise, the initial calibration will be verified with a standard prepared independently of that employed for the initial calibration.

A continuing calibration check will be performed at a frequency of ten (10) percent during the analytical sequence or every two (2) hours, whichever is more frequent.

The proposed instrument detection limits are presented in Table 6.2.

TABLE 6.1. TYPICAL OPERATING PARAMETERS FOR MAJOR INSTRUMENTATION

PARAMETER	TYPICAL OPERATING CONDITIONS
Aluminum Antimony Arsenic Barium Beryllium Cadmium Calcium Chromium Cobalt Copper Iron Lead Magnesium Manganese Nickel Potassium Selenium Silver Sodium Thallium Vanadium Zinc	<u>Inductively Coupled Plasma (ICP) Optical Emission Spectroscopy</u> Jarrell-Ash 9000A Inductively Coupled Argon Plasma Optical Emission Spectrometer. 0.75 meter direct reading air spectrometer with simultaneous determinations on fixed channels. Background correction. Variable N+1 channel. Tylans FC26 flow controller for nebulizer argons. High solids nebulizer. Peristaltic pump. IBM AT Data Acquisition system with ThermoSPEC System Software Version 3.03. IBM video monitor and high speed dot matrix impact printer. Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Statement of Work, Inorganic Analysis Multi-Media, Multi-Concentration, SOW No. 787, U.S. Environmental Protection Agency, July, 1987.
	<u>Atomic Absorption Spectroscopy</u> Perkin Elmer Zeeman/5100 Atomic Absorption Spectrometer. Double Beam Optical System. Flame and Graphite Furnace with L'vov platforms. Background Corrector. Perkin Elmer 7700 Professional Computer with Perkin Elmer 7000 Series Computer Software Version 2.3 and Model 5100 Software Version 2.72. Perkin Elmer Dual Electrodeless Discharge Lamp Power Supply. Perkin Elmer HGA-400 Graphite Furnace Controller Perkin Elmer AS-60/70 Autosampling System.

	Perkin Elmer PR-310 Printer. Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Program Statement of Work, Inorganic Analysis Multi-Media, Multi-Concentration, SOW No. 787, U.S. Environmental Protection Agency, July, 1987.
Mercury	Cold Vapor Mercury Analysis Coleman MAS-50A Cold Vapor Mercury Analyzer. ISCC Model ISC-240 Autosampler. Perkin Elmer Strip Chart Recorder Model 56. Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Program Statement of Work, Inorganic Analysis Multi-Media, Multi-Concentration, SOW No. 787, U.S. Environmental Protection Agency, July, 1987.
Cyanide	Manual distillation units. Bausch and Lomb Spectronic 20. Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Program Statement of Work, Inorganic Analysis Multi-Media, Multi-Concentration, SOW No. 787, U.S. Environmental Protection Agency, July, 1987.
Percent Solids	Farberware Model 460 Convection Drying Oven or equivalent at 103 + 105°C. Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Program Statement of Work, Inorganic Analysis Multi-Media, Multi-Concentration, SOW No. 787, U.S. Environmental Protection Agency, July, 1987.

TABLE 6.2. CONTRACT REQUIRED LIMITS.[1]

PARAMETER	CAS RN	Contract Required Detection Limit(1,2) (ug/L)
Aluminum	7429-90-5	200
Antimony	7440-36-0	60
Arsenic	7440-38-2	10
Barium	7440-39-3	200
Beryllium	7440-41-7	5
Cadmium	7440-43-9	5
Calcium	7440-70-2	5000
Chromium	7440-47-3	10
Cobalt	7440-48-4	50
Copper	7440-50-8	25
Iron	7439-89-6	100
Lead	7439-92-1	5
Magnesium	7439-95-4	5000
Manganese	7439-96-5	15
Mercury	7439-97-6	0.2
Nickel	7440-02-0	40
Potassium	7440-09-7	5000
Selenium	7782-49-2	5
Silver	7440-22-4	10
Sodium	7440-23-5	5000
Thallium	7440-28-0	10
Vanadium	7440-62-2	10
Zinc	7440-66-6	20
Cyanide		10

---

[1] In the event of a Catastrophic Failure, any analytical method specified in the Statement of Work will be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits will be acceptable if the sample concentration exceeds five times the detection limit of the instrument or methods in use.

[2] The Instrument Detection Limits (IDLs) are determined as three (3) times the pooled standard deviation for seven consecutive measurements acquired on each of three non-consecutive days on standard solutions at a nominal 3 to 5 times the IDLs.

7.0 ANALYTICAL METHODOLOGY

The current U. S. Environmental Protection Agency Contract Laboratory Program inorganic analytical methodology will be utilized. The analytical methodology is specified in the following document:

> Contract Laboratory Program, Statement of Work, Inorganic Analysis Multi-Media, Multi-Concentration, SOW No. 787, U.S. Environmental Protection Agency, July, 1987.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

For the ICP analyses and AA analyses, other than mercury, all concentrations from the prepared sample digestates will be taken directly from the respective data systems following an external standard calibration.

For aqueous samples, no sample concentration effect will be achieved, consequently the final reported metals concentrations in ug/L will be calculated as:

(Observed Sample Concentration ug/L) (Dilution Factor)

For soil/sediment samples, the final reported metals concentrations in mg/kg dry weight will be calculated manually as:

$$\frac{(\text{Sample digestate concentration mg/L})\ (\text{Final digestate sample volume L})\ (\text{Dilution Factor})}{(\text{Wet Sample Weight kg})\ (\text{Percent Solids/100})}$$

For nonaqueous samples with substantial organic content, the final reported metals concentrations in mg/kg net weight will be calculated manually as:

$$\frac{(\text{Sample digestate concentration mg/L})\ (\text{Final digestate sample volume L})\ (\text{Dilution Factor})}{(\text{Wet Sample Weight kg})\ (\text{Percent Solids/100})}$$

Prepared mercury digestate concentrations will be taken in terms of peak heights from the output of a strip chart recorder. Final mercury concentrations will then be calculated in the same manner other metals concentrations are calculated.

The percent solids will be calculated directly in terms of the analytical balance readings.

$$\text{Percent Solids} = \frac{\text{Weight of pan + dry sample - Weight of pan}}{\text{Weight of pan plus wet sample - Weight of pan}} \times 100$$

The raw data calculations and final data will be screened and edited to provide a scientifically valid and legally defensible package.

A minimum of ten (10) percent of the data will be reviewed by functional management for completeness and correctness prior to submission.

The final report will consist predominately of concentration data handwritten or computer generated on data terms equivalent to those presented in the appendix.

9.0 INTERNAL QUALITY CONTROL CHECKS

The daily initial calibration verification will be made employing certified solutions obtained from the U. S. Environmental Protection Agency as available. The initial calibrations will be verified with standards independent of that employed for the initial calibration.

Continuing calibration checks will be performed at a frequency of ten (10) percent during the analytical sequence or every two (2) hours, whichever is more frequent.

Duplicate sample analyses will be performed with a frequency of one (1) per twenty (20) field samples of a similar matrix type.

Matrix spike sample analyses will be performed with a frequency of one (1) per twenty (20) field samples of a similar matrix type.

Each time a set of samples is processed or new reagents or materials are employed, a laboratory method blank will be processed and analyzed.

Each time a set of samples is processed, a laboratory control sample from the U.S. Environmental Protection Agency, as available, and appropriate for the individual analytical work request will be processed and analyzed with a frequency of one (1) per twenty (20) of fewer samples of a similar matrix.

At least ten (10) percent of all manual calculations will be checked.

10.0 PERFORMANCE AND SYSTEM AUDITS

Performance will be subjected to external audits in terms of U.S. Environmental Protection Agency Performance Evaluation and U. S. Environmental Protection Agency On-Site Laboratory Evaluations.

Quality Control Samples will be analyzed with each batch of samples analyzed.

11.0 PREVENTIVE MAINTENANCE

The Jarrell-Ash 9000 ICP, Perkin Elmer 5100 AA, and Coleman MAS-50 Cold Vapor Mercury Analyzer systems allocated for use on this project are maintained by qualified personnel.

Manufacturers' service contracts are maintained on the Jarrell-Ash 9000 ICP and the Perkin Elmer 5100 AA and ancillary Perkin Elmer equipment. Routine maintenance such as changing the graphite furnace platforms or tubes on the Perkin Elmer 5100 AA cleaning the cell windows on the Coleman MAS-50 Cold Vapor Mercury Analyzer, cleaning the ICP nebulizer or torch, or changing the source on the Bausch and Lomb Spectronic 20 is performed on an "as needed" basis.

Selected critical spare parts such as ICP torches and RF power tubes and expendable materials are maintained on-site to minimize downtime.

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

The precision of the method is expressed in terms of the relative percent differences (RPD) for each component are calculate as follows:

$$RPD = \frac{D^1 - D^2}{(D^1 + D^2)/2} \times 100$$

where RPD, D^1, and D^2 are Relative Percent Difference, First Sample Value, and Second Sample Value (duplicate), respectively.

The precision will be reported as noncalculable should the parameter value for either the first sample value or the second sample value be below the detection limits proposed in Table 6.2.

The accuracy of the method is expressed as the percent recovery

$$100\ (SSR - SR)/SA$$

where SSR, SR, and SA are spiked sample result, and spike added, respectively.

The completeness will be calculated as the ratio of the number of samples analyzed and providing valid data to the total number of field samples submitted and authorized for analysis.

13.0 CORRECTIVE ACTION

The Quality Assurance Program provides the mechanism for providing rapid corrective action in any problem area to minimize the possibility of producing data of questionable validity. These corrective actions are intended to eliminate both immediate problems involving sampling procedures, analytical procedures, or improperly functioning instrumentation long-term problems involving systematic errors.

The corrective action entails the following:

1) Definition of the problem,

2) Assignment of responsibility for investigating the problem,

3) Investigation and determination of the cause of the problem,

4) Determination of the corrective action to eliminate the problem,

5) Assignment of responsibility for implementing the corrective action,

6) Determination of the effectiveness of the corrective action, and

7) Verification that the corrective action has eliminated the problem.

The corrective action form presented in Figure 13.1 will be employed to document all corrective actions taken. The corrective action form may be initiated by any project individual who observes a major problem. If more than one problem is involved, each problem and corrective action will be documented in a single form.

QUALITY ASSURANCE
CORRECTIVE ACTION REQUEST FORM

Originator ______________________ Date __________

Nature of Problem ______________________

Recommended Corrective Action ______________________

Reviewed by ______________________ Date __________

Corrective Action Required ______________________

Action Assigned to ______________________ Date Due __________

Action Completed ______________________ Date __________
(Attach Description of Solution) Signed

Reviewed by ______________________ Date __________

FIGURE 13.1 CORRECTIVE ACTION REQUEST FORM.

U.S. EPA - CLP

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

SOW No.: _____

EPA Sample No.	Lab Sample ID.

EPA form should
be photocopied
for inclusion in
this section.

Were ICP interelement corrections applied? Yes/No ___

Were ICP background corrections applied? Yes/No ___

If yes-were raw data generated before application of background corrections? Yes/No ___

Comments:

Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the ollowing signature.

Lab Manager: ____________________

Date: __________

COVER PAGE - IN 7/87

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO. ______

Lab Name: ______ Contract: ______

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix (soil/water): ______ Lab Sample ID: ______

Level (low/med): ______ Date Received: ______

% Solids: ______

Concentration Units (ug/L or mg/kg dry weight): ______

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: ______ Clarity Before: ______ Texture: ______

Color After: ______ Clarity After: ______ Artifacts: ______

Comments:

U.S. EPA - CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Initial Calibration Source: ____________

Continuing Calibration Source: ____________

Concentration Units: ug/L

	Initial Calibration			Continuing Calibration					
Analyte	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

AA CRDL Standard Source: ____________

ICP CRDL Standard Source: ____________

Concentration Units: ug/L

	CRDL Standard for AA			CRDL Standard for ICP				
Analyte	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic								
rium								
ryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

U.S. EPA - CLP

3
BLANKS

Lab Name: ______________ Contract: ________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Preparation Blank Matrix (soil/water): ______

Preparation Blank Concentration Units (ug/L or mg/kg): ______

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron											
Lead											
Magnesium											
Manganese											
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											

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4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No: ______ SAS No.: ______ SDG No.: ______

ICP ID Number: __________ ICS Source: __________

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Lab Name: ____________ Contract: ________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Matrix (soil/water): ______ Level (low/med): ______

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

FORM V (PART 1) - IN 7/87

U.S. EPA - CLP

5B
POST DIGEST SPIKE SAMPLE RECOVERY

EPA SAMPLE NO. ____________

Lab Name: ____________ Contract: ____________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix (soil/water): ______ Level (low/med): ______

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

Lab Name: ______________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Matrix (soil/water): ______ Level (low/med): ______

% Solids for Sample: ______ % Solids for Duplicate: ______

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Cyanide								

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7

LABORATORY CONTROL SAMPLE

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Solid LCS Source: ____________

Aqueous LCS Source: ____________

Analyte	Aqueous (ug/L)			Solid (mg/kg)					
	True	Found	%R	True	Found	C	Limits		%R
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
mium									
cium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

U.S. EPA - CLP

8

STANDARD ADDITION RESULTS

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Concentration Units: ug/L

EPA Sample No.	An	Dil	0 ADD ABS	1 ADD		2 ADD		3 ADD		Final Conc.	r	Q
				CON	ABS	CON	ABS	CON	ABS			

U.S. EPA - CLP

10
HOLDING TIMES

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

EPA Sample No.	Matrix	Date Received	Mercury Prep Date	Mercury Holding Time	Cyanide Prep Date	Cyanide Holding Time

U.S. EPA - CLP

11

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: ____________ Contract: ________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

ICP ID Number: __________ Date: ________

Flame AA ID Number: __________

Furnace AA ID Number: __________

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		
Antimony			60		
Arsenic			10		
Barium			200		
Beryllium			5		
Cadmium			5		
Calcium			5000		
Chromium			10		
Cobalt			50		
Copper			25		
Iron			100		
Lead			5		
Magnesium			5000		
Manganese			15		
Mercury			0.2		
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

Comments:

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12A
ICP INTERELEMENT CORRECTION FACTORS (QUARTERLY)

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

ICP ID Number: ____________ Date: ________

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Al	Ca	Fe	Mg	__
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
cium						
omium						
obalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

U.S. EPA - CLP

12B
ICP INTERELEMENT CORRECTION FACTORS (QUARTERLY)

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

ICP ID Number: ____________ Date: ________

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		__	__	__	__	__
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

U.S. EPA - CLP

13

ICP LINEAR RANGES (QUARTERLY)

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: _____

ICP ID Number: __________ Date: ________

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum			
Antimony			
Arsenic			
Barium			
Beryllium			
Cadmium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Magnesium			
Manganese			
Mercury			
Nickel			
Potassium			
Selenium			
Silver			
Sodium			
Thallium			
Vanadium			
Zinc			

Comments:

ETC

QUALITY ASSURANCE PLAN FOR THE DETERMINATION OF THE CONTRACT LABORATORY PROGRAM (CLP) ORGANIC TARGET COMPOUND LIST (TCL) PARAMETERS

SUBMITTED TO:

PREPARED BY:

ETC/TOXICON
3213 MONTERREY BOULEVARD
BATON ROUGE, LOUISIANA 70814
(504) 925-5012

DECEMBER, 1987

APPROVAL:

ETC/TOXICON
QUALITY ASSURANCE OFFICER ________________

ETC/TOXICON
PROJECT MANAGER ________________

QUALITY ASSURANCE OFFICER ________________

PROJECT OFFICER ________________

ETC

TABLE OF CONTENTS

Document Distribution

Title	Individual
Project Officer:	
Quality Assurance Officer:	
ETC/Toxicon Project Manager:	
ETC/Toxicon Quality Assurance Officer:	

1.0 PROJECT DESCRIPTION

The objective of this project is to provide the determinations of the Contract Laboratory Program (CLP) Organic Target Compound List (TCL) Parameters in multi-media at multi-concentration levels.

Characterization of the 126 Organic TCL Parameters, enumerated in Appendix A*, emcompasses the three analytical fractions - Purgeable Volatiles, Semivolatile Extractable Base/Neutral/Acids and Pesticide/PCBs.

APPENDIX A* Of this Attachment 1 to the Quality Assurance Project Plan (APPENDIX B) of the Work Plan.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Effective organization and management is crucial to successfully complete the analytical characterizations in a timely manner, and within budget.

The organizational structure proposed for this work is presented in Figure 2.1.

Project Manager

The Project Manager is responsible for the day-to-day management of the total project staff and provides the primary avenue of communication with the Project Officer. The Project Manager is responsible for maintaining technical performance, meeting schedules, meeting budgets and approving all analytical and quality assurance/quality control procedures to be used in the course of the project.

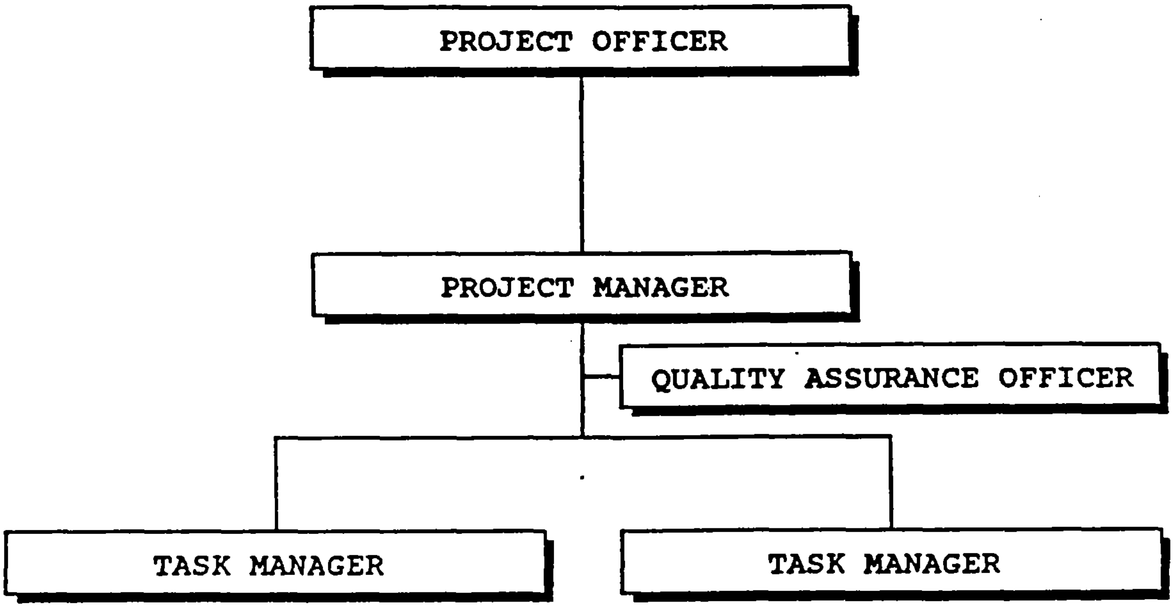
Quality Assurance Officer

The Quality Assurance Officer is responsible for developing the Quality Assurance Project Plan and verifying its proper implementation and continued utilization.

Task Manager

The assigned Task Manager is responsible for the technical of each task. He is the principal investigator in each aspects task and/or supervises the activities of each task team member.

FIGURE 2.1
PROPOSED ORGANIZATIONAL STRUCTURE



3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA IN TERMS OF PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

The quality assurance objectives for measurement data in terms of precision, accuracy, and completeness are presented in Table 3.1.

The measurements will be made such that the results are as representative of the sample matrix being characterized as is readily achieved with the application of the quoted methodology.

All analytical concentration results will be reported in ug/L for aqueous samples, in ug/kg dry weight basis for soil samples, and in ug/kg wet weight basis for nonaqueous samples with substantial organic content. Soil moisture content

Soil moisture content and pH will be reported in percent and standard pH units, respectively.

TABLE 3.1 PRECISION, ACCURACY AND COMPLETENESS OBJECTIVES

Measurement Parameters	Contract Laboratory Program (CLP) Purgeable Volatile Target Compound List (TCL) Parameters CLP Semivolatile Extractable Base/Neutral/ Acid TCL Parameters[1] pH Percent Moisture
Methods	Packed and/or Capillary Column Gas Chromatography/Mass Spectrometry Packed and/or Capillary Column Gas Chromatography/Electron Capture Detection Purge and Trap and/or Solvent Extraction Sample Preparation Potentiometric Determination of Soil pH Gravimetric Determination of Soil Percent Moisture
Reference	Contract Laboratory Program, Statement Of Work Organic Analysis Multi-Media, Multi-Concentration, 10/86 Rev. 7/87, U. S. Environmental Protection Agency-July, 1987.
Experimental Conditions	Spiked and unspiked field samples
Surrogate Percent Recovery	Compound specific[2]
Precision (Relative Percent Difference Matrix Spike & Matrix Spike	Compound specific[3]

Accuracy (Percent Recovery Matrix Spike & Matrix Spike Duplicate)	Compound specific[3]
Completeness	Ninety-five (95) Percent

---

[1] See Appendix A* for an enumeration of TCL parameters.

[2] See Appendix B* for an enumeration of surrogate compounds and control limits.

[3] See Appendix C* for an enumeration of matrix spike compounds and control limits.

*APPENDIX A,B,C, of this Attachment 1 to the Quality Assurance Project Plan (APPENDIX B) of the Work Plan.

4.0 SAMPLING PROCEDURE

The primary consideration of sample collection is to obtain a sample that is representative of the whole or of one or more selected components and to store the sample such that its integrity is maintained during the approved holding times.

Containers for aqueous purgeable volatiles will be glass vials with open screw tops and teflon-lined silicon septa.

Glass containers with teflon-lined screw caps will be employed for the collection of all organic field samples.

Glass vials for purgeable volatiles will be baked in a clean dedicated oven at 105-110^{o}C for four (4) hours. The teflon-lined silicon septa will be washed in high purity, i.e., low ketone content methanol, and/or will be be baked in a clean dedicated oven at 105-110^{o} for one (1) hour.

All semivolatile extractable and pesticide/PCB sample containers and cap liners will be washed with a nonphosphate detergent, rinsed sequentially with three (3) individual portions of tapwater, three (3) individual portions of organic-free water, distilled in glass acetone, distilled in glass methylene chloride and allowed to air dry.

The cleaned containers will be stored sealed until opened in the field for sample collection.

All samples will be preserved at 4^{o}C or at wet ice temperature immediately on sample collection and will be prior to analysis stored at 4^{o}C.

The sample holding times for purgeable volatiles is ten (10) days from the date of sample receipt. The sample holding times for semivolatile extractables and pesticide/PCBs is five (5) days to start extractions using continuous liquid extractors or five (5) days to complete the extractions using separatory funnels. The sample holding times for sample extracts for semivolatile extractables or pesticide/PCBs is forty (40) days from the date of sample receipt.

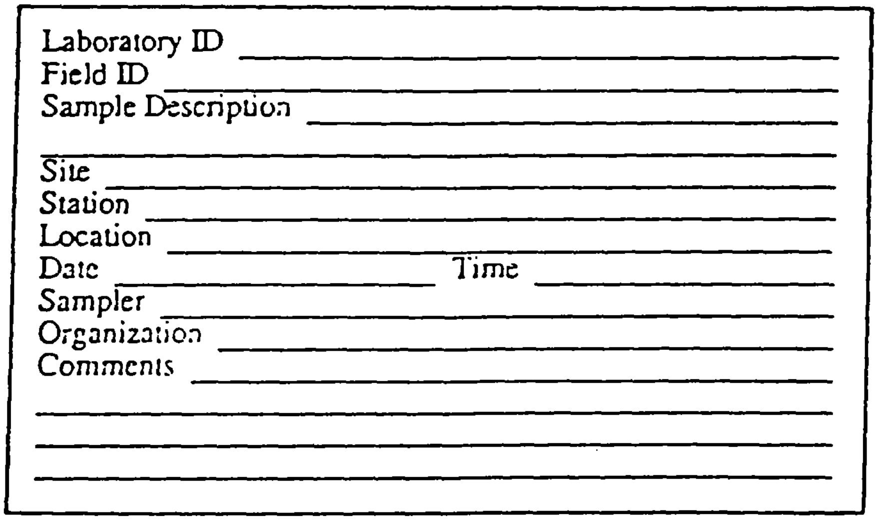
5.0 CHAIN-OF-CUSTODY AND DOCUMENT CONTROL

Sample custody is an important part of any laboratory or field operation. In order to maintain and document sample custody, the following chain-of-custody procedures will be strictly followed. A sample is said to be under custody if:

1. It is in actual possession of the responsible person, or;
2. It is in view, following physical possession, or;
3. It was in possession of said personnel and was locked and sealed to prevent tampering, or;
4. It is in a secure area.

The sampling episode will be documented in the field at the time of sample collection using water resistant ink and sample tags such as presented in Figure 5.1 and chain-of-custody records such as presented in Figure 5.2.

FIGURE 5.1. SAMPLE TAG.



Laboratory ID ______
Field ID ______
Sample Description ______
______
Site ______
Station ______
Location ______
Date ______ Time ______
Sampler ______
Organization ______
Comments ______
______
______
______

CHAIN-OF-CUSTODY RECORD

PROJECT NO.	PROJECT NAME			NUMBER CONTAINERS												REMARKS
SAMPLERS: (Printed Name & Signature)																
SITE																
ADDRESS																
STATION	STATION LOCATION	DATE/TIME	COMP or GRAB													

Relinquished by: (Printed Name & Signature)	DATE/TIME	Received by: (Printed Name & Signature)	Relinquished by: (Printed Name & Signature)	DATE/TIME	Received by: (Printed Name & Signature)
REMARKS			REMARKS		
Relinquished by: (Printed Name & Signature)	DATE/TIME	Received by: (Printed Name & Signature)	Relinquished by: (Printed Name & Signature)	DATE/TIME	Received
REMARKS			REMARKS		

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Figure 5.2. Chain-of-Custody Record.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

Major instrumentation and typical operating conditions are presented in Table 6.1.

The highest quality calibration standards readily available commercially will be utilized to provide an initial instrument calibration. These standards will consist of single component and/or multi-component standards, as appropriate.

The GC/MS instrumentation will be calibrated for each twelve (12) hour shift to provide acceptable performance.

Compliance with U.S. Environmental Protection Agency GC/MS instrument tuning mass spectral abundance criteria will be demonstrated at the beginning of every twelve-hour shift that standards, samples, or associated quality control samples are analyzed.

The mass spectral abundance criteria for semivolatile extractable analyses will be demonstrated by the injection of 50 ng decafluorotriphenylphosphine (DFTPP) or the injection or purge and trap thermal desorption of 50 ng of bromofluorobenzene (BFB). A simple straightforward data processing of mass spectral scans will be performed to meet either the DFTPP or BFB tuning criteria presented in Table 6.2.

The initial GC/MS calibration will be performed utilizing a multicomponent standard or standards containing all the target compounds, surrogates, and internal standards. The calibration will be performed at a minimum of four (4) levels for all target compounds and at five (5) levels for most target compounds.

A single level continuing GC/MS calibration verification will be performed during any subsequent twelve (12) hour shift using a multicomponent standard or standards containing all the target compounds, surrogates, and internal standards. The calibration will be performed using the next to lowest to mid-level standard.

TABLE 6.1. TYPICAL OPERATING PARAMETERS FOR MAJOR INSTRUMENTATION

PARAMETER	TYPICAL OPERATING CONDITIONS
Contract Laboratory Program (CLP) Purgeable Volatile Target Compounds List (TCL) Parameters	Finnigan MAT 4510B Research Grade Gas Chromatography/Mass Spectrometers with Finnigan MAT9611 Gas Chromatograph with both capillary and packed column inlets.
	Data General Nova 4 x 5 Minicomputer with 70 megabyte Winchester-type disk drive with 20 megabyte cartridge steamer tape, a Printronix High Speed Printer/Plotter, and dual Westward 1015 Video Display Terminals.
	Super Incos™ Software.
	Auto Quant™ for automated batch sample processing.
	Data Master™ allows the transfer of data files from the GC/MS data system to IBM AT Microcomputer for sample processing.
	QA Form Master™ provides quantitation and summary quality assurance data reports according to the Environmental Protection Agency Contract Laboratory protocols.
	National Bureau of Standards/Environmental Protection Agency/National Institute of Health Mass Spectral Library consisting of 42,261 mass spectral entries on magnetic disk, released 1985.
	Tekmar LSC-2 Purge and Trap Unit with Tekmar ALS Automatic Liquid Sampler.Computer with
	Purging Unit for preparing large volumes of purgeable volatile-free water employed for purge and trap analyses, method blanks, and trip blanks.
	Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration 10/86, Rev. 7/87. U. S. Environmental Protection Agency, July 1987.

TABLE 6.1 (CONTINUED) TYPICAL OPERATING PARAMETERS FOR MAJOR INSTRUMENTATION

PARAMETER	TYPICAL OPERATING CONDITIONS
CLP Semivolatile Extractable Base/Neutral/ Acid Target Compounds List (TCL) Parameter	Finnigan MAT 4510B Research Grade Gas Chromatograph/Mass Spectrometers with Pulsed Positive Ion/Negative Ion Chemical Ionization (PPINIC) and a Finnigan MAT9611 Gas Chromatograph with both capillary and packed column inlets.
	Data General Nova 4 x 16 Microcomputer with a 70 megabyte Winchester-type disk drive with 20 megabyte cartridge streamer tape, a Printronix High Speed Printer/Plotter, and dual Westward 1015 Video Display Terminals.
	Super Incos™ Software.
	Auto Quant™ for automated batch sample processing.
	Data Master™ allows the transfer of data files from the GC/MS data system to IBM AT Microcomputer for sample processing.
	QA Form Master™ provides quantitation and summary quality assurance data reports according to the Environmental Protection Agency Contract Laboratory protocols.
	National Bureau of Standards/Environmental Protection Agency/National Institute of Health Mass Spectral Library consisting of 42,261 mass spectral entries on magnetic disk, released 1985.
	Stand-Alone Data System compatible with those on the Finnigan MAT 4510B Research Grade Gas Chromatograph/Mass Spectrometers. Data General Nova 4 X/5 Minicomputer with 70 megabyte Winchester-type disk drive and 20 megabyte cartridge streamertape, Digital High Speed Printer/Plotter, Model LX-02-4, and two Graphon Model 225 Video Display Terminals.
	Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Program, Statement of

Work, Organic Analysis Multi-Media, Multi-Concentration 10/86, Rev. 7/87. U. S. Environmental Protection Agency, July 1987.

TABLE 6.1 (CONTINUED) TYPICAL OPERATING PARAMETERS FOR MAJOR INSTRUMENTATION

PARAMETER	TYPICAL OPERATING CONDITIONS
CLP Pesticide/ PCB Target Compounds List (TCL) Parameters	Two Varian 3400 Gas Chromatographs are equipped with Ni-63 pulsed electron capture detectors and Varian Model 8040 Automatic Liquid Samplers. Both units are interfaced to a Nelson Analytical 3000 Chromatography System via Nelson Analytical 762SB A/D convertors.
	Two Hewlett Packard 5890A Gas Chromatographs with 15 millicurie Ni-63 pulsed electron capture detectors and Hewlett Packard 7673A Automatic Liquid Samplers. Configured for both packed and capillary chromatography. Both units are interfaced to a Nelson Analytical 3000 Chromatography System via Nelson Analytical 960 A/D Convertor.
	Nelson Analytical 2600 Chromatography Software.
	IBM XT Microcomputer with 20 megabyte fixed disk, Quadram Quad Board Multifunction Card with 640 kilobytes RAM memory, and IBM enhanced graphics card.
	IBM Enhanced Color Monitor
	Zenith Z-150 Microcomputer with 10 Megabyte Fixed Disk and AST Six Pack Multifunction Card with 640 kilobytes RAM Memory.
	Zenith Monochrome (Amber) Monitor.
	Hyundai Super 16 Turbo Microcomputer with 30 megabyte Fixed Disk, 640 Kilobyte RAM Memory, and Enhanced Graphics Monitor.
	Hyundai Enhanced Color Monitor.
	Three Epson FX-100 Dot Matrix Printers.

TABLE 6.1 (CONTINUED) TYPICAL OPERATING PARAMETERS FOR MAJOR INSTRUMENTATION

PARAMETER	TYPICAL OPERATING CONDITIONS
	Hewlett Packard 5710 gas chromatograph with 15 milicurie Ni-63 pulsed electron capture detector equipped Hewlett Packard 7672A Automatic Liquid Sampler and Spectral Physics SP4270 Integrator.
	Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration 10/86, Rev. 7/87. U. S. Environmental Protection Agency, July 1987.
Aqueous Extractions	Sixty One-liter Continuous Liquid Liquid Extraction Units cooled with Nestlab Coolflow Model CFT-75 Refrigerated Recirculator.
	Separatory funnel Extraction Units.
	Operated to meet criteria specified in Contract Laboratory Program, Statement Of Work, Organic Analysis Multi-Media, Multi-Concentration 10/86, Rev. 7/87, U. S. Environmental Protection Agency, July, 1987.[1]
Soil	Heat Systems Ultrasonic, Inc. Ultrasonic Proces Model W-375 with 3/4 inch High Grain Horn Model 305 and Standard Tapered Microtip Model 419.
	Heat Systems Ultrasonic, Inc. Ultrasonic Processor Model W-380 with 3/4 inch High Gain Horn Model 305.
	Operated according to manufacturer's instructions to meet criteria specified in Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration 10/86, Rev. 7/87. U. S. Environmental Protection Agency, July 1987.

TABLE 6.1 (CONTINUED) TYPICAL OPERATING PARAMETERS FOR MAJOR INSTRUMENTATION

PARAMETER	TYPICAL OPERATING CONDITIONS
Solvent Extract Concentration	Kuderna-Danish Evaporative Concentrators Micro Snyder Concentrators. Nitrogen Blowndown Evaporative Concentrator
Gel Permeation Chromatography	Cole-Palmer Instrument Company, Masterflex Pump Model 7520-25, Beckman Instruments, Inc. Analytical UV Detector Model 153 with Biochemical Cell, Two Ace Glass Incorporated Gel Permeation Chromatography Adjusta-Chrom Columns Model 5819, and Two Sample Injectors consisting of Reyodyne, Inc. Type 50 Teflon Rotary Valves and Fixed Volume Sample Loops. Operated according to manfuacturer's instructions to meet criteria specified in Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration, 10/86, Rev. 7/87, U. S. Environmental Protection Agency, July 1987.
pH	
Percent Moisture	Farberware Model 460 Convection Drying Oven or equivalent at 105°C.

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[1] Personal communication January, 1985, with Mr. Dale Rushneck of Interface, Inc., Fort Collins, CO.

TABLE 6.2. GC/MS INSTRUMENT TUNING MASS SPECTRAL ABUNDANCE CRITERIA

Decafluorotriphenylphosphine (DFTPP)

m/e	Ion Abundance Criteria
51	30.0 - 60.0% of mass 198
68	Less than 2.0% of mass 69
69	Mass 69 relative abundance
70	Less than 2.0% of mass 69
127	40.0 - 60.0% o of mass 198
197	Less than 1.0% of mass 198
198	Base peak, 100% relative abundance
199	5.0 - 9.0% of mass 198
275	10.0 - 30.0% of mass 198
365	Greater than 1.00% of mass 198
441	Present, but less than mass 443
442	Greater than 40.0% of mass 198
443	17.0 - 23.0% of mass 442

Bromofluorobenzene (BFB)

m/3	Ion Abundance Criteria
50	15.0 - 40.0% of mass 95
75	30.0 - 60.0% of mass 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of mass 95
173	Less than 1.0% of mass 95
174	Greater than 50.0% of mass 95
175	5.0 - 9.0% of mass 174
176	Greater than 95.0%, but less than 101.0% of mass 174
177	5.0 - 9.0% of mass 176

TABLE 6.3. CONTRACT REQUIRED QUANTITATION LIMITS.[1]

PARAMETER	CONTRACT REQUIRED QUANTITATION LIMIT
Contract Laboratory Program (CLP) Purgeable Volatile Target Compound List (TCL) Parameters	Compound Specific[1]
CLP Semivolatile Extractable Base/ Neutral/Acid TCL Parameters	Compound Specific[1]
CLP Pesticide/PCB TCL Parameters	Compound Specific[1]

[1] See Appendix A*for an enumeration of individual compounds and Contract Required Quantitation Limits (CRDLs).

Compound specific.[1] Ranges from 5 to 10 ug/L in aqueous samples, to 5 to 10 ug/Kg wet weight in low level soil samples, and 625 to 1250 ug/Kg wet weight in medium level soil samples.

Compound specific.[1] Ranges from 10 to 50 ug/L in aqueous samples, 330 to 1600 ug/Kg wet weight in low level soil samples, and 19800 to 96000 ug/Kg wet weight in medium level soil samples.

Compound specific.[1] Ranges from 0.05 to 0.10 ug/L and 0.5 to 1.0 ug/L for single response and multi-response parameters, respectively, in aqueous samples, 8.0 to 16.0 ug/Kg wet weight and 80.0 to 160.0 ug/Kg wet weight for single response and multiresponse parameters, respectively, in low level soil samples, and 120 to 250 ug/Kg wet weight and 1200 to 2400 ug/Kg wet weight for single response and multiresponse parameters, respectively, in medium level soil sample.

APPENDIX A*of this Attachment 1 to the Quality Assurance Project Plan (APPENDIX B) of the Work Plan.

7.0 ANALYTICAL METHODOLOGY

The current U. S. Environmental Protection Agency Contract Laboratory Program organic analytical methodology will be utilized. The analytical methodology is specified in the following document:

> Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration, 10/86 Rev. 7/87, U.S. Environmental Protection Agency, July, 1987.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

All concentrations from samples or prepared sample extracts will be taken directly from the data systems following an internal standard calibration for the semivolatile extractable base/neutral/acids work and following an external calibration for the pesticide/PCBs.

For aqueous purgeable volatile samples, no sample concentration effect will be achieved, consequently the final reported metals concentrations in ug/L will be calculated as:

$$(\text{Observed Sample Concentration ug/L})\ (\text{Dilution Factor})$$

For soil/sediment samples, the final reported metals concentrations in mg/kg dry weight will be calculated manually as:

$$\frac{(\text{Sample digestate concentration ug/L})\ (\text{Final digestate sample volume L})\ (\text{Dilution Factor})}{(\text{Wet Sample Weight kg})}$$

The percent moisture will be calculated directly in terms of the analytical balance readings.

$$\text{Percent Moisture} = \frac{\text{Weight of pan + wet sample - Weight of pan}}{\text{Weight of pan plus + wet sample - Weight of pan}} \times 100$$

The raw data calculations and final data will be screened and edited to provide a scientifically valid and legally defensible package.

The final report will consist predominately of concentration data and the appropriate supporting quality control data handwritten or computer generated on data terms equivalent to those presented in Appendix D*

APPENDIX D*of this Attachment 1 to the Quality Assurance Project Plan (APPENDIX B) of the Work Plan.

9.0 INTERNAL QUALITY CONTROL CHECKS

The daily initial calibration verification will be made employing certified solutions obtained from the U. S. Environmental Protection Agency as available. The initial calibrations will be verified with standards independent of that employed for the initial calibration.

Duplicate sample analyses will be performed with a frequency of one (1) per twenty (20) field samples of a similar matrix type.

Similarly, matrix spike sample analyses will be performed with a frequency of one (1) per twenty (20) field samples of a similar matrix type.

Each time a set of twenty (20) or fewer samples is processed or new reagents or materials are employed, a laboratory method blank will be processed and analyzed.

Laboratory control samples from the U.S. Environmental Protection Agency, as available, will be processed and analyzed with a frequency of one (1) per aqueous and one (1) per soil/ sediment matrices as appropriate for the individual analytical work request.

TABLE 9.1. SEVENTY-TWO (72) HOUR INSTRUMENT RUN SEQUENCE FOR PESTICIDE/PCB ANALYSIS.

Step	Instrument Run
1	Evaluation Standard Mix A[1,2]
2	Evaluation Standard Mix B[1,3]
3	Evaluation Standard Mix C[1,4]
4	Individual Standard Mix A[5,6]
5	Individual Standard Mix B[6,7]
6	Toxaphene
7	Aroclors 1016/1260
8	Aroclor 1221
9	Aroclor 1232
10	Aroclor 1242
11	Aroclor 1248
12	Aroclor 1254
13	5 samples
14	Evaluation Standard Mix B
15	5 samples
16	Individual Standard Mix A or B
17	5 samples
18	Evaluation Standard Mix B
19	5 samples
20	Individual Standard Mix A or B, whichever not run in Step 16
21	5 samples
22	Above sequence repeated starting with Evaluation Standard Mix B in Step 14
23	Pesticide/PCB analysis sequence must end with Individual Standard Mix A and B regardless of samples analyzed.

---

[1] Contains aldrin, endrin, 4,4'-DDT, and dibutychlorendate.

[2] Low level standard at approximately 20 percent full scale.

[3] Mid-level standard at approximately 50 percent full scale.

[4] High level standard at approximately 100 percent full scale but still within the linear range.

[5] Contains approximately one half of the single component TCL Pesticides an dibutylchlorendate.

[6] Individual Standards Mixes A and B may be combined into one mixture provided all components chromatically separated with no overlap.

[7] Contains remaining single component TCL Pesticides, aldrin, and dibutylchlorendate.

[8] Arochlors 1221 and 1232 must be analyzed on each instrument and each column at a minimum of once per month.

10.0 PERFORMANCE AND SYSTEM AUDITS

Performance will be subjected to external audits in terms of U.S. Environmental Protection Agency Performance Evaluation Samples and U. S. Environmental Protection Agency On-Site Laboratory Evaluations,as available.

11.0 PREVENTIVE MAINTENANCE

The Finnigan MAT 4510B Gas Chromatograph/Mass Spectrometers Varian 3400 Gas Chromatographs with electron capture detectors, and Hewlett Packard 5890A Gas Chromatographs with electron capture detectors allocated for use on this project are maintained by qualified personnel.

Instrument redundancy coupled with an extensive stock of spare parts and materials on-site serves to minimize downtime.

Routine maintenance such as changing chromatographic septa and injector inserts, chromatographic column maintenance, and cleaning of the mass spectrometer ion source and/or analyze section are performed on an "as needed" basis.

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

The precision of the method is expressed in terms of the relative percent differences (RPD) for each component are calculated as follows:

$$RPD = 100 \frac{/D_1 - D_2}{(D_1+D_2)/2}$$

where RPD, D_1, and D_2 are Relative Percent Difference, Matrix Spike, and Matrix Spike Value, respectively.

The accuracy of the method is expressed as the percent recovery of selected target compounds spiked into the Matrix Spike and Matrix Spike Duplicate and surrogate compounds spiked into all samples

$$100 (SSR - SR)/SA$$

where SSR, SR, and SA are spiked sample result, sample result, and spike added, respectively.

The percent recovery for surrogates is expressed in an analogous manner as

$$100 SSSR/SSA$$

where SSSR and SSA are spiked surrogate sample result ant surrogate spike added, respectively.

The completeness will be calculated as the ratio of the number of samples analyzed and providing valid data to the total number of field samples submitted and authorized for analysis.

13.0 CORRECTIVE ACTION

The Quality Assurance Program provides the mechanism for providing rapid corrective action in any problem area to minimize the possibility of producing data of questionable validity. These corrective actions are intended to eliminate both immediate problems involving sampling procedures, analytical procedures, or improperly functioning instrumentation long-term problems involving systematic errors.

The corrective action entails the following:

1) Definition of the problem,
2) Assignment of responsibility for investigating the problem,
3) Investigation and determination of the cause of the problem,
4) Determination of the corrective action to eliminate the problem,
5) Assignment of responsibility for implementing the corrective action,
6) Determination of the effectiveness of the corrective action, and
7) Verification that the corrective action has eliminated the problem.

The corrective action form presented in Figure 13.1 will be employed to document all corrective actions taken. The corrective action form may be initiated by any project individual who observes a major problem. If more than one problem is involved, each problem and corrective action will be documented in a single form.

14.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

The quality assurance officer will submit a copy of the final project analytical report quality assurance section along with the results of performance and system audits and the enumeration of any significant quality assurance problems and recommended solutions to senior-level management for review.

Quality Assurance Project Plan

Attachment 1

APPENDIX A *

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

		Quantitation Limits**	
Volatiles	CAS Number	Water µg/L	Low Soil/Sediment[a] µg/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethene	75-34-4	5	5
9. 1,1-Dichloroethane	75-35-3	5	5
10. 1,2-Dichloroethene (Total)	540-59-0	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,2-Dichloropropane	78-87-5	5	5
19. cis-1,3-Dichloropropene	10061-01-5	5	5
20. Trichloroethene	79-01-6	5	5
21. Dibromochloromethane	124-48-1	5	5
22. 1,1,2-Trichloroethane	79-00-5	5	5
23. Benzene	71-43-2	5	5
24. trans-1,3-Dichloropropene	10061-02-6	5	5
25. Bromoform	75-25-2	5	5
26. 4-Methyl-2-pentanone	108-10-1	10	10
27. 2-Hexanone	591-78-6	10	10
28. Tetrachloroethene	127-18-4	5	5
29. Toluene	108-88-3	5	5
30. 1,1,2,2-Tetrachloroethane	79-34-5	5	5

Volatiles (continued)	CAS Number	Quantitation Limits** Water µg/L	 Low Soil/Sediment[a] µg/Kg
31. Chlorobenzene	108-90-7	5	5
32. Ethyl Benzene	100-41-4	5	5
33. Styrene	100-42-5	5	5
34. Xylenes (Total)	1330-20-7	5	5

[a] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRDL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Source: Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration, 10/86 Rev. 7/87, U. S. Environmental Protection Agency, July 1987.

Semivolatiles	CAS Number	Quantitation Limits** Water µg/L	Low Soil/Sediment[b] µg/Kg
35. Phenol	108-95-2	10	330
36. bis(2-Chloroethyl)ether	111-44-4	10	330
37. 2-Chlorophenol	95-57-8	10	330
38. 1,3-Dichlorobenzene	541-73-1	10	330
39. 1,4-Dichlorobenzene	106-46-7	10	330
40. Benzyl Alcohol	100-51-6	10	330
41. 1,2-Dichlorobenzene	95-50-1	10	330
42. 2-Methylphenol	95-48-7	10	330
43. bis(2-Chloroispropyl)ether	108-60-1	10	330
44. 4-Methylphenol	106-44-5	10	330
45. N-Nitroso-di-n-dipropylamine	621-64-7	10	330
46. Hexachloroethane	67-72-1	10	330
47. Nitrobenzene	98-95-3	10	330
48. Isophorone	78-59-1	10	330
49. 2-Nitrophenol	88-75-5	10	330
50. 2,4-Dimethylphenol	105-67-9	10	330
51. Benzoic Acid	65-85-0	50	1600
52. bis(2-Chloroethoxy)methane	111-91-1	10	330
53. 2,4-Dichlorophenol	120-83-2	10	330
54. 1,2,4-Trichlorobenzene	120-82-1	10	330
55. Naphthalene	91-20-3	10	330
56. 4-Chloroaniline	106-47-8	10	330
57. Hexachlorobutadiene	87-68-3	10	330
58. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59. 2-Methylnaphthalene	91-57-6	10	330
60. Hexachlorocyclopentadiene	77-47-4	10	330
61. 2,4,6-Trichlorophenol	88-06-2	10	330
62. 2,4,5-Trichlorophenol	95-95-4	50	1600
63. 2-Chloronaphthalene	91-58-7	10	330
64. 2-Nitroaniline	88-74-4	50	1600
65. Dimethylphthalate	131-11-3	10	330
66. Acenaphthylene	208-96-8	10	330
67. 2,6-Dinitrotoluene	606-20-2	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330

Semivolatiles	CAS Number	Quantitation Limits** Water μg/L	Low Soil/Sediment[b] μg/Kg
73. 2,4-Dinitrotoluene	121-14-2	10	330
74. Diethylphthalate	84-66-2	10	330
75. 4-Chlorophenyl-phenyl-ether	7005-72-3	10	330
76. Fluorene	86-73-7	10	330
77. 4-Nitroaniline	100-01-6	50	1600
78. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79. N-nitrosodiphenylamine	86-30-6	10	330
80. 4-Bromophenyl-phenylether	101-55-3	10	330
81. Hexachlorobenzene	118-74-1	10	330
82. Pentachlorophenol	87-86-5	50	1600
83. Phenanthrene	85-01-8	10	330
84. Anthracene	120-12-7	10	330
85. Di-n-butylphthalate	84-74-2	10	330
86. Fluoranthene	206-44-0	10	330
87. Pyrene	129-00-0	10	330
88. Butyl Benzyl Phthalate	85-68-7	10	330
89. 3,3'-Dichlorobenzidine	91-94-1	20	660
90. Benzo(a)anthracene	56-55-3	10	330
91. Chrysene	218-01-9	10	330
92. bis(2-Ethylhexyl)phthalate	117-81-7	10	330
93. Di-n-octylphthalate	117-84-0	10	330
94. Benzo(b)fluoranthene	205-99-2	10	330
95. Benzo(k)fluoranthene	207-08-9	10	330
96. Benzo(a)pyrene	50-32-8	10	330
97. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
98. Dibenz(a,h)anthracene	53-70-3	10	330
99. Benzo(g,h,i)perylene	191-24-2	10	330

[b] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semivolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Source: Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration, 10/86 Rev. 7/87, U. S. Environmental Protection Agency, July 1987.

Pesticides/PCBs	CAS Number	Quantitation Limits** Water µg/L	Low Soil/Sediment[c] µg/Kg
100. alpha-BHC	319-84-6	0.05	8.0
101. beta-BHC	319-85-7	0.05	8.0
102. delta-BHC	319-86-8	0.05	8.0
103. gamma-BHC (Lindane)	58-89-9	0.05	8.0
104. Heptachlor	76-44-8	0.05	8.0
105. Aldrin	309-00-2	0.05	8.0
106. Heptachlor Epoxide	1024-57-3	0.05	8.0
107. Endosulfan I	959-98-8	0.05	8.0
108. Dieldrin	60-57-1	0.10	16.0
109. 4,4'-DDE	72-55-9	0.10	16.0
110. Endrin	72-20-8	0.10	16.0
111. Endosulfan II	33213-65-9	0.10	16.0
112. 4,4'-DDD	72-54-8	0.10	16.0
113. Endosulfan Sulfate	1031-07-8	0.10	16.0
114. 4,4'-DDT	50-29-3	0.10	16.0
115. Methoxychlor	72-43-5	0.5	80.0
116. Endrin ketone	53494-70-5	0.10	16.0
117. alpha-Chlordane	5103-71-9	0.5	80.0
118. gamma-Chlordane	5103-74-2	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. Aroclor-1016	12674-11-2	0.5	80.0
121. Aroclor-1221	11104-28-2	0.5	80.0
122. Aroclor-1232	11141-16-5	0.5	80.0
123. Aroclor-1242	53469-21-9	0.5	80.0
124. Aroclor-1248	12672-29-6	0.5	80.0
125. Aroclor-1254	11097-69-1	1.0	160.0
126. Aroclor-1260	11096-82-5	1.0	160.0

[c] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticide/PCB TCL Compounds are 15 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Source: Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration, 10/86 Rev. 7/87, U. S. Environmental Protection Agency, July 1987.

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Attachment 1

APPENDIX B*

Contract Required Surrogate Spike Recovery Limits

CONTRACT REQUIRED SURROGATE SPIKE RECOVERY LIMITS

Fraction	Surrogate Compound	Low/Medium Water	Low/Medium Soil
Purgeable Volatile	1,2-Dichloroethane-d4	76-114	70-121
	Toluene-d8	88-110	81-117
	4-Bromofluorobenzene	86-115	74-121
Semivolatile Base/Neutral	2-Fluorobiphenyl	43-116	30-115
	Nitrobenzene-d5	35-114	23-120
	Terphenyl-d14	33-141	18-137
Semivolatile Acid	2-Fluorophenol	21-100	25-121
	Phenol-d5	10-94	24-113
	2,4,6-Tribromophenol	10-123	19-122
Pesticide	Dibutylchlorendate	(24-154)*	(20-150)*

* Pesticide limits are for advisory purposes only.

Source: Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration, 10/86 Rev. 7/87, U. S. Environmental Protection Agency, July 1987.

Quality Assurance Project Plan

Attachment 1

APPENDIX C*

Contract Required Matrix Spike Recovery Limits and Relative Percent Difference Limits

CONTRACT REQUIRED MATRIX SPIKE RECOVERY LIMITS AND RELATIVE PERCENT DIFFERENCE LIMITS

Fraction/Parameter	Water		Low/Medium Soil	
	Percent Recovery*	Relative Percent Difference**	Percent Recovery	Relative Percent Difference
Purgeable Volatile				
Benzene	76-127	11	66-142	21
Chlorobenzene	75-130	13	60-133	21
1,1-Dichloroethene	61-145	14	59-172	22
Toluene	76-125	13	59-139	21
Trichlorethene	71-120	14	62-137	24
Semivolatile Base/Neutral				
Acenaphthene	46-118	31	31-137	19
1,4-Dichlorobenzene	36-97	28	28-104	27
2,4-Dinitrotoluene	24-96	38	28-89	47
N-Nitroso-di-n-propylamine	41-116	38	41-126	38
Pyrene	26-127	31	35-142	36
1,2,4-Trichlorobenzene	39-98	28	38-107	23
Semivolatile Acid				
4-Chloro-3-methylphenol	23-97	42	26-103	33
2-Chlorophenol	27-123	40	25-102	50
4-Nitrophenol	10-80	50	11-114	50
Pentachlorophenol	9-103	50	17-109	47
Phenol	12-89	42	26-90	35
Pesticide				
Aldrin	40-120	22	34-132	43
Gamma-BHC (Lindane)	56-123	15	46-127	50
4,4'-DDT	38-127	27	23-134	50
Dieldrin	52-126	18	31-134	38
Endrin	56-121	21	42-139	45
Heptachlor	40-131	20	35-130	31

Pesticide limits are for advisory purposes only.

Source: Contract Laboratory Program, Statement of Work, Organic Analysis Multi-Media, Multi-Concentration, 10/86 Rev. 7/87, U. S. Environmental Protection Agency, July 1987.

Quality Assurance Project Plan

Attachment 1

APPENDIX D *

Reporting Forms

Reporting Forms

Organic Analysis Data Sheets (Form I, All Fractions)

Surrogate Recovery (Form II, All Fractions)

Matrix Spike/Matrix Spike Duplicate Recovery (Form III, All Fractions)

Method Blank Summary (Form IV, All Fractions)

GC/MS Tuning and Mass Calibration (Form V Volatile Organics Analysis, Form V Semivolatile Organics)

Initial Calibration Data (Form VI Volatile Organics Analysis, Form VI Semivolatile Organics)

Continuing Calibration Data (Form VII Volatile Organics Analysis, Form VII Semivolatile Organics)

Internal Standard Area Summary (Form VIII Volatile Organics, Form VIII Semivolatile Organics)

Pesticide Evaluation Standards Summary (Form VIII Pesticide Organics)

Pesticide/PCB Standards Summary (Form IX Pesticide Organics)

Pesticide/PCB Identification (Form X Pesticide Organics)

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ______

Matrix: (soil/water) ______ Lab Sample ID: __________

Sample wt/vol: _______ (g/mL) ____ Lab File ID: __________

Level: (low/med) _____ Date Received: ________

% Moisture: not dec. ______ Date Analyzed: ________

Column: (pack/cap) _____ Dilution Factor: ________

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ______	Q
74-87-3	Chloromethane		
74-83-9	Bromomethane		
75-01-4	Vinyl Chloride		
75-00-3	Chloroethane		
75-09-2	Methylene Chloride		
67-64-1	Acetone		
75-15-0	Carbon Disulfide		
75-35-4	1,1-Dichloroethene		
75-34-3	1,1-Dichloroethane		
540-59-0	1,2-Dichloroethene (total)		
67-66-3	Chloroform		
107-06-2	1,2-Dichloroethane		
78-93-3	2-Butanone		
71-55-6	1,1,1-Trichloroethane		
56-23-5	Carbon Tetrachloride		
108-05-4	Vinyl Acetate		
75-27-4	Bromodichloromethane		
78-87-5	1,2-Dichloropropane		
10061-01-5	cis-1,3-Dichloropropene		
79-01-6	Trichloroethene		
124-48-1	Dibromochloromethane		
79-00-5	1,1,2-Trichloroethane		
71-43-2	Benzene		
10061-02-6	trans-1,3-Dichloropropene		
75-25-2	Bromoform		
108-10-1	4-Methyl-2-Pentanone		
591-78-6	2-Hexanone		
127-18-4	Tetrachloroethene		
79-34-5	1,1,2,2-Tetrachloroethane		
108-88-3	Toluene		
108-90-7	Chlorobenzene		
100-41-4	Ethylbenzene		
100-42-5	Styrene		
1330-20-7	Xylene (total)		

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) ______ Lab Sample ID: ____________

Sample wt/vol: ______ (g/mL) ____ Lab File ID: ____________

Level: (low/med) ____ Date Received: __________

% Moisture: not dec. ______ dec. ______ Date Extracted: __________

Extraction: (SepF/Cont/Sonc) ______ Date Analyzed: __________

GPC Cleanup: (Y/N) ___ pH: ____ Dilution Factor: __________

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)_______	Q
108-95-2	Phenol		
111-44-4	bis(2-Chloroethyl)ether		
95-57-8	2-Chlorophenol		
541-73-1	1,3-Dichlorobenzene		
106-46-7	1,4-Dichlorobenzene		
100-51-6	Benzyl alcohol		
95-50-1	1,2-Dichlorobenzene		
95-48-7	2-Methylphenol		
108-60-1	bis(2-Chloroisopropyl)ether		
106-44-5	4-Methylphenol		
621-64-7	N-Nitroso-di-n-propylamine		
67-72-1	Hexachloroethane		
98-95-3	Nitrobenzene		
78-59-1	Isophorone		
88-75-5	2-Nitrophenol		
105-67-9	2,4-Dimethylphenol		
65-85-0	Benzoic acid		
111-91-1	bis(2-Chloroethoxy)methane		
120-83-2	2,4-Dichlorophenol		
120-82-1	1,2,4-Trichlorobenzene		
91-20-3	Naphthalene		
106-47-8	4-Chloroaniline		
87-68-3	Hexachlorobutadiene		
59-50-7	4-Chloro-3-methylphenol		
91-57-6	2-Methylnaphthalene		
77-47-4	Hexachlorocyclopentadiene		
88-06-2	2,4,6-Trichlorophenol		
95-95-4	2,4,5-Trichlorophenol		
91-58-7	2-Chloronaphthalene		
88-74-4	2-Nitroaniline		
131-11-3	Dimethylphthalate		
208-96-8	Acenaphthylene		
606-20-2	2,6-Dinitrotoluene		

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ____________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) ______ Lab Sample ID: ____________

Sample wt/vol: ______ (g/mL) ____ Lab File ID: ____________

Level: (low/med) ____ Date Received: __________

% Moisture: not dec. ______ dec. ______ Date Extracted: __________

Extraction: (SepF/Cont/Sonc) ______ Date Analyzed: __________

GPC Cleanup: (Y/N) ___ pH: ____ Dilution Factor: ________

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ______	Q
99-09-2	3-Nitroaniline		
83-32-9	Acenaphthene		
51-28-5	2,4-Dinitrophenol		
100-02-7	4-Nitrophenol		
132-64-9	Dibenzofuran		
121-14-2	2,4-Dinitrotoluene		
84-66-2	Diethylphthalate		
7005-72-3	4-Chlorophenyl-phenylether		
86-73-7	Fluorene		
100-01-6	4-Nitroaniline		
534-52-1	4,6-Dinitro-2-methylphenol		
86-30-6	N-Nitrosodiphenylamine (1)		
101-55-3	4-Bromophenyl-phenylether		
118-74-1	Hexachlorobenzene		
87-86-5	Pentachlorophenol		
85-01-8	Phenanthrene		
120-12-7	Anthracene		
84-74-2	Di-n-butylphthalate		
206-44-0	Fluoranthene		
129-00-0	Pyrene		
85-68-7	Butylbenzylphthalate		
91-94-1	3,3'-Dichlorobenzidine		
56-55-3	Benzo(a)anthracene		
218-01-9	Chrysene		
117-81-7	bis(2-Ethylhexyl)phthalate		
117-84-0	Di-n-octylphthalate		
205-99-2	Benzo(b)fluoranthene		
207-08-9	Benzo(k)fluoranthene		
50-32-8	Benzo(a)pyrene		
193-39-5	Indeno(1,2,3-cd)pyrene		
53-70-3	Dibenz(a,h)anthracene		
191-24-2	Benzo(g,h,i)perylene		

(1) - Cannot be separated from Diphenylamine

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix: (soil/water) Lab Sample ID:

Sample wt/vol: (g/mL) Lab File ID:

Level: (low/med) Date Received:

% Moisture: not dec. dec. Date Extracted:

Extraction: (SepF/Cont/Sonc) Date Analyzed:

GPC Cleanup: (Y/N) pH: Dilution Factor:

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)	Q
319-84-6	alpha-BHC		
319-85-7	beta-BHC		
319-86-8	delta-BHC		
58-89-9	gamma-BHC (Lindane)		
76-44-8	Heptachlor		
309-00-2	Aldrin		
1024-57-3	Heptachlor epoxide		
959-98-8	Endosulfan I		
60-57-1	Dieldrin		
72-55-9	4,4'-DDE		
72-20-8	Endrin		
33213-65-9	Endosulfan II		
72-54-8	4,4'-DDD		
1031-07-8	Endosulfan sulfate		
50-29-3	4,4'-DDT		
72-43-5	Methoxychlor		
53494-70-5	Endrin ketone		
5103-71-9	alpha-Chlordane		
5103-74-2	gamma-Chlordane		
8001-35-2	Toxaphene		
12674-11-2	Aroclor-1016		
11104-28-2	Aroclor-1221		
11141-16-5	Aroclor-1232		
53469-21-9	Aroclor-1242		
12672-29-6	Aroclor-1248		
11097-69-1	Aroclor-1254		
11096-82-5	Aroclor-1260		

FORM I PEST 1/87 Rev.

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: ______________________ Contract: __________

Lab Code: _______ Case No.: _____ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) _____ Lab Sample ID: ____________

Sample wt/vol: ______ (g/mL) ____ Lab File ID: ____________

Level: (low/med) _____ Date Received: _________

% Moisture: not dec. _____ Date Analyzed: _________

Column: (pack/cap) _____ Dilution Factor: _______

CONCENTRATION UNITS:
(ug/L or ug/Kg) _____

Number TICs found: _____

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
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27.				
28.				
29.				
30.				

FORM I VOA-TIC 1/87 Rev.

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name:
Contract:

Lab Code:
Case No.:
SAS No.:
SDG No.:

Matrix: (soil/water)
Lab Sample ID:

Sample wt/vol: (g/mL)
Lab File ID:

Level: (low/med)
Date Received:

% Moisture: not dec. dec.
Date Extracted:

Extraction: (SepF/Cont/Sonc)
Date Analyzed:

GPC Cleanup: (Y/N)
pH:
Dilution Factor:

CONCENTRATION UNITS:
(ug/L or ug/Kg)

Number TICs found:

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
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27.				
28.				
29.				
30.				

2A
WATER VOLATILE SURROGATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ______

	EPA SAMPLE NO.	S1 (TOL) #	S2 (BFB) #	S3 (DCE) #	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

		QC LIMITS
S1 (TOL)	= Toluene-d8	(88-110)
S2 (BFB)	= Bromofluorobenzene	(86-115)
S3 (DCE)	= 1,2-Dichloroethane-d4	(76-114)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2B
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: ______________________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Level:(low/med) _____

	EPA SAMPLE NO.	S1 (TOL) #	S2 (BFB) #	S3 (DCE) #	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
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21						
22						
23						
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26						
27						
28						
29						
30						

		QC LIMITS
S1 (TOL)	= Toluene-d8	(81-117)
S2 (BFB)	= Bromofluorobenzene	(74-121)
S3 (DCE)	= 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: ______________________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

	QC LIMITS
S1 (NBZ) = Nitrobenzene-d5	(35-114)
S2 (FBP) = 2-Fluorobiphenyl	(43-116)
S3 (TPH) = Terphenyl-d14	(33-141)
S4 (PHL) = Phenol-d6	(10-94)
S5 (2FP) = 2-Fluorophenol	(21-100)
S6 (TBP) = 2,4,6-Tribromophenol	(10-123)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

page __ of __

FORM II SV-1

1/87 Rev.

2D
SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name: ______________________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Level: (low/med) _____

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

		QC LIMITS
S1 (NBZ)	= Nitrobenzene-d5	(23-120)
S2 (FBP)	= 2-Fluorobiphenyl	(30-115)
S3 (TPH)	= Terphenyl-d14	(18-137)
S4 (PHL)	= Phenol-d6	(24-113)
S5 (2FP)	= 2-Fluorophenol	(25-121)
S6 (TBP)	= 2,4,6-Tribromophenol	(19-122)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

page __ of __

FORM II SV-2

1/87 Rev.

2E
WATER PESTICIDE SURROGATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

	EPA SAMPLE NO.	S1 (DBC) #	OTHER
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
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22			
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24			
25			
26			
27			
28			
29			
30			

	ADVISORY QC LIMITS
S1 (DBC) = Dibutylchlorendate	(24-154)

Column used to flag recovery values

* Values outside of QC limits

D Surrogates diluted out

page __ of __

FORM II PEST-1

1/87 Rev.

2F
SOIL PESTICIDE SURROGATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Level: (low/med) _____

	EPA SAMPLE NO.	S1 (DBC) #	OTHER
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
18			
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22			
23			
24			
25			
26			
27			
28			
29			
30			

ADVISORY
QC LIMITS
S1 (DBC) = Dibutylchlorendate (20-150)

Column to be used to flag recovery values

* Values outside of QC limits

D Surrogates diluted out

page __ of __

FORM II PEST-2

1/87 Re

3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Matrix Spike - EPA Sample No.: __________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene					61-145
Trichloroethene					71-120
Benzene					76-127
Toluene					76-125
Chlorobenzene					75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					14	61-145
Trichloroethene					14	71-120
Benzene					11	76-127
Toluene					13	76-125
Chlorobenzene					13	75-130

 # Column to be used to flag recovery and RPD values with an asterisk

*** Values outside of QC limits**

RPD: ______ out of ______ outside limits

Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____

____

FORM III VOA-1 1/87 Rev.

3B
SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Matrix Spike - EPA Sample No.: __________ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene					59-172
Trichloroethene					62-137
Benzene					66-142
Toluene					59-139
Chlorobenzene					60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					22	59-172
Trichloroethene					24	62-137
Benzene					21	66-142
Toluene					21	59-139
Chlorobenzene					21	60-133

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits

Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____

3C
WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ______________ Contract: ______________

Lab Code: ________ Case No.: ________ SAS No.: ________ SDG No.: ________

Matrix Spike - EPA Sample No.: ____________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
Phenol					12- 89
2-Chlorophenol					27-123
1,4-Dichlorobenzene					36- 97
N-Nitroso-di-n-prop.(1)					41-116
1,2,4-Trichlorobenzene					39- 98
4-Chloro-3-methylphenol					23- 97
Acenaphthene					46-118
4-Nitrophenol					10- 80
2,4-Dinitrotoluene					24- 96
Pentachlorophenol					9-103
Pyrene					26-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					42	12- 89
2-Chlorophenol					40	27-123
1,4-Dichlorobenzene					28	36- 97
N-Nitroso-di-n-prop.(1)					38	41-116
1,2,4-Trichlorobenzene					28	39- 98
4-Chloro-3-methylphenol					42	23- 97
Acenaphthene					31	46-118
4-Nitrophenol					50	10- 80
2,4-Dinitrotoluene					38	24- 96
Pentachlorophenol					50	9-103
Pyrene					31	26-127

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____
____

FORM III SV-1 1/87 Rev.

3D

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Matrix Spike - EPA Sample No.: __________ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
Phenol					26- 90
2-Chlorophenol					25-102
1,4-Dichlorobenzene					28-104
N-Nitroso-di-n-prop.(1)					41-126
1,2,4-Trichlorobenzene					38-107
4-Chloro-3-methylphenol					26-103
Acenaphthene					31-137
4-Nitrophenol					11-114
2,4-Dinitrotoluene					28- 89
Pentachlorophenol					17-109
Pyrene					35-142

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					35	26- 90
2-Chlorophenol					50	25-102
1,4-Dichlorobenzene					27	28-104
N-Nitroso-di-n-prop.(1)					38	41-126
1,2,4-Trichlorobenzene					23	38-107
4-Chloro-3-methylphenol					33	26-103
Acenaphthene					19	31-137
4-Nitrophenol					50	11-114
2,4-Dinitrotoluene					47	28- 89
Pentachlorophenol					47	17-109
Pyrene					36	35-142

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____
____

FORM III SV-2 1/87 Rev.

3E

WATER PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix Spike - EPA Sample No.: __________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
Lindane					56-123
Heptachlor					40-131
Aldrin					40-120
Dieldrin					52-126
Endrin					56-121
4,4' DDT					38-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Lindane					15	56-123
Heptachlor					20	40-131
Aldrin					22	40-120
Dieldrin					18	52-126
Endrin					21	56-121
4,4' DDT					27	38-127

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____

FORM III PEST-1 1/87 Rev.

3F

SOIL PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix Spike - EPA Sample No.: __________ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
Lindane					46-127
Heptachlor					35-130
Aldrin					34-132
Dieldrin					31-134
Endrin					42-139
4,4' DDT					23-134

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Lindane					50	46-127
Heptachlor					31	35-130
Aldrin					43	34-132
Dieldrin					38	31-134
Endrin					45	42-139
4,4' DDT					50	23-134

 # Column to be used to flag recovery and RPD values with an asterisk

*** Values outside of QC limits**

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____
____

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ______

Lab File ID: ___________ Lab Sample ID: ___________

Date Analyzed: ________ Time Analyzed: ________

Matrix: (soil/water) _____ Level:(low/med) _____

Instrument ID: ________

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
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18				
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21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS: ______________________________

page __ of __

FORM IV VOA 1/87 Rev.

4B
SEMIVOLATILE METHOD BLANK SUMMARY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab File ID: ____________ Lab Sample ID: ____________

Date Extracted: __________ Extraction: (SepF/Cont/Sonc) ____

Date Analyzed: __________ Time Analyzed: __________

Matrix: (soil/water) ______ Level: (low/med) ____

Instrument ID: __________

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS: ______________________________________

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FORM IV SV

1/87 Rev.

4C
PESTICIDE METHOD BLANK SUMMARY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab Sample ID: ____________ Lab File ID: ____________

Matrix:(soil/water) _____ Level:(low/med) _____

Date Extracted: __________ Extraction: (SepF/Cont/Sonc) _____

Date Analyzed (1): __________ Date Analyzed (2): __________

Time Analyzed (1): __________ Time Analyzed (2): __________

Instrument ID (1): __________ Instrument ID (2): __________

GC Column ID (1): __________ GC Column ID (2): __________

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

COMMENTS: ______________________________________

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FORM IV PEST

1/87 Rev.

5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ______

Lab File ID: __________ BFB Injection Date: __________

Instrument ID: ________ BFB Injection Time: ________

Matrix:(soil/water) ______ Level:(low/med) _____ Column:(pack/cap) _____

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	
75	30.0 - 60.0% of mass 95	
95	Base peak, 100% relative abundance	
96	5.0 - 9.0% of mass 95	
173	Less than 2.0% of mass 174	( )1
174	Greater than 50.0% of mass 95	
175	5.0 - 9.0% of mass 174	( )1
176	Greater than 95.0%, but less than 101.0% of mass 174	( )1
177	5.0 - 9.0% of mass 176	( )2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

page __ of __

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Lab File ID: ____________ DFTPP Injection Date: ________

Instrument ID: __________ DFTPP Injection Time: ________

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	
68	Less than 2.0% of mass 69	( )1
69	Mass 69 relative abundance	
70	Less than 2.0% of mass 69	( )1
127	40.0 - 60.0% of mass 198	
197	Less than 1.0% of mass 198	
198	Base Peak, 100% relative abundance	
199	5.0 to 9.0% of mass 198	
275	10.0 - 30.0% of mass 198	
365	Greater than 1.00% of mass 198	
441	Present, but less than mass 443	
442	Greater than 40.0% of mass 198	
443	17.0 - 23.0% of mass 442	( )2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

page __ of __

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Instrument ID: __________ Calibration Date(s): __________ __________

Matrix: (soil/water) ______ Level: (low/med) _____ Column: (pack/cap) ______

Min $\overline{RRF}$ for SPCC(#) = 0.300 (0.250 for Bromoform) Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = __________ RRF50 = __________

RRF100= __________ RRF150= __________ RRF200= __________

COMPOUND		RRF20	RRF50	RRF100	RRF150	RRF200	$\overline{RRF}$	% RSD	
Chloromethane	#								#
Bromomethane									
Vinyl Chloride	*								*
Chloroethane									
Methylene Chloride									
Acetone									
Carbon Disulfide									
1,1-Dichloroethene	*								*
1,1-Dichloroethane	#								#
1,2-Dichloroethene (total)									
Chloroform	*								*
1,2-Dichloroethane									
2-Butanone									
1,1,1-Trichloroethane									
Carbon Tetrachloride									
Vinyl Acetate									
Bromodichloromethane									
1,2-Dichloropropane	*								*
cis-1,3-Dichloropropene									
Trichloroethene									
Dibromochloromethane									
1,1,2-Trichloroethane									
Benzene									
trans-1,3-Dichloropropene									
Bromoform	#								#
4-Methyl-2-Pentanone									
2-Hexanone									
Tetrachloroethene									
1,1,2,2-Tetrachloroethane	#								#
Toluene	*								*
Chlorobenzene	#								#
Ethylbenzene	*								*
Styrene									
Xylene (total)									
Toluene-d8									
Bromofluorobenzene									
1,2-Dichloroethane-d4									

6B
SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Instrument ID: __________ Calibration Date(s): __________ __________

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = __________ RRF50 = __________

RRF80 = __________ RRF120= __________ RRF160= __________

COMPOUND		RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD	
Phenol	*								*
bis(2-Chloroethyl)ether									
2-Chlorophenol									
1,3-Dichlorobenzene									
1,4-Dichlorobenzene	*								*
Benzyl alcohol									
1,2-Dichlorobenzene									
2-Methylphenol									
bis(2-Chloroisopropyl)ether									
4-Methylphenol									
N-Nitroso-di-n-propylamine	#								#
Hexachloroethane									
Nitrobenzene									
Isophorone									
2-Nitrophenol	*								*
2,4-Dimethylphenol									
Benzoic acid									
bis(2-Chloroethoxy)methane									
2,4-Dichlorophenol	*								*
1,2,4-Trichlorobenzene									
Naphthalene									
4-Chloroaniline									
Hexachlorobutadiene	*								*
4-Chloro-3-methylphenol	*								*
2-Methylnaphthalene									
Hexachlorocyclopentadiene	#								#
2,4,6-Trichlorophenol	*								*
2,4,5-Trichlorophenol									
2-Chloronaphthalene									
2-Nitroaniline									
Dimethylphthalate									
Acenaphthylene									
2,6-Dinitrotoluene									
3-Nitroaniline									
Acenaphthene	*								*
2,4-Dinitrophenol	#								#
4-Nitrophenol	#								#

6C
SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Instrument ID: __________ Calibration Date(s): __________ __________

Min $\overline{RRF}$ for SPCC(#) = 0.050   Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = ______________ RRF50 = ______________

RRF80 = ______________ RRF120= ______________ RRF160= ______________

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
Dibenzofuran							
2,4-Dinitrotoluene							
Diethylphthalate							
4-Chlorophenyl-phenylether							
Fluorene							
4-Nitroaniline							
4,6-Dinitro-2-methylphenol							
N-Nitrosodiphenylamine (1) *							*
4-Bromophenyl-phenylether							
Hexachlorobenzene							
Pentachlorophenol *							*
Phenanthrene							
Anthracene							
Di-n-butylphthalate							
Fluoranthene *							*
Pyrene							
Butylbenzylphthalate							
3,3'-Dichlorobenzidine							
Benzo(a)anthracene							
Chrysene							
bis(2-Ethylhexyl)phthalate							
Di-n-octylphthalate *							*
Benzo(b)fluoranthene							
Benzo(k)fluoranthene							
Benzo(a)pyrene *							*
Indeno(1,2,3-cd)pyrene							
Dibenz(a,h)anthracene							
Benzo(g,h,i)perylene							
Nitrobenzene-d5							
2-Fluorobiphenyl							
Terphenyl-d14							
Phenol-d6							
2-Fluorophenol							
2,4,6-Tribromophenol							

(1) Cannot be separated from Diphenylamine

FORM VI SV-2   1/87 Rev.

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Instrument ID: _________ Calibration Date: __________ Time: ________

Lab File ID: ___________ Init. Calib. Date(s): __________ ________

Matrix: (soil/water) _____ Level: (low/med) _____ Column: (pack/cap) _____

Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
Chloromethane	#				#
Bromomethane					
Vinyl Chloride	*				*
Chloroethane					
Methylene Chloride					
Acetone					
Carbon Disulfide					
1,1-Dichloroethene	*				*
1,1-Dichloroethane	#				#
1,2-Dichloroethene (total)					
Chloroform	*				*
1,2-Dichloroethane					
2-Butanone					
1,1,1-Trichloroethane					
Carbon Tetrachloride					
Vinyl Acetate					
Bromodichloromethane					
1,2-Dichloropropane	*				*
cis-1,3-Dichloropropene					
Trichloroethene					
Dibromochloromethane					
1,1,2-Trichloroethane					
Benzene					
trans-1,3-Dichloropropene					
Bromoform	#				#
4-Methyl-2-Pentanone					
2-Hexanone					
Tetrachloroethene					
1,1,2,2-Tetrachloroethane	#				#
Toluene	*				*
Chlorobenzene	#				#
Ethylbenzene	*				*
Styrene					
Xylene (total)					
Toluene-d8					
Bromofluorobenzene					
1,2-Dichloroethane-d4					

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Instrument ID: __________ Calibration Date: __________ Time: __________

Lab File ID: ____________ Init. Calib. Date(s): __________ __________

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
Phenol	*				*
bis(2-Chloroethyl)ether					
2-Chlorophenol					
1,3-Dichlorobenzene					
1,4-Dichlorobenzene	*				*
Benzyl alcohol					
1,2-Dichlorobenzene					
2-Methylphenol					
bis(2-Chloroisopropyl)ether					
4-Methylphenol					
N-Nitroso-di-n-propylamine	#				#
Hexachloroethane					
Nitrobenzene					
Isophorone					
2-Nitrophenol	*				*
2,4-Dimethylphenol					
Benzoic acid					
bis(2-Chloroethoxy)methane					
2,4-Dichlorophenol	*				*
1,2,4-Trichlorobenzene					
Naphthalene					
4-Chloroaniline					
Hexachlorobutadiene	*				*
4-Chloro-3-methylphenol	*				*
2-Methylnaphthalene					
Hexachlorocyclopentadiene	#				#
2,4,6-Trichlorophenol	*				*
2,4,5-Trichlorophenol					
2-Chloronaphthalene					
2-Nitroaniline					
Dimethylphthalate					
Acenaphthylene					
2,6-Dinitrotoluene					
3-Nitroaniline					
Acenaphthene	*				*
2,4-Dinitrophenol	#				#
4-Nitrophenol	#				#

FORM VII SV-1 1/87 Rev.

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: ____________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Instrument ID: __________ Calibration Date: _________ Time: __________

Lab File ID: ____________ Init. Calib. Date(s): _________ _________

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	$\overline{RRF}$	RRF50	%D
Dibenzofuran			
2,4-Dinitrotoluene			
Diethylphthalate			
4-Chlorophenyl-phenylether			
Fluorene			
4-Nitroaniline			
4,6-Dinitro-2-methylphenol			
N-Nitrosodiphenylamine (1) *			*
4-Bromophenyl-phenylether			
Hexachlorobenzene			
Pentachlorophenol *			*
Phenanthrene			
Anthracene			
Di-n-butylphthalate			
Fluoranthene *			*
Pyrene			
Butylbenzylphthalate			
3,3'-Dichlorobenzidine			
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate *			*
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene *			*
Indeno(1,2,3-cd)pyrene			
Dibenz(a,h)anthracene			
Benzo(g,h,i)perylene			
Nitrobenzene-d5			
2-Fluorobiphenyl			
Terphenyl-d14			
Phenol-d6			
2-Fluorophenol			
2,4,6-Tribromophenol			

(1) Cannot be separated from Diphenylamine

8A

VOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: ______________ Contract: ________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab File ID (Standard): ________ Date Analyzed: ________

Instrument ID: ________ Time Analyzed: ________

Matrix:(soil/water) ______ Level:(low/med) ______ Column:(pack/cap) ______

		IS1(BCM) AREA #	RT	IS2(DFB) AREA #	RT	IS3(CBZ) AREA #	RT
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

UPPER LIMIT = + 100%
of internal standard area.
LOWER LIMIT = - 50%
of internal standard area.

Column used to flag internal standard area values with an asterisk

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8B

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: ____________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab File ID (Standard): ____________ Date Analyzed: ________

Instrument ID: ________ Time Analyzed: ________

		IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

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8C
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab File ID (Standard): ____________ Date Analyzed: ________

Instrument ID: ________ Time Analyzed: ________

		IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS6(PRY) AREA #	RT
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100%
of internal standard area.
LOWER LIMIT = - 50%
of internal standard area.

Column used to flag internal standard area values with an asterisk

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8D
PESTICIDE EVALUATION STANDARDS SUMMARY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Instrument ID: __________ GC Column ID: __________

Dates of Analyses: __________ to __________

Evaluation Check for Linearity

PESTICIDE	CALIBRATION FACTOR EVAL MIX A	CALIBRATION FACTOR EVAL MIX B	CALIBRATION FACTOR EVAL MIX C	%RSD (</= 10.0%)
ALDRIN				
ENDRIN				
4,4'-DDT				
DBC				

(1)

(1) If > 10.0% RSD, plot a standard curve and determine the ng for each sample in that set from the curve.

Evaluation Check for 4,4'-DDT/Endrin Breakdown
(percent breakdown expressed as total degradation)

		DATE ANALYZED	TIME ANALYZED	ENDRIN	4,4'-DDT	COMBINED (2)
01	INITIAL EVAL MIX B					
02	EVAL MIX B					
03	EVAL MIX B					
04	EVAL MIX B					
05	EVAL MIX B					
06	EVAL MIX B					
07	EVAL MIX B					
08	EVAL MIX B					
09	EVAL MIX B					
10	EVAL MIX B					
11	EVAL MIX B					
12	EVAL MIX B					
13	EVAL MIX B					
14	EVAL MIX B					

(2) See Form instructions.

8E

PESTICIDE EVALUATION STANDARDS SUMMARY

Evaluation of Retention Time Shift for Dibutylchlorendate

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Instrument ID: ________ GC Column ID: ________

Dates of Analyses: ________ to ________

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	t D	*
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						

* Values outside of QC limits (2.0t for packed columns, 0.3t for capillary columns)

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9

PESTICIDE/PCB STANDARDS SUMMARY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Instrument ID: __________ GC Column ID: __________

DATE(S) OF ANALYSIS FROM: __________ TO: __________

TIME(S) OF ANALYSIS FROM: __________ TO: __________

DATE OF ANALYSIS __________

TIME OF ANALYSIS __________

EPA SAMPLE NO. (STANDARD) __________

COMPOUND	RT	RT WINDOW		CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
		FROM	TO					
alpha-BHC								
beta-BHC								
delta-BHC								
gamma-BHC								
Heptaclor								
Aldrin								
Hept. epoxide								
Endosulfan I								
Dieldrin								
4,4'-DDE								
Endrin								
Endosulfan II								
4,4'-DDD								
Endo.sulfate								
4,4'-DDT								
Methoxychlor								
Endrin ketone								
a. Chlordane								
g. Chlordane								
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed. %D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition

10
PESTICIDE/PCB IDENTIFICATION

EPA SAMPLE NO.

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

GC Column ID (1): __________ GC Column ID (2): __________

Instrument ID (1): __________ Instrument ID (2): __________

Lab Sample ID: ____________

Lab File ID: ____________ (only if confirmed by GC/MS)

PESTICIDE/PCB	RETENTION TIME		RT WINDOW OF STANDARD FROM	TO	QUANT? (Y/N)	GC/MS? (Y/N)
01________	Column 1	______	______	______	_	_
02	Column 2	______	______	______	_	_
03________	Column 1	______	______	______	_	_
04	Column 2	______	______	______	_	_
05________	Column 1	______	______	______	_	_
06	Column 2	______	______	______	_	_
07________	Column 1	______	______	______	_	_
08	Column 2	______	______	______	_	_
09________	Column 1	______	______	______	_	_
10	Column 2	______	______	______	_	_
11________	Column 1	______	______	______	_	_
12	Column 2	______	______	______	_	_

Comments: ____

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Red Oak Landfill
Red Oak, Iowa

WORK PLAN
QUALITY ASSURANCE PROJECT PLAN
(APPENDIX B)

ATTACHMENT 2

Operation, Maintenance, and Calibration Procedures for Field Analytical Equipment

OPERATING MANUAL

TIP*

PHOTOVAC
incorporated

Unit 2 134 Doncaster Avenue
Thornhill, Ontario Canada L3T 1L3
Phone: (416) 881-8225 Telex: 06-964634

* TIP IS A TRADEMARK OF PHOTOVAC INCORPORATED

The sample bag should have known internal volume (when inflated to the point where the material just begins to stretch) and should have appropriate fittings for gas filling and connection to the TIP*. The bag is first filled with Zero air (TIP* can be used to check that this air is clear of contamination). A simple calculation can then be done to find out how much of the chemical, as gas or as vapor or liquid, must be added to provide the required concentration.

If we are dealing with a gas, the calculation is the simplest imaginable. If the volume of the bag is 25 L, we simply add 25 µL to yield a 1 ppm mixture. For higher or lower concentrations, we adjust accordingly.

If, however, we have to prepare a standard from liquid or solid sample, the procedure is slightly more complex (but only slightly!). The best way that we have found involves using headspace (this means taking a sample of vapor from above the liquid in a bottle). Vapor pressure of a given liquid varies with temperature. Let us imagine that we are workding with benzene at room temperature 20 degrees C (68 degrees F). Vapor pressure tables tell us that benzene exerts a vapor pressure of 74 mm Hg at this temperature. If benzene was a gas, we would just add 25 µL to our 25 L bag to make a 1 ppm mix, but benzene is a liquid at this temperature, contributing only partially to the total atmospheric pressure above the liquid, and we need to take a larger volume from the headspace than this. Actually, we must take 25 x 760/74 = 257 µL and this will give 1 ppm in the bag (760 mm Hg is, near enough, atmospheric pressure). We could write a formula:

$$v = V \times 760/p$$

Where v = Volume of headspace required (µL)
V = Volume of bag (L)
p = Vapor pressure of sample material in mm Hg at ambient temperature.

One vital point not to be overlooked is the type of syringe used for this purpose which usually employs a steel plunger having a minute Teflon^{TM} tip and graduated glass barrel. The needle is either epoxy bonded to the end of the barrel or removable type having a knurled screw-on sleeve and a Teflon^{TM} sealing bush between itself and the glass. This type of syringe gives excellent service and a commercially available type is Hamilton 1750 RN (500 µL capacity with a replaceable needle).

We must be very careful, however, as this syringe ages. The Teflon^{TM} plunger tip gradually wears and leaks can develop between this and the glass wall; also, the screw-on needle seal can work loose and needs to be checked periodically. Leakage in syringes can be the major cause of problems associated with reproducibility and replication of standards and actual results.

TABLE 1

Compound	Relative Response
Acetone	0.452
Benzene	1.000
n-Butyl Acrylate	0.280
Diethylamine	0.509
Ethylene	0.043
Ethylene Oxide	0.130
Furfural	0.240
n-Hexane	0.085
n-Heptane	0.147
Iso-butylene	0.589
Iso-propyl Alcohol	0.046
Methyl Ethyl Ketone	0.099
Propylene	0.454
Propylene Oxide	0.060
Toluene	0.814
1,1,1-Trichloroethane	0.010
1,1,2-Trichloroethylene	0.734
m-Xylene	0.900

Once the "meaning" (perhaps in health terms) of a certain high reading in a certain situation has been assessed, TIP* can be used with more confidence as a definitive tool. If readings are taken over a lengthy time period, it may be valuable to calibrate TIP* against one of the components known to be present in the homologous mixture. This serves as a reasonably accurate "base line" for reference.

Now we come to actual methods of calibration. The basic requirement here is to have a supply of the compound, for which calibration is required, diluted in clean air to a level close to that at which measurement has to be made. If we are working in the 0.1 to 10 ppm range with benzene, say, it is appropriate to carry out calibration at mid-range or at around 1 ppm. Similarly, if work is being done on air samples where concentrations of 200 to 1000 ppm are to be measured, a calibration at about 600 ppm would be very appropriate.

Choice of calibration point is important because instrument response is not perfectly linear and, for example, an instrument calibrated at 1 ppm and used to measure around 1000 ppm would be an unsuitable choice and significant error would be anticipated.

It is important to realize also that, ideally, the matrix gas used for the calibration standard should be the same as the one being analyzed. Thus, if vinyl chloride monomer is to be measured in nitrogen atmosphere, the standard should also be prepared in nitrogen atmosphere. There will be a small, but significant error if this is not done; and while such an error can certainly be compensated for, it is sensible to eliminate it if this is practical.

Many specialty gas suppliers provide excellent quality analyzed gaseous standards. Unfortunately, there are exceptions to this and they result from the fact that certain chemical compounds do not have good "keeping" properties at low concentration. Hydrogen sulfide is an excellent example. On the other hand, unsaturated chlorinated compounds, like vinyl chloride and trichloroethylene, "keep" almost indefinitely at low concentration. Benzene can be stored in this way, but choice of containment materials is vital; rubbers are definitely unsuitable.

Whether or not to use a commercially supplied standard is a decision which should be made jointly with a trusted supplier. Photovac will be happy to advise if problems occur.

Probably one of the very best (and certainly the cheapest) ways of acquiring a standard is to make your own. Procedures vary, but we have found that certain plastic sample bags made from proprietary materials, such as Tedlar™, are suitable for containing home made standards for periods, certainly of hours.

CALIBRATION

We should probably start by saying that the function of calibration is one of the most misunderstood operations that the instrument user is called upon to perform.

Everybody would love to have an eternally calibrated instrument, which only needs to be pointed at the problem in order to yield data of unswerving reliability under every imaginable condition!

Sadly, this era has yet to dawn for field instruments of this type (and for most others, for that matter). Nevertheless, many improvements have been made to instrument design in order to simplify calibration to the stage where it is palatable. We have addressed this problem and offer some simple (but not simplistic) practical solutions.

With TIP*, two basic calibration operations must be performed. These are adjustment of Zero and the adjustment of Span.

The zero adjustment is the easiest. Under conditions where super accuracy and sensitivity are not required, it may be sufficient to acquire zero by taking TIP* outside and using outdoor air. In other cases an office area may prove to be clean enough for the purpose (but don't count on it!). When rigorously done, a source of "Zero Air" or even "Ultra Zero Air" is necessary. These are high purity grades of compressed air, available in bottled form from most major suppliers. The bottle is fitted with a regulator and the air supply can be directly connected to TIP*'s input fitting; a very low rate of flow should be used and the pressure applied must never exceed 1 psi (5 kPa.).

Having adjusted zero (and this should be done with the "SPAN" control at maximum), we will now turn to the procedure for span calibration. How this is done depends so very much upon the task being undertaken. If we are simply doing leak detection of a photoionizable gas or vapor, calibration is seldom necessary; the best strategy is merely to turn span to maximum for best sensing of leakage - actual numerical values are of secondary importance here.

If we are making a "ball-park" assessment of a situation where there is a high ionizable loading in the air, consisting of a mixture of many components, readings obtained will be a composite of these. With photoionization, as the Table of Response Factors shows, readings for a given concentration will vary strongly from compound to compound. This means that the reading on TIP* will be dependent upon both concentration and the nature of the mixture involved. TIP*, in this case, works as a scoping tool; the user can move around the contaminated area seeking "hot spots". When these are located, further investigation may be carried out using an instrument such as Photovac's 10S Portable Gas Chromatograph in order to identify the compounds present.

If we don't have the vapour pressure for a particular liquid, we could always use the actual liquid itself to make the standard in the bag.

This is more difficult because the amount to be taken turns out to be quite small and there is a possibility of interaction between the liquid before it evaporates and the wall of the bag. The formula in this case is:

$$m = 4.1 \times 10^{-8} \times M \times V \times C$$

in which m is the mass in grams of liquid which must be taken to give a concentration of C parts-per-million in a volume of V liters where the molecular mass of the liquid is M a.m.u.

Example: We have to make a 1 ppm standard of benzene in a Tedlar^{TM} bag containing 100 liters of clean air. How much benzene must be added?

$$m = 4.1 \times 10^{-8} \times 78 \times 100 \times 1 = 320 \times 10^{-6} \text{ grams}$$

From Tables, the density of benzene is 0.88 g/mL

Therefore the volume of benzene which must be taken is:

$$320 \times 10^{-6}/.88 = 360 \times 10^{-6} \text{ mL or } 0.36 \text{ uL}$$

A 1.00 uL graduated syringe can therefore be used to deliver the correct amount of liquid benzene into the Tedlar^{TM} bag.

INSTRUCTION MANUAL

TRACE GAS ANALYZER

HNU MODEL PI 101

HNU Systems, Inc.
160 Charlemont St.
Newton, MA 02161

December 1985

SECTION 3

CALIBRATION

3.1 INTRODUCTION

The PI 101 Analyzer is designed for trace gas analysis in ambient air and is calibrated at HNU with certified standards of benzene, vinyl chloride and isobutylene. Other optional calibrations are available (e.g., ammonia, ethylene oxide, H2S, etc.). Calibration data is given in the data sheet. If a special calibration has been done, the data is given in the Application Data Sheet, which notes the sample source, type of calibration (see Section 8, Appendix), and other pertinent information.

Good instrumentation practice calls for calibration on the species to be measured in the concentration range to be used. This procedure assures the operator that the analyzer is operating properly and will generate reliable data.

Some general points to consider when calibrating the PI 101 are that the analyzer is designed for operation at ambient conditions and therefore the gas standards used for calibration should be delivered to the analyzer at ambient temperatures and pressure and at the proper flow rates.

WARNING:

The PI 101 is a non-destructive analyzer; calibrations using toxic or hazardous gases must be done in a hood.

The frequency of calibration should be dictated by the usage of the analyzer and the toxicity of the species measured. If the analyzer has been serviced or repaired, calibration should be done to verify operation and performance. It is recommended that calibration be checked frequently at first (daily or every other day) and then regularly based on the confidence level developed.

The normal meter scaleplate is 0 to 20. If the scaleplate is different, refer to the Application Data Sheet. If there are questions, consult the HNU representative before proceeding with calibration check.

An accurate and reliable method of calibration check is to use an analyzed gas cylinder in a test setup as shown in Figure 3-1 and described below. Additional material on calibration is given in Section 8, Appendix.

3.2 ANALYZED GAS CYLINDER

a. Concentration - The calibration gas cylinder is to contain the species of interest made up in an air matrix at or near the concentration to be analyzed. If the component is unstable in air, another matrix is to be used. The final calibration mixture should be similar to the sample the PI 101 will analyze. If the expected concentration is not known then a concentration should be chosen that will cause a scale displacement of 50 to 80% on the X10 range. Calibration on X10 range will provide accurate values on the X1 range as well.

For use on the 0-2000 range, a two-standard calibration is preferred: one at 70 to 85% of the Linear range and the other at 25 to 35% of the linear range. With the linear range of approximately 600 ppm for most compounds these points would lie between 420 to 510 ppm and 150 to 210 ppm, respectively.

b. Stability - The calibration gas must be stable within the cylinder during the period of use. If the calibration is required in the field, then use of a small cylinder is recommended. In addition, the choice of cylinder material in contact with the gas must be considered (steel, aluminum or teflon). If there are any questions, the operator should request stability and usage information from the gas supplier.

WARNING

Extreme care must be taken in the handling of gas cylinders. Contents are under high pressure. In some cases, the contents may be hazardous. Many gas suppliers will provide data sheets for the mixtures upon request.

c. Delivery - The cylinder containing the calibration mixture must be connected to a proper regulator.

WARNING

Never open the valve on a gas cylinder container without a regulator attached.

Leak test all tank/regulator connections as well as the main cylinder valve to prevent toxic or hazardous materials from leaking into the work area. Care must be taken that the materials of construction of the regulator will not interact with the calibration gas.

One method of sampling the calibration gas is illustrated in Figure 3-1. Connect the cylinder to one leg of the tee, a flow meter to the opposite leg, and the probe to the third leg. The flow meter does not require a valve. If there is a valve, it must be left wide open. the flowmeter is only to indicate excess flow. Adjust the flow from the regulator such that only a little excess flow is registered at the flowmeter.

This insures that the PI 101 sees the calibration gas at atmospheric pressure and ambient temperature.

d. Usage - Generally, a gas cylinder should not be used below 200-300 psi as pressure effects could cause concentration variations. The cylinder should not be used past the recommended age of the contents as indicated by the manufacturer. In case of difficulty, verify the contents and concentration of the gas cylinder.

e. Alternate means of calibration are possible. For more information, contact the HNU Service Department.

3.3 PROBE

a. Identify the probe by the lamp label. If a question exists, disassemble the probe and inspect the lamp. The energy of the lamp is etched into the glass envelope.

b. Connect the probe to the readout assembly, making sure the red interlock switch is depressed by the ring on the connector.

c. Set the SPAN pot to the proper value for the probe being calibrated. Refer to the calibration memo accompanying the probe.

d. Check the Ionization Potential (IP) of the calibration gas to be used. The IP of the calibration gas must be at or below the IP of the lamp.

e. Proceed with the calibration as described in Section 3.4. Check the calibration memo for specific data. If any questions develop, call the HNU representative.

f. NOTE: The 11.7eV lamp has a special cleaning compound. Do not use water or any other cleaning compound with the 11.7 eV lamp. Do not interchange ion chambers, amplifier boards or lamps between probes. (See Section 5.2).

3.4 PROCEDURE

a. Battery check - Turn the function switch to BATT. The needle should be in the green region. If not, recharge the battery.

b. Zero set - Turn the function switch to STANDBY. In this position the lamp is OFF and no signal is generated. Set the zero point with the ZERO set control. The zero can also be set with the function switch on the X1 position and using a "Hydrocarbon-free" air. In this case "negative" readings are possible if the analyzer measures a cleaner sample when in service.

c. 0-20 or 0-200 range - For calibrating on the 0-20 or 0-200 range only one gas standard is required. Turn the function switch to the range position and note the meter reading. Adjust the SPAN control setting as required to read the ppm concentration of the standard. Recheck the zero setting (step b.). If readjustment is needed, repeat step c. This gives a two-point calibration; zero and the gas standard point. Additional calibration points can be generated by dilution of the standard with zero air if desired (see Section 8).

d. 0-2000 range - For calibrating on the 0-2000 range, use of two standards is recommended as cited in Section 3.2a. First calibrate with the higher standard using the SPAN control for setting. Then calibrate with the lower standard using the ZERO adjustment. Repeat these several times to ensure that a good calibration is obtained. The analyzer will be appoximately linear to better than 600 ppm, (see Figure 3-2). If the analyzer is subsequently to be used on the 0-20 or 0-200 range, it must be recalibrated as described in steps b. and c. above.

e. Lamp cleaning - If the span setting resulting from calibration is 0.0 or if calibration cannot be achieved, then the lamp must be cleaned (see Section 5.2).

f. Lamp replacement - If the lamp output is too low or if the lamp has failed, it must be replaced (see Section 5.3).

3.5 CALIBRATION CHECKING

Rapid calibration checking in the field can be accomplished by use of a small disposable cylinder containing isobutylene. Immediately after a calibration has been completed, a reading is taken on a special isobutylene standard. This provides a reference concentration measurement for later checking in the field. This can be done at any time with a portable cylinder containing this same special standard, using this reference reading as a check, and making adjustments to the analyzer if necessary. In effect, this is an indirect method of calibration, one maintaining the calibration to give direct readings for the original gas mixture, but using the portable isobutylene cylinder. Details are given in Section 8.2 of the Appendix.

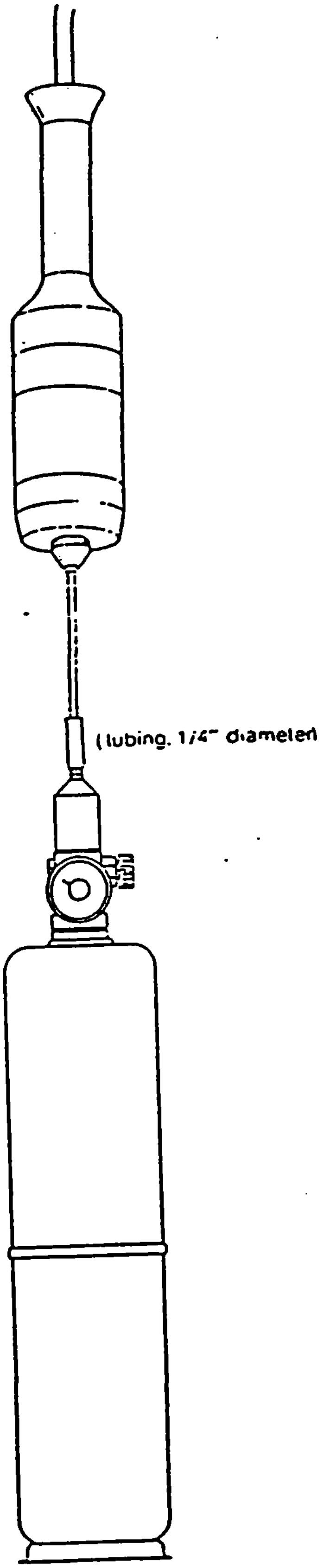


FIGURE 3-1
CALIBRATION TEST SET UP

SECTION 5

MAINTENANCE

.1 INTRODUCTION

Maintenance of the analyzer consists of cleaning the lamp and ion chamber, replacement of the lamp or other component parts or subassemblies.

WARNING: Turn the function switch on the control panel to the OFF position before any disassembly. Otherwise, high voltage of 1200 V DC will be present.

WARNING: Use great care when operating the analyzer with the readout assembly outside its case due to the presence of 1200 V DC.

WARNING: Do not look at the light source from any closer than 6 inches with unprotected eyes. Observe only briefly. Continued exposure to ultraviolet energy generated by the light source can be harmful to eyesight.

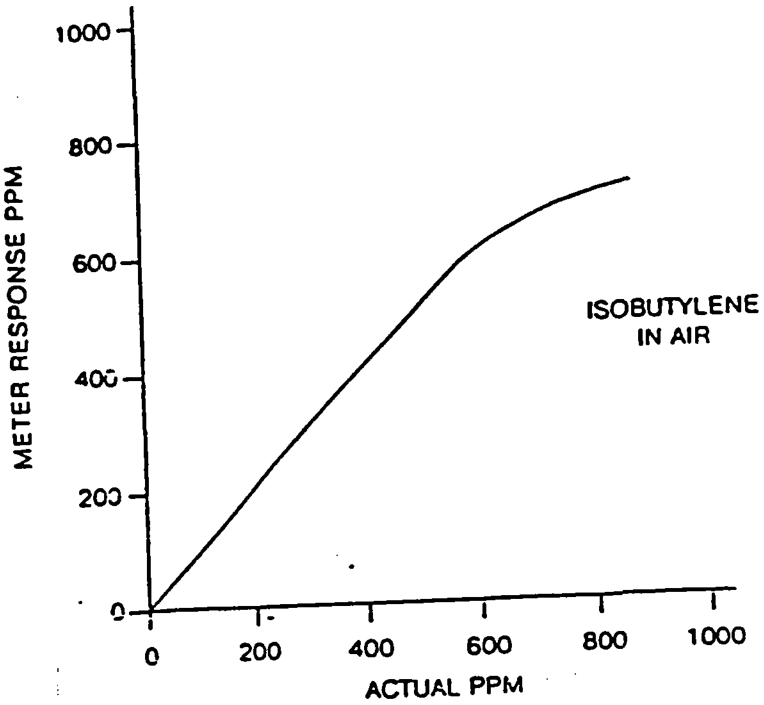
CAUTION: Do not interchange lamps of different eV ratings in a probe. Amplifier and components are selected for a specific eV lamp. A probe with the wrong lamp will not operate properly.

.2 UV LAMP AND ION CHAMBER CLEANING

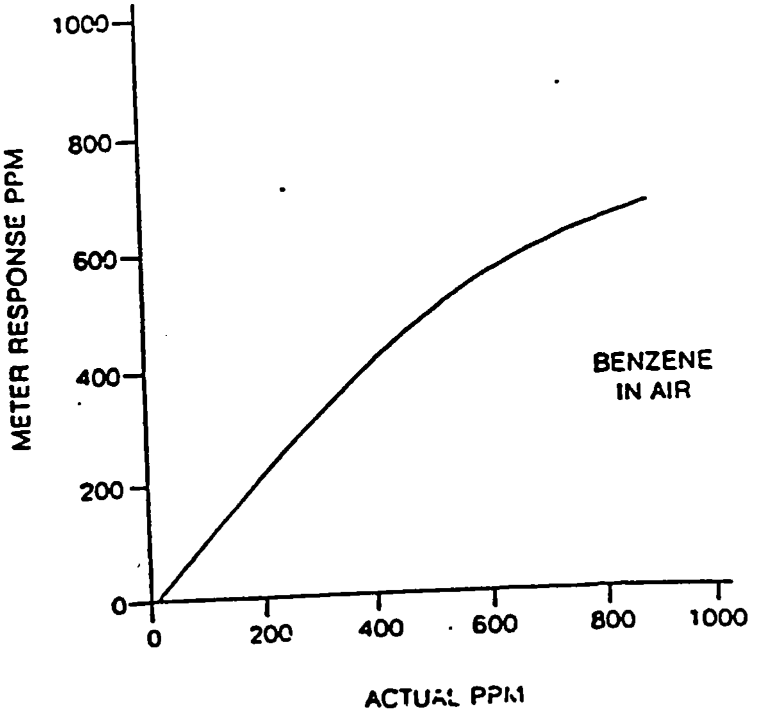
During periods of operation of the analyzer, dust or other foreign matter could be drawn into the probe forming deposits on the surface of the UV lamp or in the ion chamber. This condition is indicated by meter readings that are low, erratic, unstable, non-repeatable, or drifting, or show apparent moisture sensitivity. These deposits interfere with the ionization process and cause erroneous readings. Check for this condition monthly or as required. Cleaning can be accomplished as follows:

a. Disassemble the probe and remove the lamp and ion chamber (see Section 5.5). Exercise great care in doing so to prevent inadvertent damage to these components.

b. First check the lamp window for fouling by looking at the surface at an incident angle. Any deposits, films or discoloration may interfere with the ionization process. Clean the window as follows:



METER RESPONSE PPM
1000
800
600
400
200
0
ISOBUTYLENE
IN AIR
0
200
400
600
800
1000
ACTUAL PPM



METER RESPONSE PPM
1000
800
600
400
200
0
BENZENE
IN AIR
0
200
400
600
800
1000
ACTUAL PPM

1) 9.5 and 10.2 eV lamps

a) First clean by rubbing gently with lens tissue dipped in a detergent solution.

b) If this does not remove deposit, apply a small amount of HNU cleaning compound (PA101534) directly onto the lens of the lamp and spread evenly over surface with a non-abrasive tissue (e.g. Kim-Wipe) or a lens tissue.

c) Wipe off compound with a new tissue.

d) Rinse with warm water (about 80 degrees F) or damp tissue to remove all traces of grit or oils and any static charge that may have built up on the lens. Dry with new tissue.

e) Reinstall lamp in detector and check analyzer operation.

f) If performance is still not satisfactory replace the lamp. See Section 5.3 and Section 6.

2) 11.7 eV lamp

a) Clean by putting a freon or chlorinated organic solvent on a tissue and rubbing gently.

b) DO NOT CLEAN THIS LAMP WITH WATER OR ANY WATER MISCIBLE SOLVENTS (methanol or acetone). It will damage the lamp.

c) DO NOT USE THE CLEANING COMPOUND used for the 9.5 and 10.2 eV lamps under any circumstances on the 11.7 eV lamp.

c. Then inspect the ion chamber for dust or particulate deposits. If such matter is present, the chamber can be cleaned by removing the outer Teflon ring, and the four screws holding the retaining ring. Carefully move the retaining ring aside (NOTE: this is soldered) and remove the screen. A tissue or cotton swab, dry or wetted with methanol, can be used to clean off any stubborn deposits. The assembly can also be gently swirled in methanol and dried gently at 50-60 degrees C for approximately a half hour. No liquid must be present at reassembly as this would affect the performance. Do not clean the ion chamber with the HNU cleaning compound cited above in para. b.1)b).

d. Reassemble the probe and check analyzer operation.

e. If performance is still not satisfactory replace the lamp. See Section 5.3.

To replace the lamp, disassemble the probe, remove the old lamp, install a new one of the same eV rating and reassemble.

WARNING

Turn the function switch on the control panel to the OFF position before disassembly. Otherwise, high voltage of 1200 V DC will be present.

CAUTION

Do not exchange lamps of different eV ratings in a probe. Amplifier and components are selected for a specific eV lamp. A probe with the wrong lamp will not operate properly.

Set the SPAN pot to 9.8 for the 10.2 eV lamp. Remove the readout assembly case (see Section 5.6). Locate the gain control potentiometer, R48, on the power supply board as shown on Figure 6-1. Recalibrate the analyzer adjusting this potentiometer, R48, with a small screwdriver to obtain the specified ppm reading, leaving the SPAN pot set at 9.8.

For the 9.5 and 11.7 eV lamps see the Application Data Sheet or calibrations memo for the proper span pot settings and readings.

WARNING

Use great care when operating the analyzer with the readout assembly outside its case due to the presence of 1200 V DC.

When calibration is accomplished, turn the analyzer OFF and replace the readout assembly in its case.

Adjustment of R48 potentiometer is used only when a new lamp is installed. At all other times adjustment is accomplished using the SPAN control potentiometer.

If calibration cannot be achieved, see Section 6, Troubleshooting.

5.4 LAMP SIZE CHANGE

If different applications for the analyzer would require different size lamps, separate probes, each with its own eV lamp, must be used. A single readout assembly will serve for any of the probes. A change in probe will require resetting of the zero control and the span pot. Calibration should be checked to verify proper operation.

5.5 PROBE DISASSEMBLY/ASSEMBLY

WARNING

Turn the function switch on the control panel to the off position before disassembly. Otherwise high voltage of 1200 V DC will be present.

Disconnect the probe cable connector at the readout assembly. Disassemble the probe by first removing the exhaust screw at the base of the probe adjacent to the handle (see Figure 5-1). Grasp the end cap in one hand and the probe shell in the other, gently pull to separate the end cap and the lamp housing from the shell.

Hold the lamp housing with the black end cap upright. Loosen the screws on the top of the end cap, separate the end cap and ion chamber from the lamp and lamp housing.

CAUTION

> Care must be taken so that the ion chamber does not fall out of the end cap or the light source does not fall out of the lamp housing.

Turn the end cap over in the hand. Tap lightly on the top. The ion chamber should fall out of the end cap into the hand.

Place one hand over the top of the lamp housing and tilt slightly. The light source will slide out of the housing.

The amplifier board can be removed from the lamp source housing assembly (see Figure 5-2) by unsnapping the coaxial connector, J1, and then removing the retaining screw. The amplifier board will then slide out of the housing assembly.

Reassemble the probe by first sliding the lamp back into the lamp housing. Place the ion chamber on top of the lamp housing, making sure that the contacts are properly aligned. The ion chamber fits only one way.

If the ion chamber is to be replaced always use one identical to the one being removed. Check the aperture (small: 3.0 mm; large: 6.0 mm) at the top of the ion chamber and materials of construction (gold-plated or Teflon) to ensure proper replacement. See Parts List, Section 7.

Place the end cap on top of the ion chamber and replace the two screws. Tighten the screws only enough to seal the O-ring.

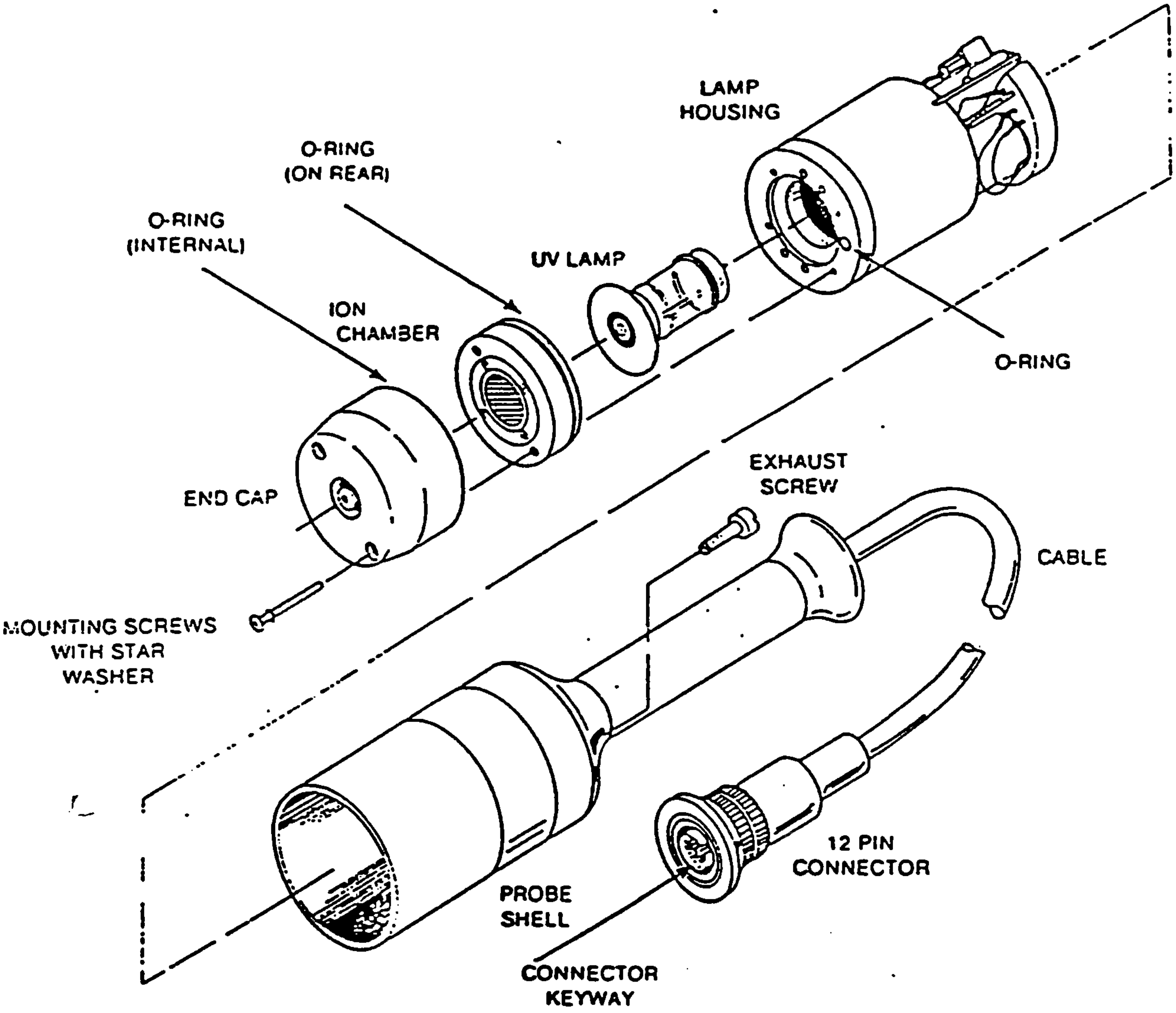


FIGURE 5-1
PROBE ASSEMBLY

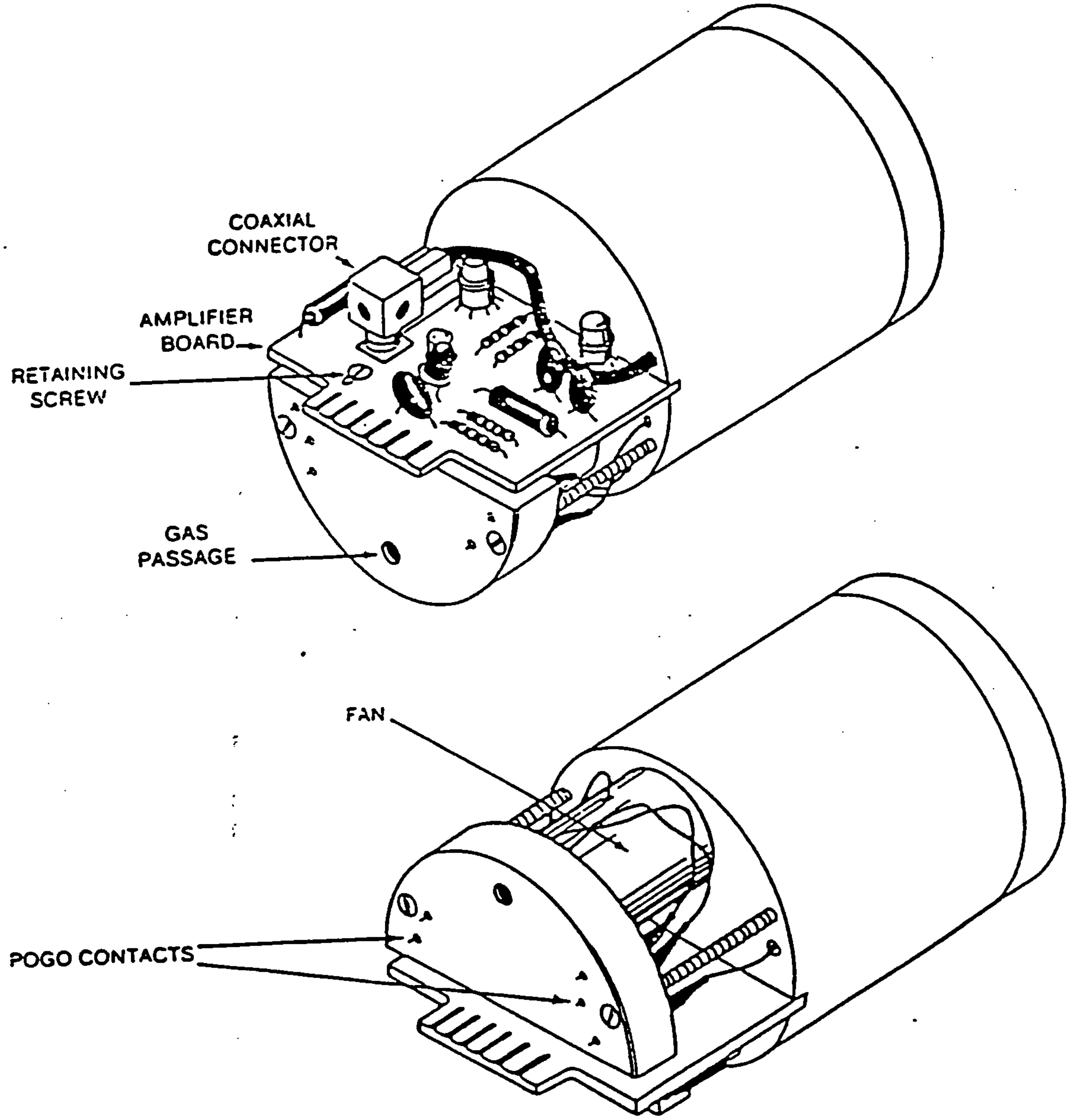


FIGURE 5-2
LAMP HOUSING ASSEMBLY

CAUTION

Do not over-tighten these screws.

Line up the pins (pogo contacts) on the base of the lamp housing with the pins inside the probe shell. Gently slide the housing assembly into the probe shell.

The end cap should meet the probe shell evenly after final assembly. If not, the ion chamber may be installed wrong.

CAUTION

DO NOT FORCE the assembly into the shell.
It fits only one way.

If it does not reassemble readily, remove and check pin alignment. Check to ensure pogo contacts are not bent. Refasten the exhaust screw at the base of the probe.

Align the 12 pin probe connector to the readout assembly and reconnect with a twisting motion until a click occurs. Check to ensure the high voltage microswitch is properly depressed. The lamp should light if the function switch is turned to any position except STANDBY.

5.6 READOUT DISASSEMBLY/ASSEMBLY

WARNING

Turn the function switch on the control panel to the OFF position before disassembly. Otherwise, high voltage of 1200 V DC will be present.

Disconnect the probe cable connection. Remove recorder jacks and cable or the plastic plug cap. Loosen the screw on the botton of the case and, holding the instrument by the bezel, remove the case (see Figure 5-3).

a. The control assembly consisting of the Printed Circuit Board (PCB) and control panel can be separated from the readout assembly by the following steps:

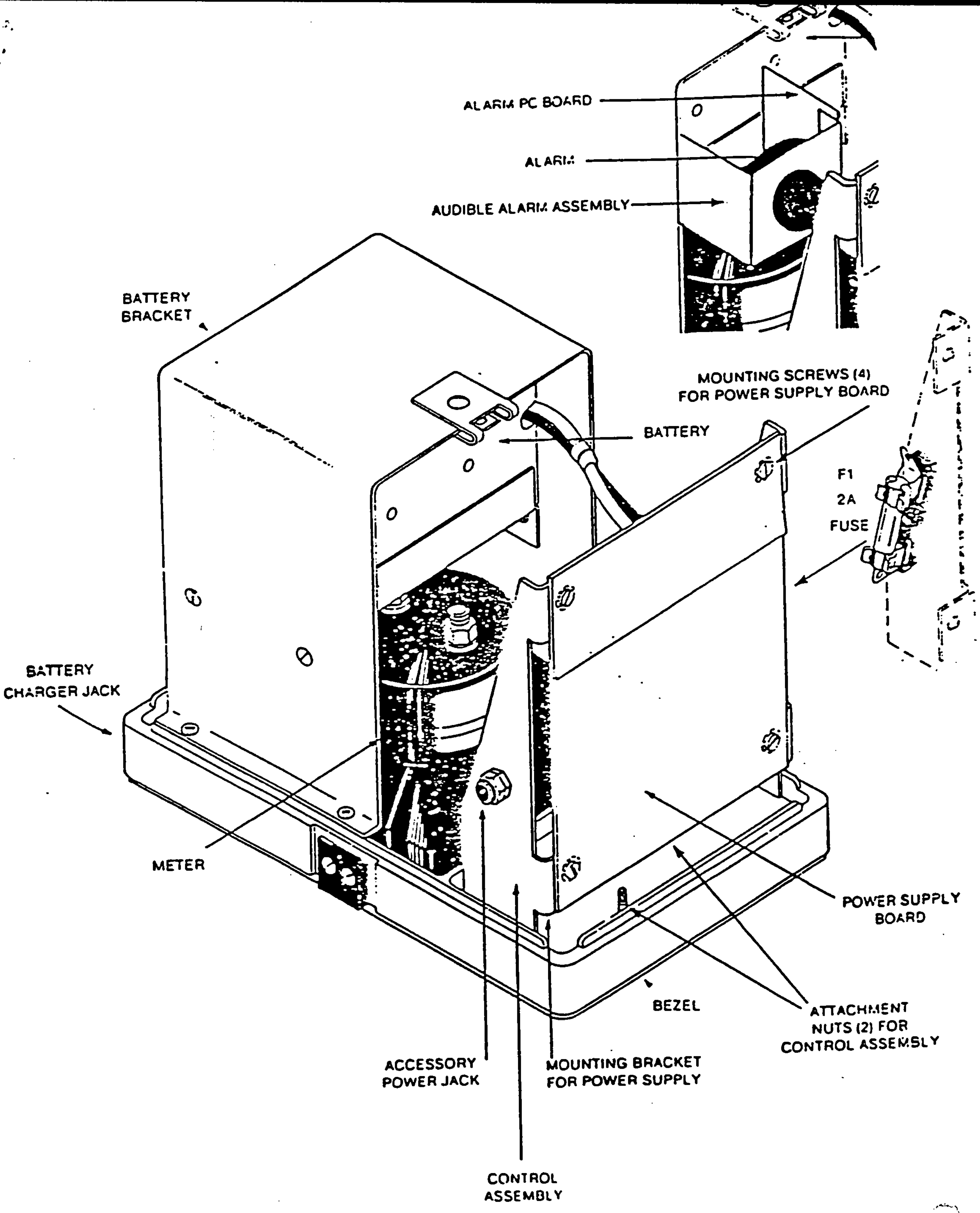


FIGURE 5-3
READOUT ASSEMBLY

1) Separate the Molex connectors in the cables to the control assembly.

2) Remove the two attachment nuts at the base of the assembly.

3) Remove the two screws at the top of the power supply board holding it to the assembly brackets.

4) Compress the brackets and slide the assembly thru the bezel. Remove a third screw at the lower corner of the board, if necessary.

b. The optional alarm assembly can be separated as follows

1) Disconnect the cable.(P6/J6 of Figure 4-5)

2) Remove the two screws holding the alarm assembly to the battery bracket

Reassembly is accomplished by reversing the above procedure.

NOTE: Be sure the function switch on the control panel is in the OFF position before inserting the control module into the case. If not, the fuse can be blown or damage can result.

POLY-PRAM®
MULTI-PARAMETER INSTRUMENTS
INSTRUCTION BOOKLET

PRESTO-TEK CORPORATION

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Los Angeles, CA 90041 USA
(213) 257-7585

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TWX: 910 321 4542 PRESTO TEK LSA

TABLE OF CONTENTS

INTRODUCTION

Ten POLY-PRAM instruments provide portable, multi-parameter measurements of conductivity in three ranges to 200,000 micromhos, pH, Millivolts, and temperature. This manual contains instructions for operation, calibration, and maintenance. The models covered in this manual are as follows:

MODEL NUMBERS	PARAMETERS MEASURABLE	MEASUREMENT RANGES pH, mv	TEMP., °C	CONDUCTIVITY, micromhos
DP-30	conductivity	—	—	0-200; 0-2,000; 0-20,000
DP-31	cond.	—	—	0-2,000; 0-20,000; 0-200,000
DP-32	cond., temp.	—	--15 to 100	0-200; 0-2,000; 0-20,000
DP-33	cond., temp.	—	–15 to 100	0-2,000; 0-20,000; 0-200,000
DP-34	cond., pH	0.00-14.00	—	0-200; 0-2,000; 0-20,000
DP-35	cond., pH	0.00-14.00	—	0-2,000; 0-20,000; 0-200,000
DP-36	cond., pH & temp.	0.00-14.00	—15 to 100	0-200, 0-2,000; 0-20,000
DP-37	cond., pH & temp.	0.00-14.00	—15 to 100	0-2,000; 0-20,000; 0-200,000
DP-38	cond., pH millivolt, temp	0.00-14.00 ±1999 mv	—15 to 100	0-200; 0-2,000; 0-20,000
DP-39	cond., pH millivolt, temp.	0.00-14.00 ±1999 mv	—15 to 100	0-2,000; 0-20,000, 0-200,000

Manual pH temperature adjust.

The new POLY-PRAM instruments are provided with an LCD display. Four, ½-inch (1.3 cm) high, bold black numerals on a light background--read results in direct sunlight. pH may be read to .01; Millivolts to ±1.0 Mv; and temperature to .1°C. Read conductivity to .1 micromho on the 0-200 scale; 1.0 on the 0-2000; 10.0 on the 0-20,000 and 100.0 on the 0-200,000 scale--ten times greater readability than conventional, dial-type instruments.

pH measurements indicate the degree of acidity or alkylinity of a solution. The Millivolt scale may be used with specific ion probes, for measuring dissolved gases, and for measuring oxidation reduction chemical reactions. The conductivity ranges provide measurements of high purity demineralized water on the 0-200 scale; tap and well waters on the 0-2000 scale; brackish waters and chemical solutions on the 0-20,000 scale; sea water is approx. 70,000 micromho, so the 0-200,000 scale will measure highly saline waters and concentrated chemical solutions.

POLY-PRAM instruments are virtually shock proof, moisture resistant, and will provide years of satisfied use if the proper care and procedures in this booklet are followed.

OPERATION

The following test procedure is recommended when performing measurements with the POLY-PRAM instruments.

BATTERIES

Check battery voltage by rotating the range function switch (knob) to the "BAT" position and press the Test switch.

The instrument operates on a rechargeable battery, YUASA, Type F-50 nickel-cadmium cell with a nominal rating of 9.6 volts at 50 Milliampere hours. The unit will be energized and ready to operate if the battery voltage is below 9 volts with the battery charger plugged in. The battery will be on trickle charge in all but the "BAT" position. When the battery voltage is below 9 volts, the unit will not operate properly. Recharge with the selector switch in the "BAT" position for fast charge. (In the "BAT" position, the battery is on full charge and will require approximately 16 hours to be fully charged.) Full charge is obtained when the battery voltage measures 11.2 volts with the charger plug removed from the unit.

WARNING: DO NOT CHARGE THE BATTERY LONGER THAN 16 HOURS WHEN THE SELECTOR SWITCH IS IN THE "BAT" POSITION, as the battery life will be drastically reduced or possibly ruined.

The required batteries may be ordered from the PRESTO-TEK Corporation, ordering information follows.

IMPORTANT

Your POLY-PRAM is the first digital, multi-parameter instrument combining conductivity, pH, Millivolts, temperature, and dissolved oxygen; and due to high sensitivity, certain notations should be made as follows:

1. DO NOT STIR SOLUTION WITH PROBES WHEN PERFORMING TESTS, as end point becomes difficult to reach.

2. IMMERSE ALL PROBES AT LEAST TWO INCHES (5 cm) INTO SOLUTION. Move probe in an UP and DOWN MOTION in test solution to disperse fluid which may have been left on probe from prior testing, and to remove air bubbles.

3. ALLOW 10 TO 15 SECONDS FOR CONDUCTIVITY, pH and MILLIVOLT READINGS to stabilize.

4. ALLOW 10 TO 30 SECONDS FOR TEMPERATURE and DISSOLVED OXYGEN READINGS to stabilize.

5. DO NOT HOLD TEST BUTTON DOWN WHEN MAKING A BATTERY VOLTAGE READING, as display will not stabilize due to indication of battery discharge.

6. RINSE PROBES IN DISTILLED WATER AFTER USE--NEVER ALLOW PROBE TO DRY OUT WITH RESIDUAL TEST FLUID LEFT ON PROBES.

7. WHEN PERFORMING HIGH PURITY CONDUCTIVITY MEASUREMENTS (low range on DP-30, 32, 34, 36, 38 and 40), PRESS TEST BUTTON WITH PROBE DRY TO DETERMINE OFF-SET, IF ANY. Subtract off-set reading from measurement results. Off-set results from probe contamination. For cleaning procedure, refer to PROBE CLEANING, in the CONDUCTIVITY SECTION of this manual.

8. CHECK BATTERY VOLTAGE BY ROTATING THE RANGE FUNCTION SWITCH (knob) TO THE "BAT" POSITION AND PRESS THE TEST SWITCH.

9. Keep conductivity probe 2" from botton of container or reading will be low.

10. When using the 200 uM conductivity scale, be sure the probe is clean. A dirty probe will contaminate the solution and the last digit will change as the contaminate is dissolved inside the probe.

CONDUCTIVITY SECTION

1. The CONDUCTIVITY PROBE SHOULD BE CLEAN. Rinse in deionized or distilled water before and after use.

2. Insert probe in solution to be tested, making sure probe is inserted to a depth of at least 1½ inches (3.8 cm). Gently move up and down to remove all air bubbles from probe. Air entrainment causes inaccurate readings.

3. Rotate the range function switch on one of the three conductivity ranges available. If the conductivity range is not known for the fluid being tested, start with the low range. Press the test button for reading and wait for display to stabilize, which is typically 8 to 10 seconds. If the display blanks out with the figure "1" on the left side of the display, overrange is indicated meaning the test fluid has a higher conductivity than range selected. Rotate range knob to next higher range. For greatest resolution, use lowest range for which display does not show 1.

4. *IMPORTANT:* After each test, rinse probe in distilled water before testing the next test fluid so as not to mix test fluids. After final use of the instrument, rinse probe in demineralized water. If probe is allowed to dry with test fluid left thereon, resultant residue will cause inaccuracies with subsequent testing.

5. *PROBE CLEANING:* The probes should be shiny bright. Probes that have become coated may be cleaned by rinsing in warm demineralized water and then rubbing the electrodes with a Q-Tip or Kleenex. If this fails, immerse probe in 10% hydrochloric acid for one minute, followed by demineralized water rinsing, and rub with a Q-Tip or Kleenex until electrodes are shiny bright.

   If the coating is comprised of organic residue such as oils, etc., this can best be removed by rinsing probe in methanol or isopropyl alcohol, or by washing with a non-abrasive soap. Again, follow with a demineralized water rinse and rub until shiny bright.

   WARNING: NEVER USE ABRASIVE SOAP OR SCRAPER OF ANY TYPE, as the precious metal plating on the electrode may be damaged, resulting in inaccurate test readings.

CALIBRATION PROCEDURES

Calibration of models DP-30, 32, 34, 36 and 38 requires three standard solutions of 150; 1,500; and 15,00 micromhos for the low, middle and high ranges, respectfully. The models DP-31, 33, 35, 37 and 39 require calibration solutions of 1,500; 15,000; and 150,000 micromhos for the low, middle and high ranges, respectfully. Refer to ACCESSORIES SECTION, which follows, for ordering information, if needed.

The calibration procedure for the CONDUCTIVITY SECTION is identical for all POLY-PRAM models; and for any model, the calibration of any range is independent of the other ranges. To begin the procedure, make sure the electrodes are shiny bright, clean. Examine the probe surfaces and make sure there are no breaks in the precious metal-plated surfaces. If probes are damaged, instrument should be returned to the PRESTO-TEK Corporation at 7321 N. Figueroa St., Los Angeles, CA 90041 for repair.

To calibrate, proceed as follows:

1. Remove the four screws on the bottom of the case and gently remove cover. Refer to the outline drawing which follows.

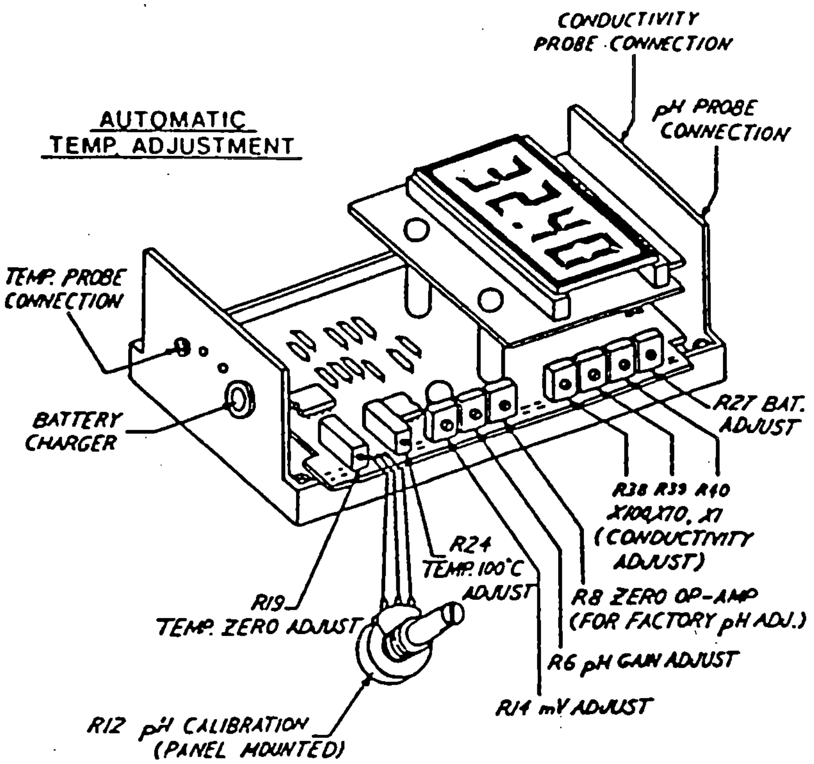
   To calibrate the low range, make sure the probe is dry, as residual demineralized water from cleaning will introduce an error in the calibration. Now, insert the probe to a depth of 1½ inches (3.8 cm) in the low range calibration solution and stir gently until all air bubbles are removed brom the probe. With the test button depressed, adjust R40 with a small screwdriver until the display corresponds with the value of the colution.

2. Rinse probe in demineralized water and dry. Insert probe in the appropriate calibration solution for the mid range, and with the test button depressed, adjust R39 until the display corresponds with the calibration solution.

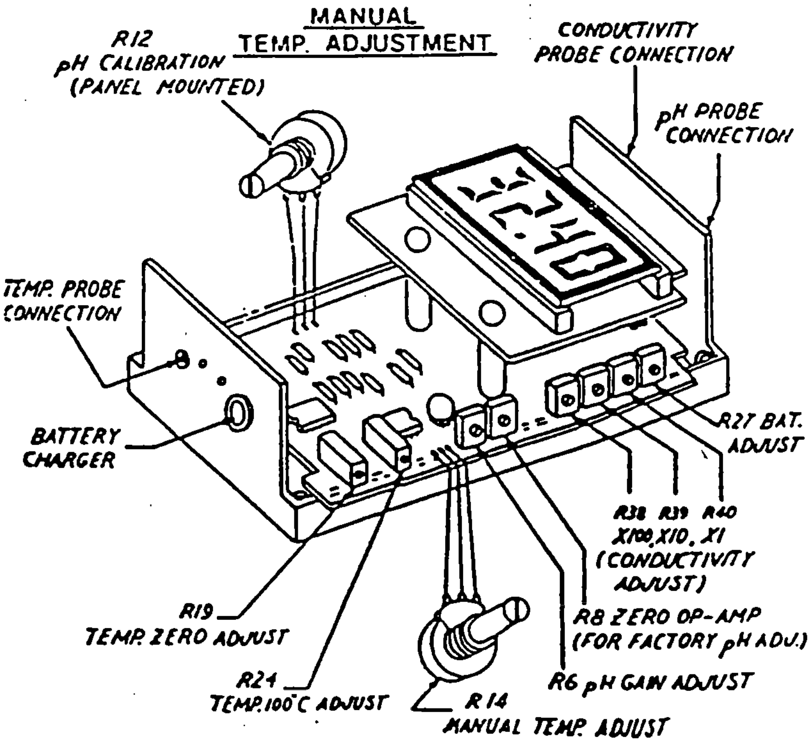
3. Rinse probe in demineralized water and dry. Proceed with the high range calibration using the appropriate solution by adjusting R38.

4. *BATTERY VOLTAGE CALIBRATION:* This step requires an accurate voltmeter, VOM or DVM. Place the leads from the above across the battery, while in place, and adjust R27 until the POLY-PRAM reading corresponds with the display of the calibration meter.

AUTOMATIC TEMP. ADJUSTMENT



MANUAL TEMP. ADJUSTMENT



TEMPERATURE SECTION

OPERATION

POLY-PRAM models DP-32, 33, 36, 37, 38 and 39 contain temperature functions. The temperature probe used in these models utilizes a dual, precision thermistor. The measuring range is from -15°C to 100°C, with an accuracy range of ±.15°C, with display resolution of .1 degree centigrade. *CAUTION:* The probe should not be used at temperatures above 100°C, as this may result in a permanent change in the characteristics of the thermistor with resultant temperature measurement inaccuracy.

For temperature tests, plug the probe into the jack marked "TEMP". With models DP-32 and 39, rotate the range function switch to "T" and depress the Test Button. With models DP-36, 37, 38 and 39, rotate the range function switch to the extreme counterclockwise position. Rotate the upper left switch to the temperature position and depress the Test Button to obtain a test reading.

When testing liquids, typically the response time for stable readings is 10 seconds from normal room temperature to either 0°C or 100°C, and in air, the response time is typically 30 seconds.

CALIBRATION

For accurate temperature calibration, use PRESTO-TEK simulator, Model TC-01, or return to the factory. Ordering information for the TC-01 simulator follows in the ACCESSORIES SECTION. To use the temperature simulator, plug it into the temperature jack and set selection switches to the temperature measurement position on the POLY-PRAM instrument. Then set the simulator control knob to 0°C, and press the Test Button. Refer to the outline drawing preceeding, and adjust *R19* until the display reads 000.0. The simulator is next set at 100°C and *R24* is adjusted to provide a reading of 100°C, which completes the temperature calibration.

An approximate temperature calibration may be accomplished by using a bath of melted ice and by testing in boiling bath of water. Understand that dissolved solids depress melting points and atmospheric pressure variations effect the boiling temperature of water.

It is suggested that ice made from demineralized water be used in demineralized water to calibrate at the 0°C point. Allow sufficient time with stirring of the water and ice to achieve temperature equilibrium. Use gently boiling water to calibrate at 100°C. Use the adjustments as indicated in the first paragraph above, allowing 10 seconds probe contact with the water.

pH SECTION

INTRODUCTION TO pH

Models DP-34 and 35 require manual temperature adjustment for pH correction due to temperature variations, and knobs are provided to allow a dial set of the temperature of the fluid being tested. The temperature adjustment range is 0-100°C.

Models DP-36, 37, 38 and 39 possess automatic pH correction due to temperature variations over a range of -15°C to 100°C.

All *POLY-PRAM* instruments with pH measurement capability are equipped with a calibration adjustment control knob.

pH and temperature probe cleanliness is important. With Models DP-34 and 35, only the pH probe is utilized in making pH measurements. With Models DP-36, 37, 38 and 39, both the pH and temperature probes are used. Rinse probes in demineralized water both before and after measurements. Replace the pH probe in the plastic bottle or probe tip cover provided.

PERMA-PROBE, Model 85060, is provided with the *POLY-PRAM* instruments. The *PERMA-PROBE* is provided with a permanent fill of reference solution and will last for several years under normal usage, before replacement is necessary. If a refillable electrode is desired, the *PRESTO-TEK* Model 85059 should be ordered. This probe requires periodic refill with solution 80117. *NOTE:* A complete selection of optional probes are listed in the *PRESTO-TEK* Laboratory pH Electrode Catalogue, Form EL.

OPERATION: When performing pH tests with Models DP-34 and 35, use the following test procedure. *NOTE:* Best results are obtained when test and buffer solutions are at the same temperature.

1. Connect the electrode to the instrument only finger tight--*DO NOT USE A TOOL.*

2. Insert pH probe and thermometer in the buffer solution. For greatest accuracy, the buffer solution used should be within 2 pH units of the

solution to be measured. Set the temperature adjust knob to correspond with the temperature of the buffer solution.

3. From the Buffer Solution Chart, which follows, determine the pH, and with the Test Button depressed, rotate calibrate adjust knob until the display corresponds with the pH of the buffer solution at the temperature of the buffer solution. The reading should stabilize within 10 to 15 seconds.

4. Remove probe and thermometer from buffer solution, rinse with demineralized water, dry, and insert in test sample. Allow temperature to stabilize, then set temperature knob to correspond with the temperature of the test solution. Depress test button and read results, allowing 10 to 15 seconds for the display to stabilize.

When performing pH tests with models DP-36, 37, 38 and 39, use the following test procedure. Only a buffer solution is needed, and greatest accuracy is achieved by using a buffer solution which is within 2 pH units of the fluid to be tested.

1. Plug in temperature probe in the proper jack and connect pH probe only finger tight--DO NOT USE A TOOL.

2. Insert both the pH and temperature probes in the buffer solution. Rotate function selector knob to the full counterclockwise position and set the left-hand knob to the temperature position.

3. Depress the Test Button and obtain the temperature reading, allowing time for the display to stabilize.

4. Refer to the Buffer Solution Chart, which follows, to obtain the pH value of the buffer solution at the temperature of the buffer solution.

5. Rotate left-hand knob to the pH position and press the Test Button. Using the pH calibrate knob, rotate until display corresponds with the buffer pH value.

6. Remove pH and temperature probes from buffer solution, rinse in demineralized water, and place in the solution to be tested.

   WARNING: DO NOT TEST IN ANY FLUID OVER 100°C IN TEMPERATURE. Depress Test Button and allow 10 to 15 seconds for the display to stabilize. Read test results.

7. After reading results, rinse probes with demineralized water and return pH probe to the plastic bottle or insert in the tip cover provided.

CALIBRATION

For accurate pH calibration, use the PRESTO-TEK Model 100 or 115 pH simulator. Further explanation of the PRESTO-TEK simulators follows, as well as ordering information, in the ACCESSORIES SECTION.

For the DP-34 and DP-35, set the controls of the simulator for pH measurement mode and the temperature control to 25°C. Plug in the pH simulator to the POLY-PRAM instrument, with pH control set at 7 pH and the temperature control at 25°C. Depress the Test Button and adjust DP-34 or DP-35 front panel calibration control for display indication of 7.00. Then set the pH simulator to "1" and, with the Test Button Depressed, adjust *R6* for a display indication of 1.00.

Calibration of the pH section of the DP-36, 37, 38 and 39 requires either a 25°C temperature bath or the PRESTO-TEK Model TC-01 temperature simulator. Place temperature probe in 25°C bath or plug the TC-01 simulator into the POLY-PRAM instrument, and plug in the pH simulator. Then set pH at 7 and the temperature simulator at 25°C. Depress the Test Button and adjust front panel calibration control for a display indication of 7.00. Now, set the pH simulator at a pH of 1 and adjust *R6* for a display indication of 1.00.

BUFFER SOLUTION CHART

(TEMPERATURE CORRECTION CHART)

Buffer solution for standardizing the instrument to the electrode, prior to use, is provided with each instrument when shipped from the factory. Additional quantities are available in 2 oz. plastic bottles by ordering direct from factory by Part Number. Solutions stored for more than one year should be checked against fresh buffers. *NOTE:* Deterioration is greatest for high pH buffers.

All buffer solutions change pH with temperature. Below is pH *vs.* temperature tabulation for the three standard buffers provided by the PRESTO-TEK Corporation.

	pH 4.01 ±.01 Red P/N 80114 Phthalate Buffer	pH 7.00 ±.01 Grn. P/N 80115 Phosphate Buffer	pH 10.01 ±.01 Blue P/N 80116 Carbonate Buffer
°C	pH	pH	pH
0	4.00	7.12	10.32
5			10.25
10	4.00	7.06	10.18
15			10.12
20	4.00	7.02	10.06
25	4.01	7.00	10.01
30	4.02	6.99	9.97
35			9.93
40	4.04	6.98	9.89
45			9.86
50	4.06	6.97	9.83
60	4.09	6.98	
70	4.13	6.99	
80	4.16	7.00	
90	4.21	7.02	
95	4.23	7.03	

CAUTION: pH 10.01 Blue buffer -- absorption of atmospheric CO_2 will lead to degradation of product.

MILLIVOLT SECTION

OPERATION

Use of the Millivolt option makes possible the measurement of voltages from 0 to ±1999 Millivolts with one Millivolt resolution and an accuracy of ±0.1% of full scale. There is no offset or temperature compensation required for this function. The input impedance is a minimum of 5×10^5 megohms. Millivolt readings are obtained by rotating the range function switch to the extreme counterclockwise position and setting the upper left switch to the Mv position. The probe to be used is plugged into the connector marked pH. By depressing the Test Button, the input signal will be displayed along with the proper polarity sign. Utilization of the Millivolt section provides measurements of oxidation reduction potentials with combination ORP probes, dissolved gas, or specific ion measurements. These probes are available from the PRESTO-TEK Corporation.

CALIBRATION

IMPORTANT: The pH section must be calibrated prior to that of the Mv section. Refer to the calibration procedures contained in the pH SECTION. A PRESTO-TEK Model 110 or 115 pH simulator is required for this procedure, or the instrument should be returned to the factory. Set the instrument range function switch to the extreme counterclockwise position, connect the pH simulator to the pH input, and set simulator for a pH of 14, which corresponds to a Millivolt reading of -414, and a temperature of 25°C. Now depress the Test Button and adjust *R14* for a display indication of -414, which completes the calibration of the Millivolt section.

pH, MILLIVOLT SIMULATOR

These devices are quite useful in the calibration of the pH and Millivolt sections of the POLY-PRAM instruments. In addition, when difficulties arise with pH measurement and control, the probe is at fault the majority of the time. Slow response, instrument instability and inaccurate measurements are symptomatic of possible probe malfunction. Knowing whether or not the probe is faulty saves lost testing time while instruments are returned for repairs unnecessarily, return and shipping costs and losses, and repair costs.

The PRESTO-TEK Corporation offers a Model 115 (9 volt battery powered) and a Model 110 (110 volt line operated) pH simulators. These units may be connected to a pH meter or controller, allowing testing at pH values of 0 - 14 in 1 pH units, or over a Millivolt range of 315 to -414 Millivolts. The use of a simulator traces the problem to the instrument or the probe.

Also, buffer solutions age or become contaminated with use. The simulator will also test the accuracy of buffer solutions when used with a pH instrument when the pH probe is functioning satisfactorily. Ordering information follows in the ACCESSORIES SECTION.

ACCESSORIES SECTION

ITEM	*DESCRIPTION*	*MODEL or PART NO.*
Cond. Probe low ranges	For use with cond. ranges 0-200; 0-2,000; 0-20,000 uM	80352
cond. probe high ranges	For use with cond. ranges 0-2000; 0-20,000; 0-200,000 uM	85347
Temp. probe	Epoxy encased--accuracy ±.15°C	85303
PERMA-PROBE pH electrode*	Plastic encased, permanent filled, combination electrode	55060

APPENDIX C

Health and Safety Plan

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1. INTRODUCTION

This Personnel Site Health and Safety Plan (HASP) has been prepared for use in conjunction with the RI/FS program of study at the Red Oak Landfill. The HASP was developed with the involvement of occupational and industrial health and safety personnel, physicians, chemists, and other appropriate personnel using Federal Regulations and published guidelines, texts, and references. Guidelines provided by the above resources have been supplemented by a site visit.

The protection of workers and environmental safety and health are major concerns during this project and cannot be compromised. The objective of this health and safety plan is to assure that safe working conditions exist at the site. The safety organization and procedures have been established based on an analysis of potential hazards and personnel protection measures which have been selected in response to these risks.

The elements of the HASP are based upon requirements described in the USEPA Standard Operating Safety Guide, the U.S. Department of Labor, OSHA Standards 29 CFR Part 1910. All reasonable precautions shall be taken by Geraghty & Miller, Inc. (G&M) and its subcontractors to ensure the safety and health of workers and the general public. All work will be performed in accordance with applicable Federal, State, and local regulations and recommendations.

2. GERAGHTY & MILLER, INC. RESPONSIBILITY

G&M will be responsible for its personnel, subcontractors, and site visitors' adherence to the HASP during the investigation and will ensure that all work is performed in accordance with the health and safety requirements described herein, the current edition of the Standard Operating Safety Guides prepared by the USEPA office of Emergency and Remedial Response, Hazardous Response Support Division, and all Federal, OSHA, State and local health and safety regulations.

Mr. Tony Pirelli has been designated as the Site Health and Safety Officer (HSO) to implement, monitor, and enforce the Site Health and Safety Plan. The Site Health and Safety Officer has the option to implement requirements in addition to those described herein on a case-by-case basis. Should an unforeseen or site-specific safety related factor, hazard or condition become evident during the drilling, G&M will take action to re-establish safe working conditions and to safeguard site personnel, the public and the environment. Actions taken to safeguard workers beyond the measures described in this plan will be verbally communicated to the Respondent's Project Coordinator or implemented and subsequently submitted in writing. Mr. Randy Boness will be the alternate HSO when the designated HSO is unable to fulfill his duties.

3. SITE LOCATION AND DESCRIPTION

The Red Oak Landfill site encompass 40 acres and is a former municipal landfill which accepted wastes drum 1962 to 1974. The contents of the landfill reportedly include municipal wastes, industrial wastes, construction/demolition wastes, and tree trimmings. The landfill site was previously a limestone quarry which operated from 1947 to 1953-1954. The site was purchased by the City of Red Oak, and the quarry pit adjacent to the East Nishnabotna River was operated as a landfill from 1962 to 1974. The water supply wellfield for the City of Red Oak is located in the highlands approximately two miles to the east/southeast.

The Red Oak Landfill Site is located on the cutting bank of the East Nishnabotna River. The topography of the landfill includes of a topographic high located in the southwest corner. The land north of the topographic high slopes to the north/northeast while the land south of the high dips to the south. Slopes within the landfill range from nearly flat terrain to slopes of approximately 10°, with the exception of the eastern edge of the landfill, adjacent to the East Nishnabotna River, where the slope is nearly vertical in places. Erosion due to surface runoff is greatest in the east central portion of the landfill where junked cars, rusted drums, and other solid wastes are presently exposed.

4. POTENTIAL CONTAMINATION SOURCES AND HAZARD EVALUATION

Constant attention shall be given to protecting on-site personnel from the physical and chemical hazards that may be encountered during the investigation. The field activities previously described consist generally of drilling, well installation, and soil and water sampling. An evaluation of the potential hazards has been completed utilizing available site history and existing soil and water sample data. The following potential exposure pathways have been identified.

- Ingestion of contaminated sediments and surface soils (accidental/poor hygiene)
- Inhalation and ingestion of contaminated particles and vapors
- Dermal contact with contaminated sediments and surface soils
- Dermal contact with contaminated equipment and structures

The investigation of subsurface conditions around any landfill (accepting hazardous or nonhazardous waste) has certain potential hazards, included the presence of explosive levels of gases (particularly methane).

Initially, the drilling operations will use hollow stem auger techniques. If explosive or toxic levels of gases are encountered, drilling operations will be modified to use either circulated water or mud as a drilling fluid.

Industrial waste disposal activities that occurred at the site were reported in CERCLA 103(c) notifications prepared by personnel from the Uni-Royal Hose Plant and the Union Carbide Battery Production Division Plant.

The Uni-royal Hose Plant in Red Oak generated waste consisting of lead-contaminated filter cake. This material was disposed at the site from mid-1973 until the landfill was closed in April 1974. The filter cake consisted of activated carbon, diatomaceous earth, and a filter pad that was periodically checked for contamination. The filter cake contained an average of 430 parts per million (ppm) lead. Approximately 8,000 pounds of drummed lead-contaminated filter cake are estimated to have been disposed at the site.

Wastes generated at the Union Carbide Battery Production Division and disposed at the site included toluene, methyl isobutyl ketone, tetrachloroethane, mineral spirits, diacetone alcohol, and laminate paper. The laminate paper contained approximately three percent (by weight) mercurous chloride, and was the only industrial waste product reported to have been disposed by Union Carbide in any form other than liquid. The laminate paper wastes were estimated to contain 600 to 700 ppb mercury.

Chemical analyses of water samples for VOCs have detected the following concentrations:

Substance	Concentration
1,1,1-trichloroethane	200 ug/L
Toluene	2,000 ug/L
Xylene	400 ug/L

Some individual VOCs have been detected, but a lower concentration (37 ug/L or less).

Thus, this HASP must address the following hazards:

- Explosive levels of gases in boreholes
- Toxic gases, toluene, 1,1,1-trichloroethane, and xylenes
- Contact with waste or contaminated soil or water

Toxicological and hazard data for toluene, xylenes, methyl isobutyl ketone, 1,1,1-trichloroethane, hydrogen sulfide, and lead have been attached. These data will be explained and made available to site personnel at the training session.

5. PERSONNEL PROTECTION PROGRAM

A Personnel Protection Program has been established and will be maintained for all personnel working at the Site. G&M will provide any necessary safety and health training to personnel assigned to the site for the purpose of performing or supervising work, health and safety, security, administrative purposes, or for any other site investigation-related function. Separate protocol will be followed for site visitors and is described in a later section.

Based on the existing data collected at the site, the use of respiratory protective equipment is expected to be limited. Level D protection has been selected for site activities. Protection will be upgraded to Level C if air monitoring and/or laboratory results indicate a higher degree of hazard. Any respiratory protection program implemented during on-site activities will be done in accordance with 29 CFR Part 1910.134. A sustained reading of 50 ppm will trigger an upgrade in protection from Level D to Level C and allows a margin of error in assuming that a 50 ppm reading is one compound. Other data obtained during the project will be used to update the use of respiratory protective equipment. If other contaminants are encountered on-site, all personnel will be made fully aware of their hazards and the appropriate procedures which will be utilized to prevent exposure.

In order to monitor for potentially explosive levels of methane, and MSA Explosimeter will be utilized on site. Hydrogen sulfide will be monitored with an Enment CGS-10 Tritector; the instrument will sound an alarm of 10 ppm of hydrogen sulfide (the ACGIH Time Weighted Average) is detected.

The levels of protection are defined as follows:

Level D:	Tyvek coveralls Hard hat Gloves - nitrile or equivalent Safety glasses
Level C:	Coveralls - Tyvek with hoods Full face respirators with appropriate cartridges Hard hat Chemical-resistant, steel toe and shank boots Inner gloves - surgical type Outer gloves - nitrile or equivalent

No changes to the specified level of protection shall be made without the approval of the Health & Safety Officer. If conditions warrant more stringent personal protection, the following will be employed, but not limited to:

- Duct taping of boots and gloves to coveralls to eliminate possible leakage at the wrist and ankle
- Inner gloves
- Eye protection
- Polyethylene-coated coverall or rain gear

5.1. Air Monitoring

The evaluation of air quality in the breathing zone will provide readings for organic vapors. Air monitoring equipment to be used for measurements will include but not limited to a field photo ionization detector such as a Total Ionizables Present (TIP) or HNU meter. The air around the borehole will be surveyed as well as the air at shoulder height (breathing zone) around the rig. This survey will take place at different points of the operation. The air monitoring equipment will be calibrated according to manufacturer instructions.

Level C protection will be required for the following airborne concentrations detected in the breathing zone:

MONITORING PARAMETERS	METHOD	INSTRUMENT	MAXIMUM AIRBORNE CONCENTRATION AT LEVEL C	RANGE OF DETECTION
Organic vapors	Photo-ionization	HNU	100 ppm	.5-100 ppm
Organic vapors	Photo-ionization	TIP	100 ppm	.5-100 ppm

If ambient air conditions exceed maximum airborne concentrations (shown above) for 10 minutes, the level of personnel protection will be considered hazardous and all work will cease (described above). The personnel protection level may be down graded to Level D when all monitoring parameters remain below 10 ppm in the breathing zone for 10 minutes or more.

5.2. Decontamination Procedures

The following sections describe the decontamination procedures to be followed when working in a Level D work environment and for Level C, if required.

5.2.1. LEVEL D DECONTAMINATION

o Equipment Worn

The full decontamination procedure for workers in Level D conditions consist of wearing the following additional equipment and following the procedures described in the sections below.

- One piece chemical resistant splash suit
- Hard Hat
- Chemically-resistant steel toe and shank boots
- Inner and outer gloves

o Procedure for Decontamination (See Figure C-1)

Station 1: Segregated Equipment Drop

Deposit equipment used on-site (tools, sampling devices and container, monitoring equipment, radios, clip boards) on a plastic drop cloth or in different container with plastic liners.

Equipment: Various size containers
Plastic liners

Station 2: Outer Garment, Boots and Gloves, Wash and Rinse

Scrub outer boots and gloves with the proper decontamination solution (hexane or methanol) and detergent/water, rinse

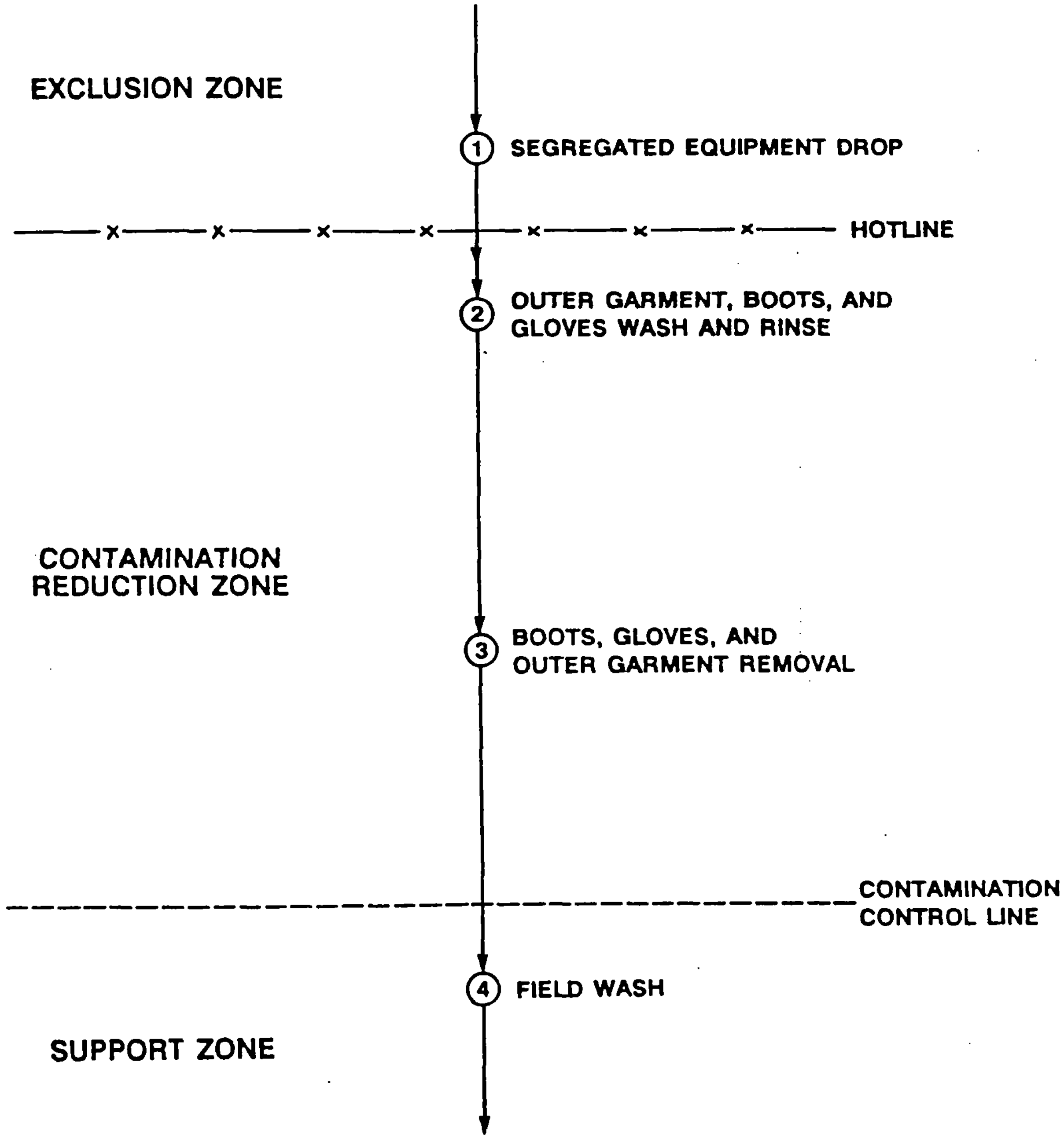

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FIGURE C-1
MINIMUM DECONTAMINATION LAYOUT
LEVEL D PROTECTION
RED OAK LANDFILL
RED OAK, IOWA

gloves, boots and garment with hand pump spray device.

Equipment:	2 containers (30-50 gallon) Hand pump spray device Water Detergent Scrub brushes

Station 3: Boot, Gloves, and Outer Garment Removal

Boots and outer gloves are removed and placed outside of the decontamination zone. Inner gloves and Tyvek suit are deposited in separate containers lined with plastic.

Equipment:	Containers (30-50 gallon) Plastic liners

Station 4: Field Wash

Thoroughly wash hands and face. Shower as soon as possible.

Equipment: Water, wash basin/bucket, soap

5.2.2. LEVEL C DECONTAMINATION

o Equipment Worn

The full decontamination procedure for workers wearing Level C Protection (with taped joints between gloves, boots, and suit) which consists of the following equipment is described in the sections below.

- One-piece, hooded, chemical-resistant splash suit
- Full respirator with appropriate cartridges face
- Hard Hat
- Chemical-resistant, steel toe and shank boots
- Inner gloves, surgical type, Outer gloves-nitrile or equivalent

o Procedure for Full Decontamination (Figure C-2)

Station 1: Segregated Equipment Drop

Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clip boards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Equipment: Various size containers
Plastic liners
Plastic drop cloths

Station 2: Outer Garment, Boots and Gloves, Wash and Rinse

Scrub outer boots and glove with the proper decontamination solution (hexane or methanol) and detergent/water. Rinse gloves, boots and garment with hand pump spray bottle into plastic bucket.

Equipment: 2 containers (30-50 gallon) hand
pump spray device (garden sprayer)

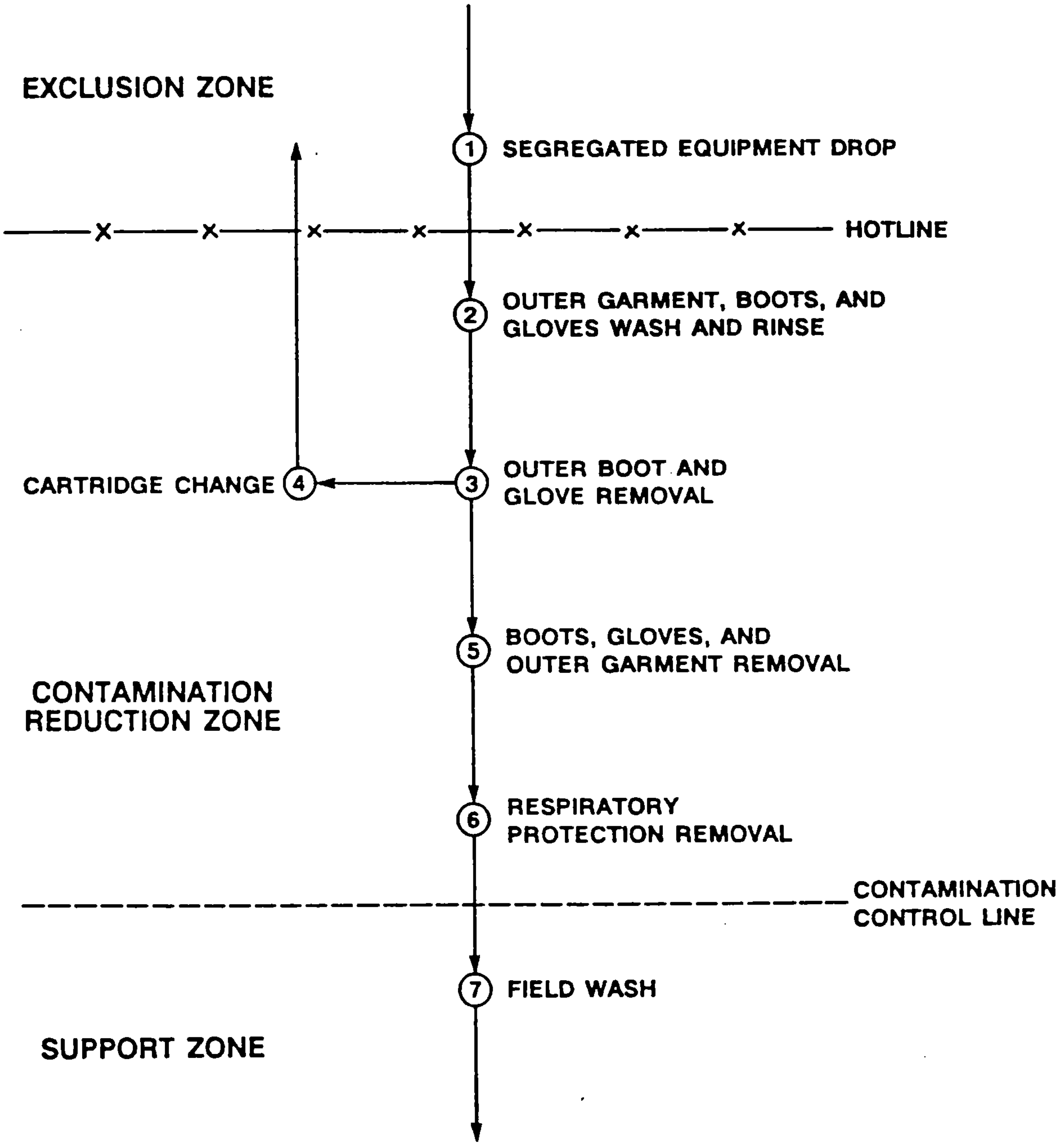

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FIGURE C-2
MINIMUM DECONTAMINATION LAYOUT
LEVEL C PROTECTION
RED OAK LANDFILL
RED OAK, IOWA

Water
Detergent
Scrub brushes

Station 3: Outer Boot and Glove Removal

Remove outer boots (if worn) and gloves with accompanying tape. Tape should be placed in a container with a plastic liner.

Equipment:	1 container (30-50 gallon)
	Plastic liner
	Bench

Station 4: Canister Change

If a worker leaves the exclusion zone to change a canister on his/her respirator, this is the last step in the decontamination procedure. Once the worker's canister is exchanged, the outer glove and boot covers are donned with joints taped. The worker may then return to the exclusion zone.

Equipment:	Respirator canisters
	Tape
	Extra gloves
	Boot covers (if worn)

Station 5: Boots, Gloves and Outer Garment Removal

Removal of boots, gloves (inner) and outer garment. The outer chemically resistant garment should be deposited in a plastic lined container.

Equipment:	Container (30-50 gallon) Bench or stool Plastic liners

Station 6: Respiratory Protection Removal

Remove the face piece respirator, deposit used cartridges in a plastic lined container and wipe the face piece with clean water and paper towels.

Equipment:	Container (30-50 gallon) Plastic liners Paper towels Detergent solution Rinse water

Station 7: Field Wash

Wash hands and face

Equipment:	Water Soap Wash basins/buckets

5.3. Training

G&M employees attend a 40-hour course given in-house on safety at chemical plants and waste sites. This course satisfies the initial training requirements of 29 CFR 1910.120 (OSHA regulation of hazardous waste site activities). All Geraghty & Miller employees entering the site have been trained by the Red Cross on basic first aid procedures and CPR. Employees have also been certified by a physician to wear respirators.

Prior to initiating site work, all site personnel (Geraghty & Miller, Inc. and subcontractors) will be required to attend a training session given by the Health & Safety Officer. This session will take place at the site prior to the start of work and will include, but is not limited to the following topics:

- Site history
- Specific hazards (including toxicological data)
- Hazard recognition
- Standard operation procedures, including no smoking, no contact lenses, and no hand to mouth contact within the exclusion zones or prior to completing decontamination
- Decontamination (personnel and equipment)
- Emergency procedures
- Respirator fit test and use

5.4. Health Monitoring

G&M has established a Health Monitoring Program with occupational health specialists at the Milwaukee Industrial Clinic in Milwaukee, Wisconsin. G&M employees receive yearly physicals consisting of the following:

- Personal, family and environmental history
- Hands-on physical examination
- Snellen's eye examination
- Pap Smear (females over age 21)
- Hemoccult testing (over age 40)
- Laboratory Testing

A. Complete Blood Count

1) Red Blood Count
2) White Blood Count
3) Differential Screening
4) Hemoglobin

    5) Hematocrit

B. Urinalysis

    1) Sugar
    2) Albumin
    3) Specific Gravity
    4) Microscopic

C. Laboratory Chemistries

    1) A.G. Ratio
    2) Albumin
    3) Alkaline, Phosphatase
    4) Bilirubin, Total
    5) Calcium
    6) Chloride
    7) Cholesterol
    8) Creatinine
    9) GGT
    10) Globulin
    11) Glucose
    12) Iron
    13) Lactic Dehydrogenase (LDH)
    14) Phosphorus
    15) Potassium
    16) Protein, Total
    17) SGOT
    18) SGPT
    19) Sodium
    20) Triglycerides
    21) Urea Nitrogen (BUN)
    22) Uric Acid

D. Special Testing

    1) PCBs in serum

6. SITE VISITOR PROTECTION

All visitors to the drilling sites shall be instructed to stay outside the clearly identified exclusion zone and remain within the support zone during the extent of their stay (refer to Figures C-1 and C-2).

Visitors shall be cautioned to avoid skin contact with contaminated or suspected contaminated surfaces. During visitation, hand-to-mouth transfers should be reduced with special precautions not to eat, drink, smoke or chew gum or tobacco. The use of alcohol or medicine is prohibited.

Visitors requesting observation of the work in the exclusion zone must read the HASP and sign a form (Figure C-3) stating they have read and understand the safety protocol and will abide by it. All visitors entering the exclusion zone must wear appropriate personnel protective gear. Should respiratory protective devices be necessary (Level C), visitors who require entrance to the exclusion zone must produce evidence that they have had a complete physical examination, have received respiratory protection training, and have been certified by a physician to use a respirator.

Visitor inspection of the exclusion zone will be left to the discretion of the on-site Health & Safety Officer.

FIGURE C-3

VISTOR REVIEW OF
SITE HEALTH AND SAFETY PLAN

RED OAK LANDFILL

THE UNDERSIGNED VISITORS OF THE RED OAK LANDFILL REQUIRE ENTRANCE TO THE EXCLUSION ZONE AND HAVE THOROUGHLY READ THE HEALTH AND SAFETY PLANS, UNDERSTAND THE POTENTIAL HAZARDS AT THE SITE AND THE PROCEDURES TO MINIMIZE EXPOSURE TO THE HAZARDS, WILL FOLLOW THE DIRECTION OF THE SITE HEALTH AND SAFETY OFFICER, AND WILL ABIDE BY THE HEALTH AND SAFETY PLAN.

NAME (PRINT)	COMPANY	DATE	SIGNATURE

7. SOIL AND GROUND-WATER SAMPLING

Soil samples will be collected during the course of the investigation as described in the RI/FS Work Plan. Project personnel should take precaution to avoid dermal and inhalation exposure at all sample locations.

During sampling activities (soil and water), smoking, chewing or eating shall be prohibited. Air monitoring equipment, as described in the Permissible Exposure Limit Provisions, shall be used to determine airborne concentrations of volatile organics sampling. Surgical gloves should be worn during all routine sampling tasks to avoid dermal contact.

8. EMERGENCY PROCEDURES

The following standard emergency procedures will be used by on-site personnel. The Health & Safety Officer shall be notified of any on-site emergencies and be responsible for ensuring that the appropriate procedures are followed. The step-wise approach for dealing with emergency situations is shown in Figure C-4.

An emergency report (Figure C-5) must be completed and submitted to the site Health and Safety Officer for each instance of employee injury or possible exposure.

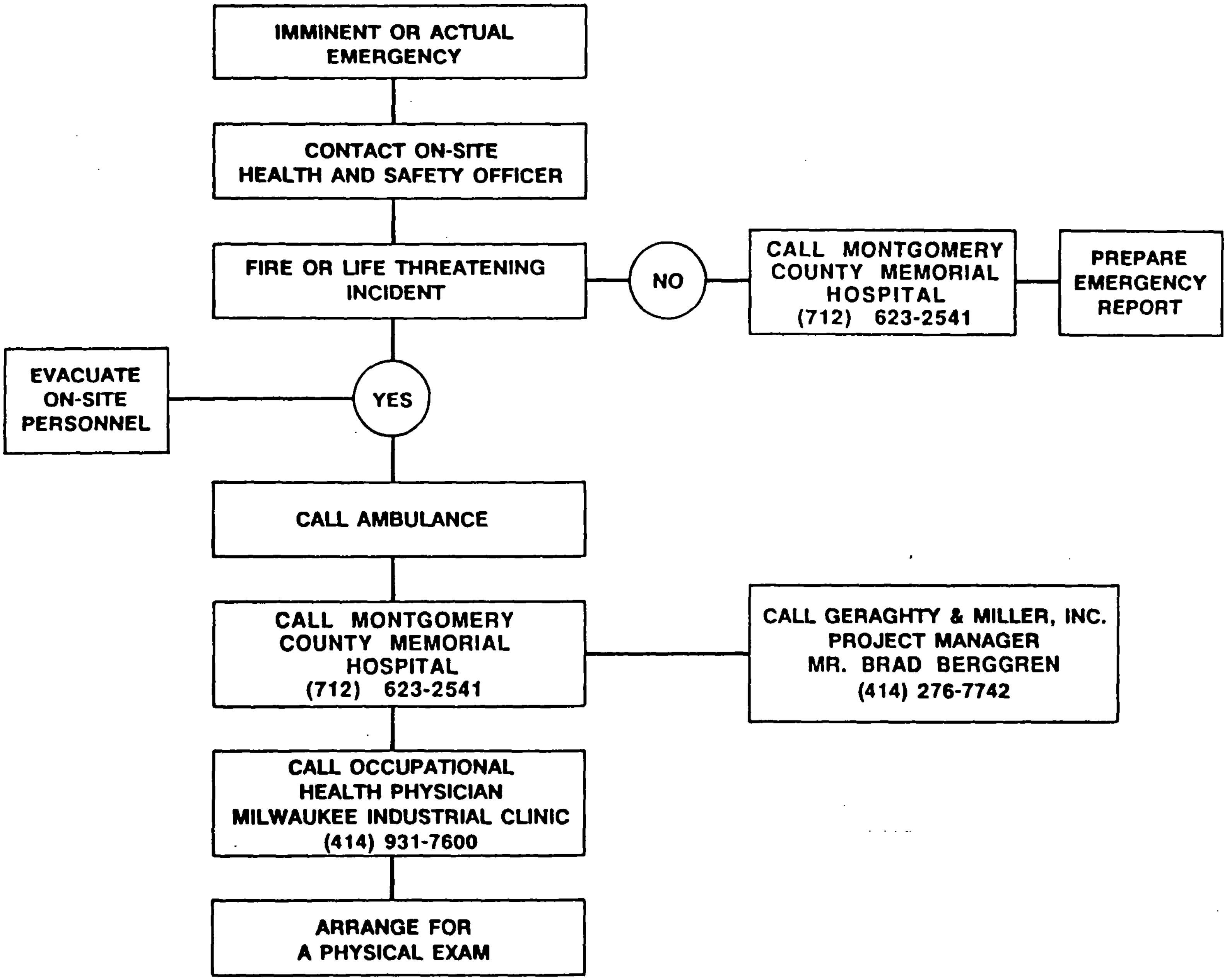
8.1. Personal Injury in the Exclusion Zone

In the event of an injury in the exclusion zone, all site personnel shall assemble at the decontamination line. The site geologist should evaluate the nature of the injury and the affected person should be decontaminated to the extent possible prior to movement to the support zone. Appropriate first aid should be initiated, and contact should be made for an ambulance and with the Montgomery County Memorial Hospital (if required). No persons shall reenter the exclusion zone until the cause of injury or symptoms are determined.

An eye wash unit will be provided in the exclusion zone at the working area.

8.2. Personnel Injury in the Support Zone

Upon notification of an injury in the support zone, the project manager and Health & Safety Officer will assess the nature of the



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Ground-Water Consultants

FIGURE C-4
EMERGENCY RESPONSE PLAN
RED OAK LANDFILL
RED OAK, IOWA

FIGURE C-5

EMERGENCY REPORT FORM

RED OAK LANDFILL

1. DATE ____________________

2. TIME OF ACCIDENT ____________________
CLIMATIC CONDITIONS ____________________

3. ON-SITE COORDINATOR ____________________

4. EMPLOYEE INJURED ____________________

5. COMPANY AFFILIATION ____________________

6. SOCIAL SECURITY NUMBER ____________________

7. INSURANCE COMPANY ____________________

8. NUMBER OF WORKERS AT SITE ____________________

NAMES OF WORKERS	COMPANY AFFILIATION
1. ____________________	____________________
2. ____________________	____________________
3. ____________________	____________________
4. ____________________	____________________
5. ____________________	____________________

9. CIRCUMSTANCES OF THE INJURY/EMERGENCY ACTION ____________________
____

10. EMERGENCY ACTIONS TAKEN ____________________
____

11. WHAT FIRST AID WAS PROVIDED? ____________________
____

12. WAS AN EMERGENCY PHONE CALL MADE TO THE PROJECT SAFETY OFFICER? ____________ IF SO, TIME: ____________

13. AMBULANCE SERVICE USED ____________________

14. HOSPITAL USED ____________________

15. ATTENDING PHYSICIAN ____________________

16. COMPANY REPRESENTATIVES CONTACTED ____________________

17. CONTRACTOR REPRESENTATIVES CONTACTED ____________________

injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, the appropriate first aid and necessary follow up as stated above should be initiated.

8.3. Fire/Explosion

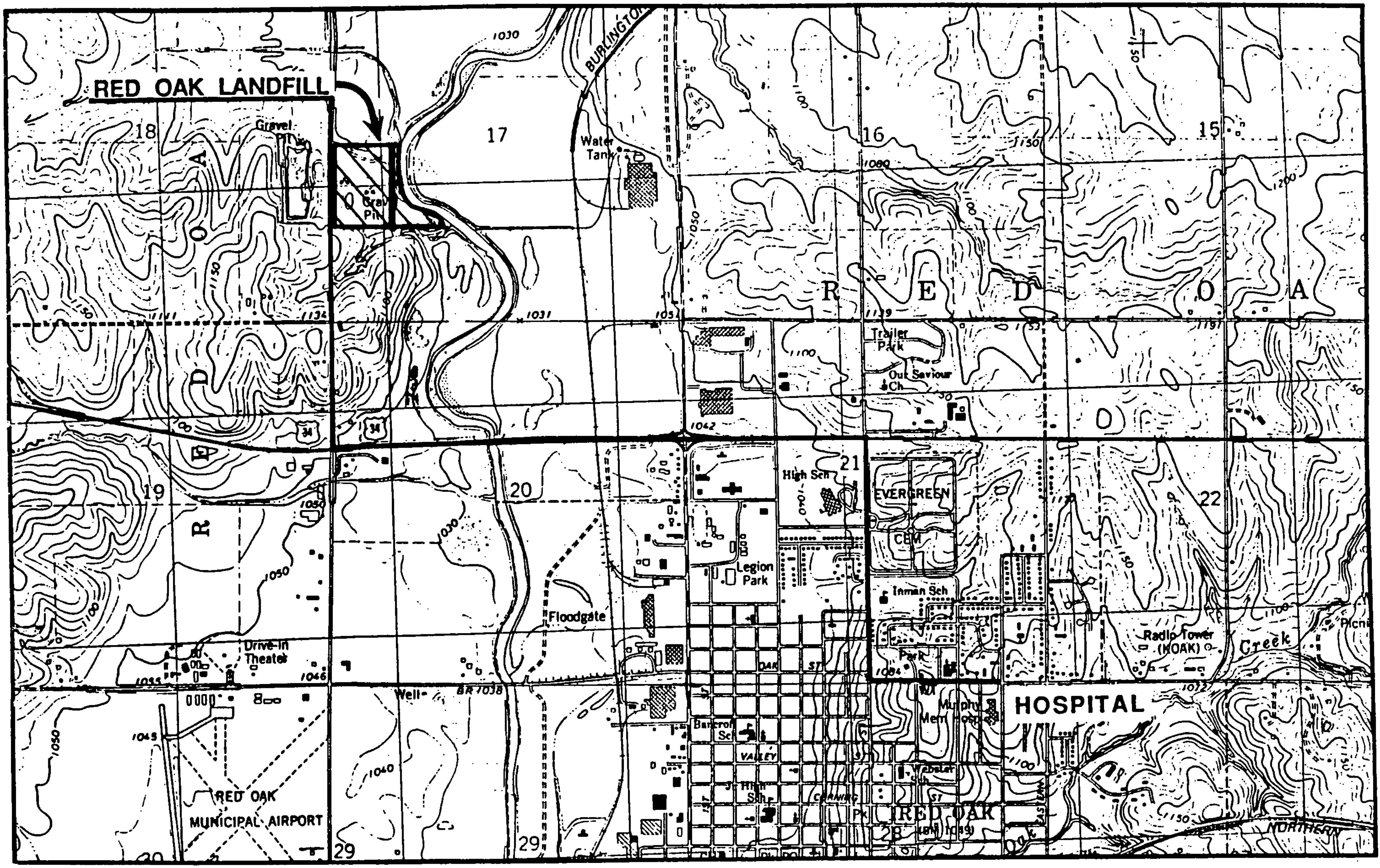
Upon notification of a fire or explosion on the site, all personnel will assemble at the contamination control line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

8.4. Personal Protective Equipment Failure

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the exclusion zone. Reentry shall not be permitted until the equipment has been replaced.

8.5. Emergency Phone Numbers

Emergency phone numbers will be posted at a conspicuous place in the support zone (Table C-1). Directions to the Montgomery County Memorial Hospital are shown in Figure C-6. The Montogmery County Sheriff and Fire Departments will be notified of the site investigation and potential hazards prior to implementation of the field work.



N

0 1000 2000 4000

SCALE IN FEET

GERAGHTY & MILLER, INC.
Ground-Water Consultants

FIGURE C-6
DIRECTION TO HOSPITAL
RED OAK LANDFILL
RED OAK, IOWA

TABLE 1

EMERGENCY PHONE NUMBERS

	Phone Number
G&M Representative Brad J. Berggren	414-276-7742
Respondents' Representative Frank Hackman	314-982-2619
Fire Department Montgomery County	712-623-5167
Ambulance Montgomery County	712-623-2511
Hospital Montgomery County Memorial 1201 Highland Avenue	712-623-2541
Sheriff Montgomery Avenue	712-623-5107

ATTACHMENT 1

WORKER HEALTH DATA

EXCEEDS CAPACITY OF CARTRIDGE RESPIRATOR. A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

SKIN PROTECTION: SAFETY GOGGLES. UNIFORM. APRON. POLYVINYL ALCOHOL GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

MESTIC (D.O.T.)

PROPER SHIPPING NAME	1,1,1-TRICHLOROETHANE (AIR ONLY)
HAZARD CLASS	ORM-A
UN/NA	UN2831
LABELS	NONE
REPORTABLE QUANTITY	1000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	1,1,1-TRICHLOROETHANE
HAZARD CLASS	6.1
UN/NA	UN2831
LABELS	HARMFUL - STOW AWAY FROM FOOD STUFFS

(TM) AND (R) DESIGNATE TRADEMARKS.
N/A = NOT APPLICABLE OR NOT AVAILABLE

THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN COMPILED FROM OUR EXPERIENCE AND DATA PRESENTED IN VARIOUS TECHNICAL PUBLICATIONS IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO REVISE MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAILABLE.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE, INSUFFICIENT INHIBITOR,
HEAT, FLAME, OTHER SOURCES OF IGNITION.
SUNLIGHT AND ULTRAVIOLET LIGHT

INCOMPATIBLES: WATER, STRONG BASES, ALUMINUM,
CHEMICALLY ACTIVE METALS, STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: HYDROGEN CHLORIDE, PHOSGENE, CHLORINE, CARBON MONOXIDE

SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS.
TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE

INTO CONTAINER FOR LATER DISPOSAL. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U226 (TOXIC WASTE)

SECTION VIII - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET
TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION

CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS
HIGH, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC
VAPOR CARTRIDGE IS RECOMMENDED. IF CONCENTRATION

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[illegible] identifiers resulted in  1 unique occurrences.

      Conversion Entry     1: Accession No.   7216776
      - Registry Number: 7439-92-1
      SIC Code: 3??3; 3562; 2816; 3323; 3691
      Material Name: LEAD
      Chemical Formula: PB
(USE) Common Uses: X-RAY PROTECTION; PAINT PIGMENT; BEARING METAL AND
      ... STEEL BATTERIES
      Binary Reactants: HYDROGEN PEROXIDE, ZIRCONIUM..
(SYN) Synergistic Materials: AS DISSOLVED OXYGEN LEVELS DECREASE LEAD
      BECOMES MORE TOXIC TO FISH. SOFT WATER ALSO INCREASES TOXICITY.
(ANT) Antagonistic Materials: THE CHARACTERISTICS OF WATER SOFT OR
      HARD THAT APPEAR TO BE CONDUCTIVE TO PLUMBO-SOLVENCY INCLUDE
      COMPARATIVE  ABSENCE OF CA AND MG BICARBONATES, LOW PH, HIGH
      DISSOLVED OXYGEN AND HIGH NITRATE CONTENT. INSOLUBLE LEAD IS NOT
      HIGHLY  TOXIC TO FISH. LEAD IS MORE TOXIC IN SOFT WATER. 50 PPM
      CA HAS DESTROYED THE TOXIC EFFECT OF 1 PPM LEAD.
(FDL) Detection Limit (Field; Techniques,Ref) (ppm): .05. LEAD,
      (BNW10* 0006)
(LDL) Detection Limit (Lab; Techniques,Ref) (ppm): .05. LEAD, (BNW10*
      0006)
(STC) Standard Codes: NFPA - 3,2,-; ICC, USCG - NO.
(FLM) Flammability: MODERATE IN FORM OF DUST EXPOSED TO HEAT OR FLAME.
(TCP) Toxic Combustion Prod.: WHEN HEATED EMITS HIGHLY TOXIC FUMES.
      ENTER WITH GREAT CARE.
(EXP) Explosiveness: MODERATE IN FORM OF DUST EXPOSED TO HEAT OR
      FLAME. REACTIVE AT HIGH TEMPERATURE AND PRESSURE; CAN REACT
      VIGOROUSLY  WITH OXIDIZING MATERIALS.
(MLT) Melting Point (C.): 327.4
(BLP) Boiling Point (C.): 1740
(SPG) Specific Gravity: 11.34
(VPN) Vapor Pressure (mm Hg): 1; 1; 5; 10; 100
(PER) Persistency: WILL SLOWLY BE PRECIPITATED BY NATURAL CARBONATES.
(PFA) Potential for Accumulation: ACCUMULATES IN BONES. POSITIVE.
      CONCENTRATION FACTORS FOR LEAD - MARINE AND FRESHWATER PLANTS
      AND INVERTEBRATES  200 AND FISH - 60 (-170). HALF-LIFE IN TOTAL
      HUMAN BODY - 1460 DAYS (R172** 0001).
(CAR) Carcinogenicity: NEGATIVE. NO TUMORIGENIC EFFECTS NOTED IN
      RODENTS ADMINISTERED 25 MG/L PB IN DRINKING WATER (R120** 0001).
(MUT) Mutagenicity: POTENTIAL. CHROMOSOME DAMAGE HAS BEEN NOTED FOR
      LEAD IN OCCUPATIONALLY EXPOSED PERSONS (R120** 0001).
(TER) Teratogenicity: 1 PPB TOXIC TO 24-32% OF CHICK EMBRYOS (NRN81
      0002). POTENTIAL.
(MST) Major Species Threatened: ALL LIFE
(INV) Inhalation Limit (Value): .15
(INT) Inhalation Limit (Text): REGULATIONS-- OSHA PEL (TWA) .05 MG/M3
      (29CFR* 1910).  RECOMMENDATIONS-- NIOSH TWA <.100 MG/M3 (CRSOE*
      78-158,78/NIOSH)  ACGIH TLV (TWA) .15 MG/M3 (TLVADM 83/ACGIH)
      ACGIH STEL .45 MG/M3/15 MIN (TLVADM 83/ACGIH)
(GHS) General Sensation: COMPOUNDS CAN BE ABSORBED THROUGH SKIN AT
      TOXIC (CHRONIC) LEVELS. SYMPTOMS INCLUDE PICA, ANOREXIA, VOMITING,
      MALAISE  AND CONVULSIONS. MAY LEAVE PERMANENT BRAIN DAMAGE.
[illegible] 15
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[illegible] NEAR FIRE [illegible].

[illegible]: THRESHOLD CONCENTRATION FOR FRESH AND SALT WATER FISH .1 PPM [illegible] 0001). .2 GM LEAD/KG BODY WEIGHT [illegible] DEATH WITHIN A FEW DAYS IN CALVES. BACTERIAL DECOMPOSITION OF ORGANIC MATTER IS INHIBITED BY .1 PPM LEAD. DAPHNIA: [illegible] IN 20 DAYS WHEN KEPT IN LEAD LINED TANKS. REPORT OF CHRONIC LEAD POISONING AMONG ANIMALS BY 1.8 PPM OF LEAD IN SOFT WATER. LEAD COMPOUNDS ARE HIGHLY TOXIC IF INGESTED OR INHALED. LEAD METAL IS AN INHALATIVE HAZARD.

Chronic Hazard Level: MORE OF A CHRONIC PROBLEM THAN ACUTE. APPLICATION FACTOR TO CONVERT 96 HOUR LC50 TO CHRONIC SAFE LIMIT [illegible]; LEAD METAL IS A CHRONIC HAZARD VIA INGESTION OR INHALATION. TROUT, .044 FOR RAINBOW TROUT. (R131** 0001) DEFORMITY AND SUB-ADULT MORTALITY HAS BEEN NOTED IN TROUT EXPOSED TO .012-.14 PPM PB FOR 19 MONTHS AND 18 DAYS: CHRONIC POISONING SYMPTOMS INCLUDE, WEIGHT LOSS, WEAKNESS, AND ANEMIA. RESPECTIVELY. (R182** 0001) FRESHWATER SHOULD NOT EXCEED .03 PPM PB AND MARINE WATERS 1/50 OF 96 HOUR LC50. (R184** 0001) DAPHNID REPRODUCTION REDUCED 16% FROM 3 WEEKS EXPOSURE TO .030 PPM PB. (JFRBAK 0010); ADMINISTRATION OF 25 MG/L PB IN DRINKING WATER LED TO RAPID DIE-OFF OF BREEDING COLONIES OF MICE AND RATS. (R120** 0001).

(HEL) Degree of Hazard to Public Health: LEAD IS AN ACUTE INHALATIVE TOXIN AND A CHRONIC INGESTIVE AND INHALATIVE TOXIN. COMPOUNDS ARE GENERALLY MORE TOXIC DUE TO SOLUBILITY. LEAD COMPOUNDS CAN ALSO BE ABSORBED THROUGH SKIN AT HIGHLY TOXIC LEVELS.

(AIR) Air Pollution: HIGH

(ACT) Action Levels: ATTEMPT TO SUPPRESS SUSPENSION OF DUSTS.

(AML) In Situ Amelioration: ADD LIME TO PRECIPITATE BASIC LEAD CARBONATE. POSSIBLE TO ADD COMPLEXING AGENT (EDTA) AND ADSORB ON CARBON. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.

(AVL) Avail. of Countermeasure Material: LIME - CEMENT PLANTS COMPLEXANTS - DETERGENT MANUFACTURERS, ANALYTICAL LABS; CARBON - WATER TREATMENT PLANTS, SUGAR REFINERIES.

(DIS) Disposal Method: ROUTE TO METAL SALVAGE FACILITY.

(IFP) Industrial Fouling Pot.: TRACES OF LEAD IN METAL-PLATING BATHS WILL AFFECT THE SMOOTHNESS AND BRIGHTNESS OF DEPOSITS.

(MWU) Major Water Use Threatened: POTABLE SUPPLY. FISHERIES.

(LOC) Probable Location and State of Material: METAL WILL SINK. MANY SALTS INSOLUBLE. MAY GET DISPERSIONS.

[illegible] Soil Chemistry: SOIL ORGANIC MATTER, PH, AND PHOSPHATE CONTENT CONTROL THE MOBILITY OF LEAD; EFFLUENT HOLDING 173 MG/L PB HAS BEEN NOTED TO UNDERGO A 98% REDUCTION IN 3 INCHES OF SOIL (R174** 0001); LEAD CONCENTRATIONS SHOULD NOT EXCEED 2 PPM AS THE SOLUBLE FORM IN THE SOIL SOLUTION FOR PHYTO TOXIC CONSIDERATIONS; CALCIUM MAY COUNTERACT SOME LEAD TOXICITY (R175** 0001); LEAD CONCENTRATIONS OF UP TO 1632 PPM IN THE TOP 12 INCHES OF SOIL CAN BE TOLERATED FROM THE STANDPOINT OF ACCUMULATION AND BIOMAGNIFICATION (WWAEA2 0001).

(HOH) Water Chemistry: LEAD IS STABLE IN OXYGENATED WATER AS THE CARBONATE, HYDROXIDE. OR; CARBONATE-HYDROXIDE SALTS. UNDER REDUCING CONDITIONS AND IN THE PRESENCE OF SULFUR, LEAD SULFIDE WILL PREDOMINATE. LEAD IS LEAST SOLUBLE AT PH 9-10 WITH CARBON DIOXIDE LEVELS AT 10-3 M. AT CARBON DIOXIDE LEVELS OF 10-2 M SOLUBILITY IS LOWEST AT PH 8-10. AT PH 7-8, SOLUBILITY OF TOTAL LEAD [illegible] (JAWWAS 0013).

[illegible]

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Conversion to local identifiers resulted in      1 unique occurrence.

         Conversion Entry      1: Accession No.        8100101
(CAS)  CAS Registry Number: 71-55-6
(SIC)  SIC Code: 2869;2879
(MAT)  Material Name: ### METHYL CHLOROFORM ###
(FML)  Chemical Formula: C2H3CL3
(USE)  Common Uses: FORMERLY USED FOR DEGREENING CITRUS FRUITS WITH
       ETHYLENE GAS AND FUMIGATING STRAWBERRIES AFTER HARVEST.
       REGISTERED  AGRICULTURAL USES HAVE BEEN CANCELLED. NOW A SOLVENT
       FOR VARIOUS INSECTICIDES. (FMCHA2 0004) HAS USE IN COLD TYPE
       METAL  CLEANING AND IN CLEANING PLASTIC MOLDS (DPMADX 0001)
(CON)  Containers: 5- AND 55- GALLON STEEL DRUMS, TANK CARS, AND TANK
       TRUCKS. NFICAM 0001) DOT- MAXIMUM NET QUANTITY IN ONE PACKAGE:
       1) ABOARD PASSENGER CARRYING AIRCRAFT OR RAILCAR: 10 GALLONS; 2)
       ABOARD CARGO- ONLY AIRCRAFT: 55 GALLONS. (FEREAC 0017) NO
       ALUMINUM CONTAINERS. (THIDD6 0002)
(STO)  General Storage Procedure: COOL, DRY, WELL-VENTILATED LOCATION.
       AWAY FROM ANY ACUTE FIRE HAZARD. (NFICAM 0001) PROTECTION FROM
       MOISTURE  SHOULD BE PROVIDED FOR BULK STORAGE. (THIDD6 0002)
(HND)  General Handling Procedure: SAFETY GOGGLES, CHEMICAL CARTRIDGE
       RESPIRATOR, AND RUBBER GLOVES. (THIDD6 0002) HALOGENATED
       SOLVENTS MUST NOT  BE USED WHERE VAPORS HAVE CONTACT WITH HOT
       SURFACES (WELDING OPERATIONS) BECAUSE OF TOXIC DECOMPOSITION
       PRODUCTS SUCH AS  CHLORINE AND HYDROGEN CHLORIDE. LOCAL EXHAUST
       VENTILATION IS NECESSARY IN SUCH CASES. (AIHG** 0001)
(BIN)  Binary Reactants: REACTS VIOLENTLY WITH ACETONE, N2O4, BOTH
       LIQUID AND GASEOUS OXYGEN, SODIUM, AND SODIUM HYDROXIDE. (DPMADX
       0001). CASES OF EXPLOSIONS ARE DESCRIBED IN (NFICAM 0001). ALSO
       REACTS VIGOROUSLY WITH ALUMINUM. (AIHG** 0001)
(COR)  Corrosiveness: READILY CORRODES ALUMINUM AND ALUMINUM ALLOYS.
       (THIDD6 0002)
(STD)  Standard Codes: UN NO. 2831, NFPA- 2,1,0; DOT-ORM-A, NO LABEL
       REQUIRED.; IATA-ORA--A CLASS, NO LABEL REQUIRED.; NIOSH NO. KJ
       29750; SIGNAL WORD: CAUTION; (FMCHA2 0004) SUPERFUND DESIGNATED
       (HAZARDOUS SUBSTANCES) LIST.
(FLM)  Flammability: SLIGHTLY FLAMMABLE AT HIGHER TEMPERATURES. (NFICAM
       0001) INHIBITED TRICHLOROETHANES HAVE BEEN FOUND TO HAVE
       EXPLOSIVE  LIMITS, BUT IGNITION REQUIRES A HIGH ENERGY SOURCE.
       ONCE THE SOURCE IS REMOVED, THE VAPOR WILL CONTINUE TO BURN.
       (AIHG** 0001)
(LFL)  Flammability Limit(%), Lower: 8.0 (NFICAM 0001)
(UFL)  Flammability Limit(%), Upper: 10.5 (NFICAM 0001)
(EXT)  Extinguishing Method: USE WATER SPRAY TO KEEP EXPOSED CONTAINERS
       COOL AND TO FLUSH SPILLS AWAY FROM EXPOSURES. (NFICAM 0001)
(AIP)  Auto Ignition Point(C.): 537 (DEGREES CELSIUS/998 DEGREES
       FAHRENHEIT (NFICAM 0001)).
(MLT)  Melting Point (C.): -32.5
(BLP)  Boiling Point (C.): 74.1
(SOL)  Solubility (ppm @ 25C): 480 TO 1000
(SPG)  Specific Gravity: 1.3 (NFICAM 0001); 1.3366 (25/4) (AIHG**
       0001); 1.334 TO 1.338 (25/25) (HUHPD6 0001); 1.3376 (20/4)
       (MERIND 0001); 1.3492 (20/4) (THIDD6 0002)
(VAP)  Vapor Pressure (mm Hg): [illegible]
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[illegible]

[illegible] : WILL NOT PERSIST AT HIGH CONCENTRATIONS IN SOIL [illegible] BECAUSE OF RAPID EVAPORATION. LOW CONCENTRATIONS (PPB [illegible]) PERSIST IN WATER WITHOUT EXTENSIVE CHEMICAL DEGRADATION.

[illegible] Potential for Accumulation: PARTITION COEFFICIENTS FOR METHYL CHLOROFORM IN THE BODY ARE 1.4 FOR BLOOD/GAS, 139 FOR OIL/GAS, AND [illegible] FOR OIL/BLOOD. THE IN VITRO USE OF OIL IS A MODEL FOR SUBCUTANEOUS FAT. METHYL CHLOROFORM IS METABOLIZED PRIMARILY TO TRICHLOROETHANOL AND TRICHLOROACETIC ACID. MOST IS EXCRETED UNCHANGED BY THE LUNG. FOR EXAMPLE, HUMAN VOLUNTEERS WHO INHALED A SINGLE BREATH OF RADIOCHLORINE-LABELED METHYL CHLOROFORM AND HELD THEIR BREATH FOR 20 SECONDS TO ENSURE MAXIMUM ABSORPTION EXHALED 44% OF THE ORIGINAL DOSE WITHIN ONE HOUR. METHYL CHLOROFORM WAS FOUND IN THE BREATH AND ALVEOLAR AIR ONE MONTH AFTER EXPOSURES TO 370-612 PPM FOR 6.5-7.0 H/DAY FOR 5 DAYS. AQUATIC ORGANISMS HAVE AN ACCUMULATION FACTOR OF <100 FOR METHYL CHLOROFORM. (LIMIT* 79/OTS) EXPOSURE OF BLUEGILL SUNFISH FOR 28 DAYS TO WATER CONTAINING 73.4 + OR - 14.3 PPB 1.1.1-TRICHLOROETHANE RESULTED IN A BIOCONCENTRATION FACTOR OF 9. THE HALF-LIFE IN THE TISSUES WAS <1 DAY. THE LOG OF THE OCTANOL/WATER PARTITION COEFFICIENT IS 2.47. (ASTM** STP 707). [illegible] FOR OCTANOL/WATER PARTITION COEFFICIENT AS CALCULATED BY [illegible] METHOD (1971) IS 2.17 (USPEDU 0001)

[illegible] Toxicological Potential: TOXIC DOSES CAUSE A PROARRHYTHMIC ACTIVITY. THE HEART THEN BECOMES SENSITIVE TO EPINEPHRINE, WHICH IF ADMINISTERED IN TOO HIGH A CONCENTRATION WILL CAUSE CARDIAC ARREST. IT IS ALSO NARCOTIC IN HIGH CONCENTRATIONS. (DPMADX 0001) TARGET ORGANS ARE KIDNEY AND LIVER. (THIDD6 0002)

<CAR> Carcinogenicity: ORAL DOSING OF OSBORNE-MENDEL STRAIN RATS AND B6C3F1 MICE WITH TECHNICAL GRADE METHYL CHLOROFORM (95% 1,1,1-TRICHLOROETHANE, 3% P-DIOXANE, AND 2% OF SEVERAL MINOR IMPURITIES) FOR 90 TO 110 WEEKS WAS PERFORMED IN NATIONAL CANCER INSTITUTE BIOASSAYS REPORTED IN 1977. NEOPLASMS WERE BELIEVED UNATTRIBUTABLE TO METHYL CHLOROFORM EXPOSURE SINCE RELATIONS COULD NOT BE ESTABLISHED AMONG THE DOSAGE GROUPS, SPECIES, SEX, TYPE OF NEOPLASM, OR THE STATE OF OCCURRENCE. NEW PROTOCOLS WERE PRESCRIBED FOR THE TESTS, WHICH HAD TO BE REPEATED. (LIMIT* 79/OTS)

<MUT> Mutagenicity: RESULTS OF MUTAGENICITY TESTS FOR METHYL CHLOROFORM IN BACTERIAL SYSTEMS INCLUDE NEGATIVE RESPONSES, EQUIVOCAL RESPONSES, AND POSITIVE RESPONSES. METHYL CHLOROFORM INDUCED CELL TRANSFORMATIONS IN THE FISCHER RAT EMBRYO CELL LINE F17[illegible], WHICH CARRY AN ONCOGENIC VIRUS. THE TRANSFORMED CELLS PRODUCED FIBROSARCOMAS IN RATS THAT WERE INOCULATED WITH THEM. CHROMOSOME DAMAGE AND CHROMATID ABERRATIONS (IN THE MALES) IN BONE MARROW CELLS WERE NOT FOUND IN RATS SACRIFICED AFTER 12 MONTHS EXPOSURE TO 875 OR 1,750 PPM METHYL CHLOROFORM FOR 6H/D, 5D/WEEK. (LIMIT* 79/OTS)

<TER> Teratogenicity: THE TERATOGENICITY OF METHYL CHLOROFORM HAS NOT BEEN ESTABLISHED. COMMERCIAL GRADE METHYL CHLOROFORM (5.5% INHIBITORS) AT 875 PPM WAS INHALED BY SPRAGUE-DAWLEY RATS (250 G) AND SWISS-WEBSTER MICE (25 TO 30 G) FOR 7H/D FROM GESTATION DAY 6 TO 15. NO TERATOGENIC EFFECTS WERE NOTED. ONE MOUSE LITTER HAD ONE OCCURRENCE OF A SHORT TAIL AND ANOTHER, A CLEFT PALATE. TWO RAT LITTERS INCLUDED VERTEBRAL ANOMALIES. THE FINDINGS WERE NOT STATISTICALLY SIGNIFICANT. SCHWETZ, ET AL. (1975) CITED IN (LIMIT* 79/OTS).

[illegible]: 1000 PPM; IDLH

[illegible]: REGULATIONS -- OSHA PEL (TWA) [illegible]

[illegible] 1910)

[illegible]

[illegible] 15 MIN 350 PPM 15 MIN [illegible] [illegible]

SHORT TERM [illegible] 1000 PPM ([illegible]* 80/MAC)

[illegible] TLV 1900 MG/M3 350 PPM (TLVADM 83/ACGIH)

[illegible] STEL 2450 MG/M3 450 PPM (TLVADM 83/ACGIH)

[illegible]ED 3-84.

[illegible] Skin Contact: SKIN ABSORPTION PRESENTS A LIMITED HEALTH HAZARD. CONTINUOUS IMMERSION OF BOTH HANDS IN METHYL CHLOROFORM FOR [illegible] APPROXIMATELY EQUIVALENT TO A .5 H VAPOR EXPOSURE [illegible] 100-500 PPM IN THE AIR. (LIMIT* 79/01S) IRRITATING TO EYES AND MUCOUS MEMBRANES. (MEIEDD 0001) CAUSES DERMATITIS. (THIDD6 0002) PROLONGED OR FREQUENT EXPOSURE MAY IRRITATE OR BURN THE SKIN. IRRITATION TO EYES WILL OCCUR WITHOUT CORNEAL INJURY. (AIHG** 0001)

(GNS) General Sensation: DIZZINESS, DROWSINESS, LOSS OF CONSCIOUSNESS AND DEATH CAN OCCUR AT INCREASING LEVELS OF EXPOSURE. INCOORDINATION AND IMPAIRED JUDGEMENT MAY OCCUR AT VAPOR EXPOSURES OF 500-1000 PPM. FUMES (WHEN INVOLVED IN FIRE) ARE IRRITATING. (NFICAN 0001) THE ODOR OF METHYL CHLOROFORM IS SLIGHT AND NOT UNPLEASANT AT 350 PPM BUT STRONG AND UNPLEASANT AT 1500 PPM. (AIHG** 0001)

(ODT) Odor Threshold, Medium (ppm): 100 TO 400

(SAF) Personal Safety Precautions: SELF-CONTAINED BREATHING APPARATUS. (NFICAN 0004) SAFETY GOGGLES, CHEMICAL CARTRIDGE RESPIRATOR AND RUBBER GLOVES NECESSARY. (THIDD6 0002)

(AHL) Acute Hazard Level: MAY CAUSE CHANGES TO EXPOSED TISSUE. NOT PERMANENT INJURY OR DEATH. CAUSES A PROARRHYTHMIC ACTIVITY WHICH SENSITIZES THE HEART TO EPINEPHRINE-INDUCED ARRHYTHMIAS. THIS MAY CAUSE CARDIAC ARREST WHEN MASSIVELY INHALED. NARCOTIC IN HIGH CONCENTRATIONS. (DPMADX 0001) HIGHEST CONCENTRATION OF ACCIDENTAL EXPOSURE TO METHYL CHLOROFORM FOR FIVE MINUTES OR LESS, THAT WOULD NOT CAUSE IRREVERSIBLE DAMAGE OR INCAPACITATION THAT WOULD PREVENT ESCAPE, IS 2500 PPM. THE ACCEPTABLE MAXIMUM PEAK, PROPOSED BY ANSI IS 800 PPM BY VOLUME FOR UP TO FIVE MINUTES OF EXPOSURE, NOT MORE THAN ONCE IN TWO HOURS OF AN EIGHT HOUR WORK DAY. ACUTE EXPOSURE PRODUCES A SIGNIFICANT TOXIC EFFECT IN THE FORM OF A FUNCTIONAL DEPRESSION OF THE CENTRAL NERVOUS SYSTEM LEADING TO RESPIRATORY FAILURE. SENSITIVE HUMANS MAY EXPERIENCE ANESTHETIC EFFECTS AT 800-1000 PPM FOR SHORT EXPOSURES. THESE EFFECTS READILY OCCUR AT 2000 PPM AND HIGHER. LETHAL EXPOSURES OCCUR AT 30000 PPM (3% BY VOLUME) IN 5-6 MINUTES. TOXIC INGESTION IS ESTIMATED AT ONE-HALF TO ONE PINT FOR A 150 POUND PERSON. (AIHG** 0001)

(CHL) Chronic Hazard Level: FATTY DEGENERATION OF THE LIVER HAS OCCURRED AFTER CHRONIC EXPOSURES TO 1000 PPM. GROWTH DEPRESSIONS HAVE BEEN CONFIRMED AT 650 PPM. (AIHG** 0001)

(AIR) Air Pollution: METHYL CHLOROFORM WILL RAPIDLY EVAPORATE FROM WATER AND PROBABLY, FROM SOILS. THUS, THE POTENTIAL FOR AIR POLLUTION FROM SPILLS IS HIGH. SHORT-TERM INHALATION AT LEVELS OF 6090 TO 22860 PPM PRODUCE ARRHYTHMIA, ANESTHESIA, LOSS OF COORDINATION. LEVELS OF 500- 5000 PPM FOR UP TO 7 HOURS PRODUCE DIZZINESS; EYE, NOSE, AND THROAT IRRITATION; LIGHT HEADEDNESS; INCOORDINATION; AND NAUSEA. LEVELS >5000 PPM MAY BE FATAL. THE TROPOSPHERIC HALF-LIFE HAS BEEN ESTIMATED BY NUMEROUS AUTHORS; ESTIMATES RANGE FROM 23 WEEKS TO 12 YEARS. ALTHOUGH A SLOW PROCESS, MOST OF THE METHYL CHLOROFORM ENTERING THE TROPOSPHERE IS PHOTOOXIDIZED BY REACTION WITH HYDROXYL RADICALS, TO [illegible] TRICHLOROACETALDEHYDE. THIS PRODUCT IS PROBABLY FURTHER OXIDIZED

[illegible] TO FIFTEEN PERCENT OF THE METHYL CHLOROFORM RELEASED WILL REACH THE STRATOSPHERE, WHERE IT IS PHOTOLYZED [illegible] AND THE CHLORINE RADICAL REACTS WITH OZONE. HOWEVER, BECAUSE THE MAXIMUM STRATOSPHERIC PRODUCTION OF CHLORINE ATOMS OCCURS SEVERAL KILOMETERS LOWER THAN FOR CHLOROFLUOROCARBONS, METHYL CHLOROFORM IS NOT AS EFFICIENT IN DESTROYING OZONE AS ARE CHLOROFLUOROCARBONS. (LIMIT* 79/OTS) THERMAL DECOMPOSITION PRODUCTS ARE NOT LIKELY TO CAUSE EXTENSIVE HARM BY THEIR NATURE, PREVENTING VOLUNTARY OVEREXPOSURE TO THESE MATERIALS, MAINLY HYDROGEN CHLORIDE EVEN THOUGH THEY ARE IRRITATING AND TOXIC. (AUTHOR* 0001)

[illegible] [illegible]: SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660. CONTAIN AND ISOLATE SPILL BY USING CLAY/BENTONITE DAMS, INTERCEPTOR TRENCHES, OR IMPOUNDMENTS. CONSTRUCT SWALE TO DIVERT UNCONTAMINATED PORTION OF WATERSHED AROUND CONTAMINATED PORTION. SEEK PROFESSIONAL HELP TO EVALUATE PROBLEM. IMPLEMENT CONTAINMENT MEASURES AND CONDUCT BENCH SCALE AND PILOT SCALE TESTS PRIOR TO FULL SCALE DECONTAMINATION PROGRAM IMPLEMENTATION. DENSITY STRATIFICATION AND IMPOUNDMENT--REMOVE PRODUCT FROM BOTTOM LAYER BY PUMPING THROUGH MANIFOLD OR POLYETHYLENE PIPE FOR COLLECTION OR REMOVE CLARIFIED UPPER PORTION BY SKIMMERS OR SIPHON. TREATMENT IS REQUIRED FOR BOTH CLARIFIED AND CONCENTRATED PRODUCT FRACTIONS. TREATMENT ALTERNATIVES INCLUDE POWDERED ACTIVATED CARBON, GRANULAR ACTIVATED CARBON, AND BIODEGRADATION. TREATMENT ALTERNATIVES FOR CONTAMINATED SOILS INCLUDE WELL POINT COLLECTION AND TREATMENT OF LEACHATES AS FOR CONTAMINATED WATERS, BENTONITE/CEMENT INJECTION TO IMMOBILIZE SPILL. CONTAMINATED SOIL RESIDUES MAY BE PACKAGED FOR DISPOSAL.

(DIS) Disposal Method: PRODUCT RESIDUES AND SORBENT MEDIA MAY BE PACKAGED IN 17H EPOXY-LINED DRUMS AND DISPOSED OF AT AN APPROVED EPA DISPOSAL SITE. DESTRUCTION BY HIGH TEMPERATURE INCINERATION WITH HYDROCHLORIC ACID SCRUBBER, IF AVAILABLE. ENCAPSULATION BY ORGANIC POLYESTER RESIN OR SILICATE FIXATION. CONFIRM DISPOSAL PROCEDURES WITH RESPONSIBLE ENVIRONMENTAL ENGINEER AND REGULATORY OFFICIALS.

(EWT) Effects on Water Treatment Process: 1 PPM IS TOXIC TO METHANE BACTERIA IN THE SECOND STAGE OF ANAEROBIC DIGESTION; 32.2 PPM IN SEWAGE SLUDGE REDUCED GAS PRODUCTION TO 60%; 60 PPM IN DRY SLUDGE INHIBITED GAS PRODUCTION BY 80%. (LIMIT* 79/OTS)

(LOC) Probable Location and State of Material: COLORLESS LIQUID. WILL SINK. DOES NOT DISSOLVE OR HYDROLYZE SIGNIFICANTLY.

[illegible] Soil Chemistry: MOVEMENT FROM THE POINT OF DISPOSAL THROUGH SOILS BY LEACHING, VOLATILIZATION, UPTAKE, OR ABSORPTION HAS NOT BEEN STUDIED. HOWEVER, MONITORING DATA INDICATE SOME SOIL UPTAKE: IT HAS BEEN DETECTED IN SOIL IN THE LOW PPB RANGE. (LIMIT* 79/OTS)

(HOH) Water Chemistry: DEGRADATION IN WATER IS OF MUCH LESSER IMPORTANCE THAN TROPOSPHERIC REACTIONS. TRANSFER REACTIONS FROM THE HYDROSPHERE TO THE ATMOSPHERE ARE RAPID COMPARED TO THE HYDROLYTIC HALF-LIFE. THE AVERAGE EVAPORATION HALF-LIFE OF METHYL CHLOROFORM FROM WATER CONTAINING 500 PPM SOIL (OF VARIOUS TYPES) WAS 17-23 MINUTES. THE HYDROLYTIC HALF-LIFE HAS BEEN ESTIMATED AT 6-9 MONTHS. THE LOWER ESTIMATES WERE UNCORRECTED FOR EVAPORATION. NO DIFFERENCE WAS FOUND IN SUNLIGHT OR DARKNESS. METHYL CHLOROFORM HYDROLYZES AT 25 DEGREES CELSIUS TO ACETIC ACID AND HYDROCHLORIC ACID. AT 10 DEGREES CELSIUS AND PH 8, VINYLIDENE CHLORIDE IS THE MAJOR END PRODUCT.

[illegible] ESTIMATED HALF LIFE IN SEAWATER AT PH 7 AND 25 DEGREES

[illegible]

[illegible] IN WATER: [illegible]

[illegible] ADEQUACY OF DATA: GOOD

[illegible]

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Conversion to local identifiers resulted in       1 unique occurrences.

          Conversion Entry      1: Accession No.       7216751
(CAS)  CAS Registry Number: 106-42-3
(MAT)  Material Name: *** P-XYLENE ***
(FML)  Chemical Formula: C6H4(CH3)2
(USE)  Common Uses: SYNTHETIC FIBERS. TETRAPHTHALIC AID.
(CON)  Containers: GLASS: 55- AND 110-GALLON METAL DRUMS; TANK CARS;
       TANK TRUCKS; TANK BARGES.
(STO)  General Storage Procedure: PROTECT AGAINS PHYSICAL DAMAGE.
       OUTSIDE OR DETACHED STORAGEIS PREFERABLE. INSIDE STORAGE SHOULD
       BE IN A STANDARD  FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET.
(FDL)  Detection Limit (Field; Techniques,Ref) (ppm): 10, REACTION TEST
       GIVEN NO LIMITS (BNW43* 0002)
(LDL)  Detection Limit (Lab; Techniques,Ref) (ppm): .003, C70 (BNW28-
       0001)
(STD)  Standard Codes: EPA 311; NFPA - 2,3,0; ICC - FLAMMABLE LIQUID,
       RED LABEL, 10 GALLON IN AN OUTSIDE CONTAINER; USCG - GRADE C,
       FLAMMABLE LIQUID; IATA - FLAMMABLE LIQUID, RED LABEL 1 LITER
       PASSENGER, 40 LITERS CARGO; SUPERFUND DESIGNATED (HAZARDOUS
       SUBSTANCES) LIST.
(FLM)  Flammability: QUITE FLAMMABLE, COMBUSTION POSSIBLE. HEAVY VAPORS
       CAN TRAVEL ALONG GROUND TO IGNITION SOURCE.
(LFL)  Flammability Limit(%), Lower: 1.1
(UFL)  Flammability Limit(%), Upper: 7
(TCP)  Toxic Combustion Prod.: HAZARDOUS, EMPLOY SELF-CONTAINED
       BREATHING APPARATUS.
(EXT)  Extinguishing Method: WATER MAY BE INEFFECTIVE. USE FOAM. CARBON
       DIOXIDE, OR DRY CHEMICAL. WATER SPRAY MAY BE USED TO REDUCE THE
       RATE  OF BURNING AND FOR COOLING CONTAINERS.
(FLP)  Flash Point (C.): 27.2
(AIP)  Auto Ignition Point(C.): 528.89
(EXP)  Explosiveness: STABLE-VAPOR CAN BE EXPLOSIVE WHEN EXPOSED TO
       HEAT OR FLAME.
(LEL)  Explosive Limit(%), Lower: 1.1
(UEL)  Explosive Limit(%), Upper: 7
(MLT)  Melting Point (C.): 13 TO 14
(BLP)  Boiling Point (C.): 137 TO 138 (IGNITES)
(SPG)  Specific Gravity: .861
(VPR)  Vapor Pressure (mm Hg): 10
(VDN)  Vapor Density: 3.66
(PER)  Persistency: BIODEGRADES SLOWLY WITH ACCLIMATED SEED.
(MST)  Major Species Threatened: WATERFOWL THRESHOLD CONCENTRATION FOR
       HARM TO COMMON CROPS: 800-2400 PPM. (85FDAV 0001)
(TIC)  Taste Imparting Characteristics (ppm): .3
(INH)  Inhalation Limit (Value): 435
(INT)  Inhalation Limit (Text): (MG/M3)
(DRC)  Direct Contact: MILD IRRITANT SKIN
(GNS)  General Sensation: CAN BE ABSORBED THROUGH SKIN AT SLIGHTLY
       HAZARDOUS CHRONIC LEVELS. .53 PPM RECOGNITION ODOR IN AIR.
       (BNW45* 0001):  MAY BE NARCOTIC AT HIGH CONCENTRATIONS.
(LOD)  Odor Threshold, Lower (ppm): .26
(MOD)  Odor Threshold, Medium (ppm): 2.21
(UOD)  Odor Threshold, Upper (ppm): 4.13
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[illegible] Personal Safety Precautions: WEAR SKIN PROTECTION AND CANISTER GAS MASK. HIGHER HEAT MAY NECESSITATE USE OF SELF-CONTAINED BREATHING APPARATUS.

[illegible] Acute Hazard Level: LETHAL CONCENTRATION FOR MICE IN AIR 5000 PPM ([illegible]). MILD IRRITANT. SLIGHT INHALATION HAZARD. TOXIC TO FISH. MAY PRODUCE BOD. PRODUCES ODOR IN WATER AT LOW LEVELS.

<CHL> Chronic Hazard Level: SLIGHT INHALATION AND SKIN ABSORPTION HAZARD.

<HHL> Degree of Hazard to Public Health: MILD IRRITANT. SLIGHT HAZARD WITH ACUTE OR CHRONIC INHALATION.

[illegible] Air Pollution: HIGH

[illegible] Action Levels: NOTIFY FIRE AND AIR AUTHORITY. IF INTENSE HEAT PREVAILS, EVACUATE AREA AND WARN CIVIL DEFENSE OF POSSIBLE EXPLOSION. ENTER FROM UPWIND. REMOVE IGNITION SOURCE. ATTEMPT TO CONTAIN SLICK.

[illegible] In Situ Amelioration: OIL SKIMMING UIPMENT AND SORBENT FOAMS CAN BE APPLIED TO SLICK. USE CARBON ON UNDISSOLVED PORTION. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ. 201-321-6660.

<AVL> Avail. of Countermeasure Material: OIL SKIMMING UIPMENT - STORED AT MAJOR PORTS; SORBENT FOAMS (POLYURETHANE)-UPHOLSTERY SHOPS; CARBON - WATER TREATMENT PLANTS, SUGAR REFINERIES

<DIS> Disposal Method: SPRAY INTO INCINERATOR OR BURN IN PAPER PACKAGING. ADDITIONAL FLAMMABLE SOLVENT MAY BE ADDED.

<IFP> Industrial Fouling Pot.: SLICK MAY REDUCE HEAT TRANSFER OR CAUSE HOT SPOTS OR SCALING MAY POSE RUPTURE HAZARD WHEN CONFINED IN BOILER FEED OR COOLING SYSTEM WATERS.

[illegible] Effects on Water Treatment Process: .1% SERIOUSLY RETARDED SEWAGE DIGESTION

[illegible] Major Water Use Threatened: RECREATION, FISHERIES. INDUSTRIAL

<LOC> Probable Location and State of Material: COLORLESS LIQUID. WILL FLOAT ON SURFACE OF WATER.

<COL> Color in Water: COLORLESS

[illegible] Adequacy of Data: FAIR

Option

[illegible]

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Conversion to local identifiers resulted in      1 unique occurrences.

     Conversion Entry      1: Accession No.      [illegible]
(CAS)   CAS Registry Number: 123-42-2
(SIC)   SIC Codes: 2818; 2834; 2899
(MAT)   Material Name: DIACETONE ALCOHOL
(CFM)   Chemical Formula: (CH3)2C(OH)CH2COCH3
(USE)   Common Uses: SOLVENT FOR CELLULOSE, OILS. RESINS,
        PHARMACEUTICALS. ANTIFREEZE SOLUTIONS
(DL )   Detection Limit (Field; Techniques,Ref) (ppm): 400, KETONE SPOT
        TEST, (BNN45* 0038)
(STC)   Standard Codes: NFPA - 1,2,0; ICC - NO; USCG - GRADE E
        COMBUSTIBLE LIQUID; IATA - FLAMMABLE LIQUID, RED LABEL. 1 LITER
        PASSENGER, 40 LITER CARGO.
(FLM)   Flammability: MODERATE. COMBUSTION WITH MODERATE HEATING.
(LFL)   Flammability Limit(%), Lower: 1.8
(UFL)   Flammability Limit(%), Upper: 6.9
(TCP)   Toxic Combustion Prod.:
        SLIGHTLY HAZARDOUS - CANISTER-TYPE MASKS.
(EXT)   Extinguishing Method: ALCOHOL FOAM. CARBON DIOXIDE. DRY
        CHEMICAL. WATER FOG. ALCOHOL FOAM. RESPIRATORY PROTECTION.
(FLP)   Flash Point (C.): 8
(AIP)   Auto Ignition Point(C.): 603
(EXP)   Explosiveness: STABLE
(LEL)   Explosive limit(%), Lower: 1.8
(UEL)   Explosive Limit(%), Upper: 6.9
(MLT)   Melting Point (C.): -44
(BLP)   Boiling Point (C.): 167.9 (IGNITES)
(SOL)   Solubility (ppm @ 25C): 1000000
(SPG)   Specific Gravity: .9
(VDN)   Vapor Density: 4.0
(PER)   Persistency: SHOULD DEGRADE AT MODERATE RATE.
(INV)   Inhalation Limit (Value): 2100 (PPM; IDLH)
(INT)   Inhalation Limit (Text): REGULATIONS-- OSHA PEL (TWA) 240 MG/M3
        50 PPM (29CFR* 1910).  RECOMMENDATIONS-- NIOSH TWA 240 MG/M3
        (CRSOE* 78-173,78/NIOSH)  NIOSH IDLH 2100 PPM (PKTGD* 80/MAC)
        ACGIH TLV (TWA)240 MG/M3 50 PPM (TLVADM 83/ACGIH) ACGIH STEL 360
        MG/M3 75 PPM (TLVADM  83/ACGIH) UPDATED 3/84
(DRC)   Direct Contact: EYES, NASAL PASSAGES - MUCOUS MEMBRANES.
(GNS)   General Sensation: FAINT PLEASANT ODOR. EYE IRRITATION GRADE 5 -
        SEVERE BURNS .005 ML (R119** 0001); NARCOTIC IN HIGH
        CONCENTRATIONS  CAN CAUSE LIVER AND KIDNEY DAMAGE AS WELL AS
        ANEMIA.
(PSP)   Personal Safety Precautions: FULL PROTECTIVE CLOTHING AND SELF-
        CONTAINED BREATHING APPARATUS REQUIRED.
(AHL)   Acute Hazard Level: IRRITANT. MODERATE INHALATIVE TOXICANT.
(CHL)   Chronic Hazard Level: UNKNOWN. 10 MG/KG MAXIMUM LEVEL PRODUCING
        NO EFFECT IN RATS WHEN ADMINISTERED IN DRINKING WATER FOR 30
        DAYS  (R119** 0001); MILD CHRONIC LOCAL IRRITANT.
(DPH)   Degree of Hazard to Public Health: IRRITANT. MODERATE INHALATIVE
        TOXICANT.
(AIR)   Air Pollution: HIGH
(ACT)   Action Levels: NOTIFY FIRE AND AIR AUTHORITY. ENTER FROM UPWIND.
        REMOVE IGNITION SOURCES.
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[illegible] In situ amelioration: [illegible]: CARBON OR PEAT MAY BE EFFECTIVE. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.

[illegible] Beach and Shore Restoration: BURN OFF.

[illegible] Avail. of Countermeasure Material: CARBON - WATER TREATMENT PLANTS, SUGAR REFINERIES: PEAT - NURSERIES, FLORAL SHOPS.

[illegible] Disposal Method: SPRAY INTO INCINERATOR OR BURN IN PAPER PACKAGING. FLAMMABLE SOLVENT MAY BE ADDED.

[illegible] Industrial Fouling Pot.: VOLATILE, MAY EXPLODE IF CONFINED IN BOILER FEED OR COOLING WATER SYSTEMS.

[illegible] Major Water Use Threatened: RECREATION, INDUSTRIAL.

[illegible] Probable Location and State of Material: COLORLESS LIQUID. WILL DISSOLVE.

[illegible] Color in Water: COLORLESS

[illegible] Adequacy of Data: POOR

(Optional)

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Search on local identifiers resulted in      1 unique occurrences.

         Conversion Entry      1; Accession No.       8100014
(CAS)    CAS Registry Number: 79-34-5
(SIC)    SIC Code: 2869
(MAT)    Material Name: *** 1,1,2,2-TETRACHLOROETHANE ***
(FOR)    Chemical Formula: C2H2CL4
(USE)    Common Uses: MANUFACTURE OF TRICHLENE: SOLVENT, METAL WASHING
         AND DEGREASING, EXTRACTION SOLVENT OF FATS AND OILS: ORGANIC
         SYNTHESIS, INSECTICIDE, HERBICIDE, PAINT REMOVER. VARNISH AND
         LACQUER; PARTICULARLY SUITABLE FOR SOLVENT OF CHLORINATED
         HYDROCARBONS AND SULFUR. (THIDD6 0002)
(CON)    Containers: 55 GAL. DRUMS (CCDCDS 0001)
(STO)    General Storage Procedure: KEEP CONTAINERS CLOSED. STORE IN A
         COOL, DARK PLACE. (THIDD6 0002)
(HND)    General Handling Procedure: INDIVIDUALS WITH DISEASES OF THE
         CENTRAL NERVOUS SYSTEM, LIVER, OR KIDNEYS SHOULD NOT HANDLE THIS
         MATERIAL. NO  EATING OR DRINKING SHOULD TAKE PLACE IN THE WORK
         AREA. EXPOSED PERSONNEL SHOULD BE GIVEN MEDICAL EXAMINATIONS
         ANNUALLY.  INCLUDING A COMPLETE BLOOD COUNT AND TESTS FOR PROPER
         LIVER AND KIDNEY FUNCTION. (THIDD6 0002) HIGHLY TOXIC BY
         INGESTION,  INHALATION. AND SKIN ABSORPTION. (CCDCDS 0001)
(BIN)    Binary Reactants: IN THE PRESENCE OF MOISTURE, THE MATERIAL
         GRADUALLY DECOMPOSES. AS THIS BREAKDOWN OCCURS, HYDROCHLORIC
         ACID IS  EVOLVED AND METALS IN CONTACT WITH THE MATERIAL MAY
         SUFFER CORROSIVE DAMAGE. OTHER BINARY REACTANTS INCLUDE: 2,4-
         DINITROPHENYL  DISULFIDE, POTASSIUM, SODIUM, POTASSIUM
         HYDROXIDE. SODIUM-POTASSIUM ALLOY AND BROMOFORM, NITROGEN
         TETROXIDE. (NFICAM 0001)  MIXTURES OF COMPOUND AND POTASSIUM,
         SODIUM, NITROGEN TETROXIDE, MAY EXPLODE. COMPOUND MIXED WITH
         SOLID POTASSIUM HYDROXIDE  AND HEATED FORMS A SPONTANEOUSLY
         FLAMMABLE GAS.
(COR)    Corrosiveness: IN THE PRESENCE OF MOISTURE, THE MATERIAL
         GRADUALLY DECOMPOSES.  AS THIS BREAKDOWN OCCURS, HYDROCHLORIC
         ACID  IS EVOLVED AND METALS IN CONTACT WITH THE MATERIAL MAY
         SUFFER CORROSIVE DAMAGE. (NFC*** 13,80/NFA)
(STD)    Standard Codes: SUPERFUND DESIGNATED (HAZARDOUS SUBSTANCES)
         LIST; UN NO. 1702, GUIDE NO. 55 (85EWAF 0001)
(FLM)    Flammability: NONFLAMMABLE (CCDCDS 0001)
(MLT)    Melting Point (C.): -44
(BLP)    Boiling Point (C.): 146.5
(SPG)    Specific Gravity: 1.86 (25/4) (THIDD6 0002); 1.596 (AWQCD* 0015)
(VPR)    Vapor Pressure (mm Hg): 16; 5; 8.5
(VDN)    Vapor Density: 5.79 (85FHA9 0001)
(PER)    Persistency: PERSISTS IN ENVIRONMENT AND IS NOT DEGRADED
         BIOLOGICALLY. (AWQCD* 0015) UNDERGOES HYDROLYSIS IN ENVIRONMENT
         SLOWLY,  ESTIMATED HALF-LIFE OF SEVERAL MONTHS TO A FEW YEARS.
         PHOTOOXIDATION AND PHOTODISSOCIATION OCCUR IN STRATOSPHERE.
         (USPEDU  0001)
(PFA)    Potential for Accumulation: HAS AN ELIMINATION HALF-LIFE OF LESS
         THAN TWO DAYS AS MEASURED BY WHOLE BODY LEVELS IN EXPOSED
         BLUEGILL.  HUMANS  IN TESTS RETAINED 94 TO 97% OF INHALED
         TETRACHLOROETHANE AND EXHALED ONLY 3.3 TO 6% OF RETAINED
         CHEMICAL IN FIRST HOUR  AFTER EXPOSURE HIGHEST ABSORPTION RATE
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[illegible] INTRAPERITONEAL ROUTE OF HALOGENATED HYDROCARBONS. TESTED [illegible] EXCRETED [illegible] OF ADMINISTERED DOSE IN FIRST 72 HOURS. [illegible] EXPOSURE OF BLUEGILL SUNFISH FOR 14 DAYS TO WATER CONTAINING 9.62 +/- 1.09 PPB 1,1,2,2-TETRACHLOROETHANE RESULTED IN A BIOCONCENTRATION FACTOR OF 8. THE HALF-LIFE IN THE TISSUES WAS <1 DAY. THE LOG OF THE OCTANOL/ WATER PARTITION COEFFICIENT IS 2.39. (ASTM** STP 707, 80I/VEI)

[illegible] Toxicological Potential: TOXIC EFFECTS ON BODY INCLUDE ACUTE YELLOW ATROPHY AND CIRRHOSIS OF LIVER, FATTY DEGENERATION OF KIDNEYS AND HEART. HEMORRHAGE INTO LUNGS AND SEROUS MEMBRANES. OTHER EFFECTS REPORTED INCLUDE EDEMA OF BRAIN. DAMAGE TO CNS WITH CHANGES IN BRAIN AND PERIPHERAL NERVES AND HEMOLYSIS OF BLOOD (DPMADX 0001)

[illegible] Carcinogenicity: IN A STUDY OF 50 MALE AND 50 FEMALE RATS DOSED BY GAVAGE WITH RATES OF 43-108 MG/KG/DAY FOR 78 WEEKS. SOME HEPATOCELLULAR CARCINOMAS WERE REPORTED ALTHOUGH NOT ENOUGH TO BE STATISTICALLY SIGNIFICANT. OPPOSITE RESULTS WERE REPORTED FOR MICE. AGAIN 50 MALES AND 50 FEMALES WERE DOSED WITH 142 AND 282 MG/KG/DAY FOR 72 WEEKS. AT THE HIGH DOSE LEVEL 44 MALES AND 43 FEMALES DEVELOPED HEPATOCELLULAR CARCINOMAS. INCIDENCE OF TUMORS WAS ALSO STATISTICALLY SIGNIFICANT AT LOWER LEVEL. ([illegible] 0015)

<MUT> Mutagenicity: MODERATELY MUTAGENIC IN AMES ASSAY. (AWOCD* 0015)

[illegible] Inhalation Limit (Value): 150 (PPM; IDLH)

[illegible] Inhalation Limit (Text): REGULATIONS--
OSHA PEL (TWA) (SKIN) 35 MG/M3 5 PPM (29CFR* 1910)
RECOMMENDATIONS--
NIOSH PEL 6.87 MG/M3 1 PPM (CRSOE* 77-121,76/NIOSH)
NIOSH IDLH 150 PPM (PKTGD* 80/MAC)
ACGIH TLV (TWA) (SKIN) 7 MG/M3 1 PPM (TLVADM 83/ACGIH)
ACGIH STEL 35 MG/M3 5 PPM (TLVADM 83/ACGIH)
UPDATED 3/84.

<DMC> Direct Contact: HIGHLY TOXIC BY INGESTION, INHALATION, AND SKIN ABSORPTION. (CCDCDS 0001)

<GNS> General Sensation: SYMPTOMS OF EXPOSURE: CONJUNCTIVITIS, INFLAMMATION OF THE SKIN, IRRITATION OF RESPIRATORY TRACT, HEADACHE, DIZZINESS, EXTREME EXHAUSTION, ENLARGED LIVER AND JAUNDICE, OLIGURIA, HEMATURIA, ALBUMINURIA, MENTAL UNSTABILITY AND DROWSINESS, PARALYSIS AND COMA, CARDIAC IRREGULARITY, TREMORS, LACK OF APPETITE, NAUSEA, VOMITING, EPIGASTRALGIA, ESPECIALLY POLYNEURITIS (INFLAMMATION OF THE NERVES) OF FINGERS AND TOES. (TRIDD6 0002) INITIAL SYMPTOMS OF EXPOSURE ARE LACRIMATION, SALIVATION, AND IRRITATION OF NOSE AND THROAT. CONTINUED EXPOSURE TO HIGH CONCENTRATIONS RESULTS IN RESTLESSNESS, DIZZINESS, NAUSEA, AND VOMITING AND NARCOSIS. WITH LESS SEVERE EXPOSURE VAGUE DIGESTIVE AND NERVOUS SYSTEMS COMPLAINTS ARE COMMON. (DPMADX 0001)

[illegible] Odor Threshold, Lower (ppm): 3

<SAF> Personal Safety Precautions: WEAR SAFETY GLASSES, GAS MASK, RUBBER PROTECTIVE CLOTHING. 50 PPM-CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE OR SUPPLIED AIR RESPIRATOR OR SELF-CONTAINED BREATHING APPARATUS. 150 PPM-SAME AS FOR 50 PPM BUT WITH A FULL FACEPIECE ON EACH OR GAS MASK WITH AN ORGANIC VAPOR CANISTER OR TYPE C SUPPLIED-AIR RESPIRATOR OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE OR CONTINUOUS-FLOW MODE. (PKTGD* 0001)

[illegible] Air Pollution: WHEN HEATED EMITS HIGHLY TOXIC DECOMPOSITION PRODUCTS. (DPMADX 0001)

[illegible] [illegible]: SINGLE-STAGE CONTACTOR DOSE OF POWDERED CARBON REQUIRED TO REDUCE THE INITIAL CONCENTRATION (C.I.) OF

[illegible] AT 1.0 MG/L TO A FINAL CONCENTRATION [illegible] OF [illegible] AT NEUTRAL PH IS [illegible] MG/L; FOR C.I. [illegible] MG/L, [illegible] MG/L. USE 20 MG CARBON PER LITER. GRANULAR CARBON COLUMN DOSES FOR CONTINUOUS OPERATION UNTIL BREAKTHROUGH (WHERE EFFLUENT CONCENTRATION EQUALS INFLUENT CONCENTRATION) ARE [illegible] MG/L TO TREAT A C.I. OF 1.0 MG/L OR A DOSE OF 5.3 MG/L TO TREAT A C.I. OF .01 MG/L. MULTIPLYING THE CARBON DOSE GIVEN BY 8.34 WILL CONVERT IT TO THE NUMBER OF POUNDS REQUIRED PER ONE MILLION GALLONS OF WATER. (CAITO* 0001) SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24 HOUR NO. 201-321-6660. CONTAIN AND ISOLATE SPILL TO LIMIT SPREAD. CONSTRUCT CLAY/BENTONITE SWALE TO DIVERT UNCONTAMINATED PORTION OF WATERSHED AROUND CONTAMINATED PORTION. ISOLATION PROCEDURES INCLUDE CONSTRUCTION OF BENTONITE OR RUBBER-LINED DAMS, INTERCEPTOR TRENCHES, OR IMPOUNDMENTS. SEEK PROFESSIONAL HELP TO EVALUATE PROBLEM AND IMPLEMENT CONTAINMENT PROCEDURES. CONDUCT BENCH-SCALE AND PILOT-SCALE TESTS PRIOR TO DECONTAMINATION PROGRAM IMPLEMENTATION. TREATMENT ALTERNATIVES FOR CONTAMINATED WATER INCLUDE POWDERED ACTIVATED CARBON SORPTION, GRANULAR ACTIVATED CARBON FILTRATION, ACID HYDROLYSIS, SORPTION BY BENTONITE, PEAT MOSS, VERMICULITE, OR POLYPROPYLENE SORBENT MEDIA, PHYSICAL REMOVAL AND IMPOUNDMENT IN A LINED PIT WITH LEACHATE COLLECTION SYSTEM. TREATMENT ALTERNATIVES FOR CONTAMINATED SOILS INCLUDE WELL POINT INJECTION TO IMMOBILIZE SPILL, PHYSICAL REMOVAL AND PLACEMENT IN A LINED PIT WITH LEACHATE COLLECTION SYSTEM, PACKAGING FOR DISPOSAL. CONFIRM TREATMENT PROCEDURES WITH RESPONSIBLE ENVIRONMENTAL ENGINEER AND REGULATORY OFFICIALS.

(DIS) Disposal Method: PRODUCT RESIDUES AND SORBENT MEDIA MAY BE PACKAGED IN 17H EPOXY-LINED DRUMS AND DISPOSED OF AT AN EPA APPROVED DISPOSAL SITE OR HIGH TEMPERATURE DESTRUCTION USING INCINERATORS WITH SCRUBBING EQUIPMENT. CONFIRM DISPOSAL PROCEDURES WITH RESPONSIBLE ENVIRONMENTAL ENGINEER AND REGULATORY OFFICIALS.

(HOH) Water Chemistry: RATE OF EVAPORATION FROM RAPIDLY STIRRED WATER AT 25 DEGREES CELSIUS OF 1 PPM SOLUTION-50% AFTER 56 MIN.-90% AFTER LESS THAN 120 MIN. (85FHA9 0001) (USPEDU 0001)

(COL) Color in Water: COLORLESS, HEAVY, VERY CORROSIVE LIQUID WITH CHLOROFORM-LIKE ODOR. (THIDD6 0002)

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Conversion to local identifiers resulted in       1 unique occurrences.

         Conversion Entry    1: Accession No.        7216798
(CAS)    CAS Registry Number: 108-10-1
(MAT)    Material Name: METHYL ISOBUTYL KETONE
(FML)    Chemical Formula: CH3.CO.CH2CH(CH3)2
(USE)    Common Uses: SOLVENT
(CON)    Containers: CANS. DRUMS. TANK CARS AND BARGES.
(STO)    General Storage Procedure: OUTSIDE OR DETACHED PREFERRED.
(FDL)    Detection Limit (Field; Techniques,Ref) (ppm): 600, CARBONYL
         SPOT TEST, (BNW45* 0032)
(LDL)    Detection Limit (Lab; Techniques,Ref) (ppm): 3 PPM, C7C, (JGCRAY
         0006)
(STD)    Standard Codes: NFPA - 2,3,0; ICC - NO; USCG - GRADE C FLAMMABLE
         LIQUID.
(FLM)    Flammability: QUITE FLAMMABLE, COMBUSTION PROBABLE.
(LFL)    Flammability Limit(%), Lower: 1.4
(UFL)    Flammability Limit(%), Upper: 7.5
(TCP)    Toxic Combustion Prod.: HAZARDOUS, USE SELF-CONTAINED BREATHING
         APPARATUS.
(EXT)    Extinguishing Method: WATER MAY BE INEFFECTIVE. "ALCOHOL" FOAM.
         WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL OR ALCOHOL FOAM.
         GOGGLES,  SELF-CONTAINED BREATHING APPARATUS.
(FLP)    Flash Point (C.): 22.78
(AIP)    Auto Ignition Point(C.): 460
(EXP)    Explosiveness: STABLE VAPORS FORM EXPLOSIVE MIXTURES WITH AIR.
(MLT)    Melting Point (C.): -84.7
(BLP)    Boiling Point (C.): 117 TO 118 (IGNITES)
(SOL)    Solubility (ppm @ 25C): 19000
(SPG)    Specific Gravity: .801
(VPN)    Vapor Pressure (mm Hg): 16
(VDN)    Vapor Density: 3.45
(PER)    Persistency: BIODEGRADES AT SLOW RATE.
(TRT)    Major Species Threatened: WATERFOWL
(INH)    Inhalation Limit (Value): 3000 (PPM; IDLH)
(INT)    Inhalation Limit (Text): REGULATIONS-- OSHA PEL (TWA) 410 MG/M3
         100 PPM (29CFR* 1910) OSHA CEILING 3000 PPM (29CFR* 1910)
         RECOMMENDATIONS--  NIOSH TWA 200 MG/M3 (CRSOE* 78-173,78/NIOSH)
         NIOSH IDLH 3000 PPM (PKTGD* 80/NAC) ACGIH TLV (TWA)205 MG/M3 50
         PPM (TLVADM  83/ACGIH) ACGIH STEL 300 MG/M3/15 MIN 75 PPM/15 MIN
         (TLVADM 83/ACGIH) UPDATED 3/84.
(DRC)    Direct Contact: EYE, IRRITANT (VAPORS).
(GNS)    General Sensation: CAMPHOR ODOR. .47 PPM RECOGNITION ODOR IN
         AIR. NARCOSIS WITH HIGH CONCENTRATIONS. TLV 100 PPM.
(SAF)    Personal Safety Precautions: WEAR FULL PROTECTIVE CLOTHING AND
         SELF-CONTAINED BREATHING APPARATUS.
(AHL)    Acute Hazard Level: IRRITANT. LETHAL CONCENTRATION FOR GUINEA
         PIGS IN AIR 20,000 PPM (12VXA5 0001). HIGHLY TOXIC WHEN INHALED
         OR  INGESTED. WILL PRODUCE BOD.
(CHL)    Chronic Hazard Level: UNKNOWN
(HPL)    Degree of Hazard to Public Health: IRRITANT. HIGHLY HAZARDOUS
         WHEN INHALED OR INGESTED.
(AIR)    Air Pollution: HIGH
(ACT)    Action Levels: NOTIFY FIRE AND AIR AUTHORITY. IF INTENSE HEAT OR
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        FLAME ARE EVIDENT. EVACUATE IMMEDIATE AREA AND WARN CIVIL
        DEFENSE OF POTENTIAL EXPLOSION. ENTER FROM UPWIND. REMOVE
        IGNITION SOURCE. ATTEMPT TO CONTAIN SLICK.
(AML)   In Situ Amelioration: OIL SKIMMING EQUIPMENT AND SORBENT FOAMS
        CAN BE APPLIED TO SLICK. CARBON OR PEAT CAN BE USED ON DISSOLVED
        PORTION.   SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING
        ASSISTANCE THROUGH EPA S ENVIRONMENTAL RESPONSE TEAM (ERT),
        EDISON, NJ,  24-HOUR  NO. 201-321-6660.
(AVL)   Avail. of Countermeasure Material: OIL SKIMMING EQUIPMENT-STORED
        AT MAJOR PORTS; SORBENT FOAM (POLYURETHANE)-UPHOLSTERY SHOPS:
        CARBON - WATER TREATMENT  PLANTS, SUGAR REFINERIES; PEAT -
        NURSERIES, FLORAL SHOPS.
(DIS)   Disposal Method: SPRAY INTO INCINERATOR OR BURN IN PAPER
        PACKAGING. ADDITIONAL FLAMMABLE SOLVENT MAY BE ADDED.
(IFP)   Industrial Fouling Pot.: SLICK MAY REDUCE HEAT TRANSFER OR CAUSE
        HOT SPOTS AND SCALING. VOLATILITY SUGGESTS RUPTURE HAZARD WHEN
        CONFINED  IN BOILER FEED OR COOLING SYSTEM WATERS.
(WTP)   Effects on Water Treatment Process: .1% IS NOT SUBSTRATE
        LIMITING, BUT 100-300 MG/L IS NONSUBSTRATE LIMITING TO ANAEROBIC
        PROCESSES (Res*** 0001).
(MWT)   Major Water Use Threatened: POTABLE SUPPLY, RECREATION,
        INDUSTRIAL, FISHERIES
(LOC)   Probable Location and State of Material: COLORLESS LIQUID. WILL
        FLOAT AT FIRST BUT SHOULD DISSOLVE AT A MODERATE RATE.
(COL)   Color in Water: COLORLESS
(DAT)   Adequacy of Data: FAIR



Option?
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[illegible] msds.ohm

 [illegible] format code specified or saved FORMAT file not found


Option? [illegible] /msds.ohm



Conversion to local identifiers resulted in      1 unique occurrences.

       Conversion Entry      1; Accession No.       7216928
(CAS)  CAS Registry Number: 108-88-3
(SIC)  SIC Code: 2829; 2815
(MAT)  Material Name: $$$ TOLUENE $$$
(FML)  Chemical Formula: C7H8
(USS)  Common Uses: DYES. EXPLOSIVES, ORGANIC COMPOUNDS. SOLVENT
       MANUFACTURING, BENZALDEHYDE AND BENZOIC ACID EXTRACTANT
(CON)  Containers: GLASS BOTTLES, CANS, DRUMS, TANK CARS, TANK TRUCKS,
       TANK BARGES.
(STO)  General Storage Procedure: PROTECT AGAINST PHYSICAL DAMAGE.
       OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD
       BE IN A STANDARD  FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET.
(HND)  General Handling Procedure: USE NON-SPARKING TOOL. GROUND LARGE
       PIECES OF UIPMENT.
(COR)  Corrosiveness: NONCORROSIVE
(FDL)  Detection Limit (Field: Techniques,Ref) (ppm): 20, AROMATICS,
       (BNW45* 0022)
(LDL)  Detection Limit (Lab; Techniques,Ref) (ppm): .001, C7C, (BNW28*
       0001)
(STD)  Standard Codes: EPA 311; NFPA - 2,3,0; ICC - FLAMMABLE LIQUID,
       RED LABEL, 10 GALLON IN AN OUTSIDE CONTAINER; USCG - GRADE
       CELSIUS FLAMMABLE LIQUID; IATA - FLAMMABLE LIQUID, RED LABEL, 1
       LITER PASSENGER, 40 LITERS CARGO; SUPERFUND DESIGNATED
       (HAZARDOUS  SUBSTANCES) LIST.
(FLM)  Flammability: QUITE FLAMMABLE, COMBUSTION PROBABLE.
(LFL)  Flammability Limit(%), Lower: 1.2
(UFL)  Flammability Limit(%), Upper: 7.1
(TCP)  Toxic Combustion Prod.: HAZARDOUS-EMPLOY SELF-CONTAINED
       BREATHING APPARATUS.
(EXT)  Extinguishing Method: WATER MAY BE INEFFECTIVE. USE WATER SPRAY.
       CARBON DIOXIDE, DRY CHEMICAL OR FOAM.
(FLP)  Flash Point (C.): 6
(AIP)  Auto Ignition Point(C.): 536.11
(EXP)  Explosiveness: STABLE-VAPORS CAN EXPLODE IF EXPOSED TO FLAME.
(LEL)  Explosive limit(%), Lower: 1.2
(UEL)  Explosive Limit(%), Upper: 7.1
(MLT)  Melting Point (C.): -95
(BLP)  Boiling Point (C.): 110.6 (IGNITES)
(SOL)  Solubility (ppm @ 25C): 470
(SPG)  Specific Gravity: .866
(VPN)  Vapor Pressure (mm Hg): 284; 36.7; 200
(VDN)  Vapor Density: 3.14
(PER)  Persistency: BIODEGRADES WITH ACCLIMATED SEED. HALF-LIFE IN LESS
       THAN SATURATED SOLUTION (TOP METER) IS 30.6 MINUTES AS A  RESULT
       OF EVAPORATION. 70% EVAPORATES WITH FIRST .01% OF WATER. SEWAGE
       SEED HAS NO EFFECT (TGFSAI 0008).
[illegible]  Carcinogenicity: RAT-NEGATIVE-118, 354, OR 590 MG/KG/D IN 2-3 HO
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      [illegible] OIL SOLUTION, EMULSIFIED AND 5-10% AQUEOUS SOLUTION OF
      [illegible] FOR 13 FEEDINGS.
(MAJ) Major Species Threatened: WATERFOWL
(TAS) Taste Imparting Characteristics (ppm): <.25
(IHL) Inhalation Limit (Value): 2000 (MG/M3; IDLH)
(IHT) Inhalation Limit (Text): REGULATIONS--
      OSHA PEL (TWA) 200 PPM (29CFR* 1910)
      OSHA PEAK 500 PPM/10 MIN (29CFR* 1910)
      OSHA CEILING 300 PPM (29CFR* 1910)
      RECOMMENDATIONS--
      NIOSH CEILING 750 MG/M3/10 MIN200 PPM/10 MIN(CRSUE* 73-
      11023,73/NIOSH)
      NIOSH TWA 375 MG/M3 100 PPM (CRSUE* 73-11023,73/NIOSH)
      NIOSH IDLH 2000 PPM (PKTGD* 80/MAC)
      ACGIH TLV (TWA)
      (SKIN) 375 MG/M3 100 PPM (TLVADM 83/ACGIH)
      ACGIH STEL
      (SKIN) 560 MG/M3/15 MIN150 PPM/15 MIN (TLVADM 83/ACGIH)
      UPDATED 3/84
(DRC) Direct Contact: EYE AND RESPIRATORY TRACT
(GNS) General Sensation: AROMATIC ODOR. ODOR DETECTABLE AT .17-1.74
      PPM IN AIR. VAPOR PRESSURE 17 TIMES ODOR THRESHOLD; 200-500 PPM
      MAY CAUSE HEADACHE, NAUSEA, AND GIDDINESS. (CHWKA9 0001)
      IRRITATION TO RABBIT BELLY GRADE 4 - SOME CAPILLARY INJECTION
      DILUTED; NO WARNING PROPERTIES. EYE IRRITATION GRADE 6 - SEVERE
      BURN FROM LESS THAN .005 ML. (R119** 0001); NARCOTIC IN HIGH
      CONCENTRATIONS. 8 HOUR EXPOSURE TO 200 PPM MAY CAUSE
      IMPAIRMENT OF COORDINATION AND REACTION TIME.
(LOT) Odor Threshold, Lower (ppm): .25
(DHI) Direct Human Ingestion (Mg./KGwt.): 1.7
(PHC) Prolonged Human Contact (ppm): 600
(SAF) Personal Safety Precautions: SAFETY GOGGLES, SELF-CONTAINED
      BREATHING APPARATUS AND IMPERVIOUS OUTERWEAR SHOULD BE WORN.
      RUBBER IS NOT RECOMMENDED  AND PVC IS CONSIDERED POOR FOR GLOVE.
      (CHEEA3 0001).
(AHL) Acute Hazard Level: LETHAL CONCENTRATION FOR MICE IN AIR. 6000
      PPM (12VXA5 0001). MODERATELY TOXIC WHEN INGESTED OR INHALED.
      SLIGHTLY  HAZARDOUS WHEN ABSORBED THROUGH SKIN. EMITS TOXIC
      VAPORS WHEN HEATED. MAY CONTAIN TOXIC BENZENE IMPURITIES. MAY
      PRODUCE  BOD. MODERATELY TOXIC TO FISH.
(CHL) Chronic Hazard Level: RABBIT .25, 1.0, AND 10 MG/KG/9 1/2 AND 5
      MONTH NO EFFECT. (A1**** 0001) MILD CHRONIC IRRITANT. MODERATELY
      TOXIC  VIA ALL CHRONIC EXPOSURE ROUTES.
(HEL) Degree of Hazard to Public Health: MODERATELY TOXIC WHEN
      INGESTED OR INHALED. SLIGHTLY HAZARDOUS WHEN ABSORBED THROUGH
      SKIN. MILD CHRONIC IRRITANT  CHRONIC HAZARDS ARE MODERATE BY ALL
      ROUTES. EMITS TOXIC VAPORS WHEN HEATED.
(AIR) Air Pollution: HIGH
(ACT) Action Levels: NOTIFY FIRE AND AIR AUTHORITY. ENTER FROM UPWIND.
      IF INTENSE HEAT PREVAILS, EVACUATE AREA AND GUARD AGAINST
      EXPLOSION. REMOVE IGNITION SOURCE. ATTEMPT TO CONTAIN SLICK.
(AML) In Situ Amelioration: OIL SKIMMING AND SORBENT FOAMS CAN BE
      APPLIED TO SLICK. USE CARBON OR PEAT ON DISSOLVED PORTION. SEEK
      PROFESSIONAL  ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S
      ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-
      321-6660.
(SHR) Beach/Shore Restoration: DO NOT BURN
(AVL) Avail of Countermeasure Material: OIL SKIMMING EQUIPMENT - STORED
      AT MARINE PORTS; SORBENT FOAMS (POLYURETHANE) -- UPHOLSTERY SHOPS;
      CARBON -- WATER TREATMENT PLANTS, SUGAR REFINERIES; PEAT --
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NURSERIES, FLORAL SHOPS

(DIS) Disposal Method: TOLUENE CAN BE BURNED UNDER CONTROLLED CONDITIONS. SPRAY INTO INCINERATOR OR BURN IN PAPER PACKAGING. ADDITION FLAMMABLE SOLVENT MAY BE ADDED.

[illegible]) Industrial Fouling Pot.: SLICK MAY CAUSE HEAT TRANSFER OR CAUSE HOT SPOTS OR SCALING. POSES RUPTURE HAZARD WHEN CONFINED IN BOILER FEED OR COOLING SYSTEM WATERS.

(WTP) Effects on Water Treatment Process: > .05% INHIBITED SEWAGE SLUDGE DIGESTION.

(WAT) Major Water Use Threatened: RECREATION, POTABLE SUPPLY, FISHERIES, INDUSTRIAL

(LOC) Probable Location and State of Material: COLORLESS LIQUID. WILL FLOAT ON SURFACE OF WATER. WILL DISSOLVE VERY SLOWLY.

(CHM) Water Chemistry: TOLUENE CAN BE OXIDIZED IN AIR TO FORM PHENOL, BUT THE REACTION GENERALLY REQUIRES CATALYSIS.

(COL) Color in Water: COLORLESS

(DAT) Adequacy of Data: GOOD

Option"

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[illegible] 1,1,1-trichloroethane

File: 12 Count:      1



Option: 1 12-[illegible]




              File 12: Entry      1; Accession No.      204914
J.T.BAKER INC.  222 RED SCHOOL LANE, PHILLIPSBURG, NJ  08865
M A T E R I A L   S A F E T Y   D A T A   S H E E T
24-HOUR EMERGENCY TELEPHONE -- (201) 859-2151

14914 -02                         1,1,1-TRICHLOROETHANE
EFFECTIVE: 07/30/86                                                ISSUED: 1
07/2[illegible]/87
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SECTION 1 - PRODUCT IDENTIFICATION
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PRODUCT NAME:       1,1,1-TRICHLOROETHANE
FORMULA:            CH3CCL3
FORMULA WT:           133.41
CAS NO.:               71-55-6
NIOSH/RTECS NO.:    KJ2975000
COMMON SYNONYMS:    CHLOROETHENE;  METHYLCHLOROFORM;  METHYLTRICHLOROMETHA
NE;
ALPHA-TRICHLOROETHANE
PRODUCT CODES:     W509,W510,9437,9436,5381
==============================================================================
========

PRECAUTIONARY LABELLING
==============================================================================
========

BAKER SAF-T-DATA(TM) SYSTEM
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HEALTH          -  1  SLIGHT
FLAMMABILITY    -  1  SLIGHT
REACTIVITY      -  1  SLIGHT
CONTACT         -  2  MODERATE
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT
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SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS
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PROPER SHIPPING NAME       TOLUENE
HAZARD CLASS               FLAMMABLE LIQUID
UN/NA                      UN1294
LABELS                     FLAMMABLE LIQUID
REPORTABLE QUANTITY        1000 LBS.

INTERNATIONAL (I.M.O.)
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PROPER SHIPPING NAME       TOLUENE
HAZARD CLASS               3.2
UN/NA                      UN1294
LABELS                     FLAMMABLE LIQUID
===========================================================================
=========


(TM) AND (R) DESIGNATE TRADEMARKS.
N/A = NOT APPLICABLE OR NOT AVAILABLE
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THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN CO
MPILED
FROM OUR EXPERIENCE AND DATA PRESENTED IN VARIOUS TECHNICAL PUBLICATIONS
. IT IS
THE USER S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATI
ON FOR
THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO RE
VISE
MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAI
  BLE.
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MPLETE-
NESS NOR FITNESS FOR PURPOSE OF THE INFORMATION CONTAINED HEREIN.
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Option?
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WARNING!
CAUSES IRRITATION
HARMFUL IF SWALLOWED OR INHALED
AVOID CONTACT WITH EYES, SKIN, CLOTHING.
AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE
VENTILATION. WASH THOROUGHLY AFTER HANDLING.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SECTION II - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
1,1,1-TRICHLOROETHANE	90-100	71-55-6

SECTION III - PHYSICAL DATA

BOILING POINT: 74 C (165 F)
VAPOR PRESSURE(MM HG): 100

MELTING POINT: -33 C (-27 F)
VAPOR DENSITY(AIR=1): 4.6

SPECIFIC GRAVITY: 1.32
(H2O=1)
EVAPORATION RATE: 12.9
(BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %)
% VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: COLORLESS LIQUID WITH A MILD ETHER-LIKE ODOR.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A
NFPA 704M RATING: 2-1-0

FLAMMABLE LIMITS: UPPER - 15.0 % LOWER - 7.5 %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MO

TOXIC GASES PRODUCED

HYDROGEN CHLORIDE, PHOSGENE, CHLORINE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 1900 MG/M3 (350 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 2450 MG/M3 (450 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 1900 MG/M3 (350 PPM)

TOXICITY: LD50 (ORAL-RAT)(G/KG) - 10.3
LD50 (IPR-RAT)(MG/KG) - 5100

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION OF VAPORS MAY CAUSE NARCOSIS AND DEPRESSION OF CENTRAL NERVOUS SYSTEM.
INHALATION OF VAPORS MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS, DROWSINESS, IRRITATION OF RESPIRATORY TRACT, AND LOSS OF CONSCIOUSNESS.

CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.
PROLONGED SKIN CONTACT MAY CAUSE DERMATITIS.
INGESTION MAY CAUSE NAUSEA AND VOMITING.
CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS

CENTRAL NERVOUS SYSTEM. SKIN, EYES, CARDIOVASCULAR SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

LIVER DISORDERS, HEART DISORDERS, SENSITIVE SKIN

ROUTES OF ENTRY

INGESTION, INHALATION, SKIN CONTACT, EYE CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

Option [illegible]

WARNING
AMMABLE
USES IRRITATION
Y BE FATAL IF SWALLOWED OR INHALED

KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING.

AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE,

USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE.

FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SECTION II - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
TOLUENE	90-100	108-88-3

SECTION III - PHYSICAL DATA

BOILING POINT: 111 C (232 F) VAPOR PRESSURE(MM HG): 22

MELTING POINT: -95 C (-139 F) VAPOR DENSITY(AIR=1): 3.2

SPECIFIC GRAVITY: 0.87 EVAPORATION RATE: 2.24
(H2O=1) (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: CLEAR, COLORLESS LIQUID WITH BENZENE-LIKE ODOR.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP 4 C (40 F) NFPA 704M RATING: 2-3-0

FLAMMABLE LIMITS: UPPER - 7.1 % LOWER - 1.2 %

FIRE EXTINGUISHING MEDIA

USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED

BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER
TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK.
CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG
OXIDIZERS MAY CAUSE FIRE.

TOXIC GASES PRODUCED

CARBON MONOXIDE, CARBON DIOXIDE

SECTION V - HEALTH HAZARD DATA

ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTANCE CEILING CONCENTRATION FOR

AN EIGHT-HOUR SHIFT = 500 PPM FOR 10 MINUTES. (PEL) CEILING = 300 PPM.

THRESHOLD LIMIT VALUE (TLV/TWA): 375 MG/M3 (100 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 560 MG/M3 (150 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): MG/M3 (200 PPM)

TOXICITY: LD50 (ORAL-RAT)(MG/KG) - 5000
LD50 (IPR-MOUSE)(MG/KG) - 1.12
LD50 (SKN-RABBIT) (G/KG) - 14
LC50 (INHL-MOUSE-8H) (PPM) - 5320

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION AND INGESTION ARE HARMFUL AND MAY BE FATAL.
INHALATION MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS, NARCOSIS,
SUFFOCATION, LOWER BLOOD PRESSURE, CENTRAL NERVOUS SYSTEM DEPRESSION.
INHALATION OF VAPORS MAY CAUSE COUGHING, CHEST PAINS, DIFFICULTY BREATHING,
OR UNCONSCIOUSNESS.
LIQUID MAY BE IRRITATING TO SKIN AND EYES. PROLONGED SKIN CONTACT MAY

RESULT IN DERMATITIS. EYE CONTACT MAY RESULT IN TEMPORARY CORNEAL DAMAG
E.

INGESTION MAY CAUSE HEADACHE, NAUSEA, VOMITING, GASTROINTESTINAL
ITATION, CONVULSIONS, AND UNCONSCIOUSNESS.
ONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS

CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

RESPIRATORY SYSTEM DISEASE, SKIN DISORDERS, PULMONARY DISEASE

ROUTES OF ENTRY

INHALATION, ABSORPTION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL
RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER
FOR
AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
H CLOTHING BEFORE RE-USE.

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT O
CCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, NITRIC ACID, SULFURIC A
CID,
CHLORINE

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

EAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.

SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP L
EAK

IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U220 (TOXIC WASTE)

SECTION VIII - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, POLYVINYL ALCOHOL GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS

BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

16

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                 File 11: Entry      1: Accession No.     242000
J.T.BAKER INC.  222 RED SCHOOL LANE, PHILLIPSBURG, NJ  08865
M A T E R I A L   S A F E T Y   D A T A   S H E E T
24-HOUR EMERGENCY TELEPHONE -- (201) 859-2151

X2060-03                               XYLENES
EFFECTIVE: 09/11/86                                               ISSUED: 1
[illegible]/87
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SECTION I - PRODUCT IDENTIFICATION
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PRODUCT NAME:       XYLENES
FORMULA:            C6H4(CH3)2
FORMULA WT:           106.17
CAS NO.:             1330-20-7
NIOSH/RTECS NO.:    ZE2100000
COMMON SYNONYMS:    DIMETHYLBENZENE;  XYLOL
PRODUCT CODES:      9489,9499,9491,9493,9490,X516,9492,9516,5377
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PRECAUTIONARY LABELLING
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BAKER SAF-T-DATA(TM) SYSTEM
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HEALTH          -  2  MODERATE
FLAMMABILITY    -  3  SEVERE (FLAMMABLE)
REACTIVITY      -  0  NONE
CONTACT         -  2  MODERATE
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT
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SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER


PRECAUTIONARY LABEL STATEMENTS
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WARNING
FLAMMABLE
CAUSES IRRITATION
HARMFUL IF SWALLOWED OR INHALED
KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOT
HING.
AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH
ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE,

USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIV
E.
FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SECTION II - HAZARDOUS COMPONENTS

COMPONENT % CAS NO.

M-XYLENE 40-65 1
08-38-3
O-XYLENE 15-20
95-47-6
P-XYLENE 0-20 1
06-42-3
ETHYL BENZENE 15-25 1
00-41-4

SECTION III - PHYSICAL DATA

BOILING POINT: 137 C (279 F) VAPOR PRESSURE(MM HG)
: 5.1

MELTING POINT: -48 C (-54 F) VAPOR DENSITY(AIR=1):
3.7

SPECIFIC GRAVITY: 0.87 EVAPORATION RATE:
0.7
(H2O=1) (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME
: 100

APPEARANCE & ODOR: COLORLESS LIQUID WITH SWEET PLEASANT ODOR.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP) [illegible] 80 F NFPA 704M RATING: [illegible]

MMABLE LIMITS: UPPER - 7.0 % LOWER - 1.1 %

FIRE EXTINGUISHING MEDIA

USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER
TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK.
CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG
OXIDIZERS MAY CAUSE FIRE.

IC GASES PRODUCED

RBON MONOXIDE, CARBON DIOXIDE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 435 MG/M3 (100 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 655 MG/M3 (150 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 435 MG/M3 (100 PPM)

TOXICITY: LD50 (ORAL-RAT)(MG/KG) - 4300
LD50 (IPR-MOUSE)(MG/KG) - 1.6
LD50 (SCU-RAT)(MG/KG) - 1700

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

HALATION AND INGESTION ARE HARMFUL AND MAY BE FATAL.
NHALATION OF VAPORS MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS,
ROWSINESS, IRRITATION OF RESPIRATORY TRACT, AND LOSS OF CONSCIOUSNESS.

INHALATION OF VAPORS MAY CAUSE NARCOSIS.
CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.
INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHE, DIZZINESS, GASTROINTESTI

[illegible]
IRRITATION, BLURRED VISION, AND LOW BLOOD PRESSURE.
CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS

CENTRAL NERVOUS SYSTEM, EYES, SKIN, GI TRACT, BLOOD, LIVER, KIDNEYS

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

INGESTION, INHALATION, SKIN CONTACT, EYE CONTACT, ABSORPTION

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

OSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL VIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U239 (TOXIC WASTE)

SECTION VIII - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEE TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, NITRILE GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS

BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

ROPER SHIPPING NAME	XYLENE
AZARD CLASS	FLAMMABLE LIQUID
JN/NA	UN1307
LABELS	FLAMMABLE LIQUID
REPORTABLE QUANTITY	1000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME XYLENES
HAZARD CLASS 3.3

UN NO UN1307
LABELS FLAMMABLE LIQUID

==
[illegible]

(TM) AND (R) DESIGNATE TRADEMARKS.
N/A = NOT APPLICABLE OR NOT AVAILABLE

THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN COMPILED FROM OUR EXPERIENCE AND DATA PRESENTED IN VARIOUS TECHNICAL PUBLICATIONS. IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO REVISE MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAILABLE. J. T. BAKER MAKES NO WARRANTY OR REPRESENTATION ABOUT THE ACCURACY OR COMPLETENESS NOR FITNESS FOR PURPOSE OF THE INFORMATION CONTAINED HEREIN.

Option

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        File 10; Entry      1; Accession No.    86549
J.T.BAKER INC.  222 RED SCHOOL LANE, PHILLIPSBURG, NJ  08865
M A T E R I A L   S A F E T Y   D A T A   S H E E T
24-HOUR EMERGENCY TELEPHONE -- (201) 859-2151

H6549 -03                  4-HYDROXY-4-METHYL-2-PENTANONE
EFFECTIVE: 11/24/86                                       ISSUED: 1
0/27/87
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SECTION 1 - PRODUCT IDENTIFICATION
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   DUCT NAME:       4-HYDROXY-4-METHYL-2-PENTANONE
   MULA:            (CH3)2C(OH)CH2COCH3
FORMULA WT:            116.16
CAS NO.:               123-42-2
NIOSH/RTECS NO.:       SA9100000
COMMON SYNONYMS:   DIACETONE ALCOHOL;4-HYDROXY-2-KETO-4-METHYLPENTANE
PRODUCT CODES:     N678,N679
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PRECAUTIONARY LABELLING
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BAKER SAF-T-DATA(TM) SYSTEM
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HEALTH          -  2  MODERATE
FLAMMABILITY    -  2  MODERATE
REACTIVITY      -  1  SLIGHT
CONTACT         -  2  MODERATE
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT
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   GGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS
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WARNING
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FLAMMABLE
CAUSES IRRITATION
HARMFUL IF SWALLOWED OR INHALED
KEEP AWAY FROM HEAT, SPARKS, FLAME.  AVOID CONTACT WITH EYES, SKIN, CLOT
HING.
AVOID BREATHING VAPOR.  KEEP IN TIGHTLY CLOSED CONTAINER.  USE WITH ADEQ
UATE
VENTILATION.  WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE WATER
 SPRAY,
ALCOHOL FOAM, DRY CHEMICAL, OR CARBON DIOXIDE. FLUSH SPILL AREA WITH WAT
ER
SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE:      RED (FLAMMABLE)
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SECTION II - HAZARDOUS COMPONENTS
========================================================================
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COMPONENT                                          %       CAS NO.


4-HYDROXY-4-METHYL-2-PENTANONE                                     90-100    1
23-42-2
========================================================================
========

SECTION III - PHYSICAL DATA
========================================================================
========

BOILING POINT:      169 C (    336 F)                  VAPOR PRESSURE(MM HG)
: 0.8

MELTING POINT:        -43 C (    -45 F)                VAPOR DENSITY(AIR=1):
  4.0

SPECIFIC GRAVITY:   0.94                               EVAPORATION RATE:
  0.12
(H2O=1)                                                (BUTYL ACETATE=1)

SOLUBILITY(H2O):      COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME
: 100

APPEARANCE & ODOR:  COLORLESS LIQUID WITH MILD ODOR.
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SECTION IV - FIRE AND EXPLOSION HAZARD DATA
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FLASH POINT (CLOSED CUP      52 C (    125 F)          NFPA 704M RATING:  1-
2-0

FLAMMABLE LIMITS:  UPPER -   6.9 %        LOWER -  1.8 %

FIRE EXTINGUISHING MEDIA
```

USE WATER SPRAY, ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.

CIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

TOXIC GASES PRODUCED

CARBON MONOXIDE, CARBON DIOXIDE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 240 MG/M3 (50 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 360 MG/M3 (75 PPM)

RMISSIBLE EXPOSURE LIMIT (PEL): 240 MG/M3 (50 PPM)

TOXICITY: LD50 (ORAL-RAT)(MG/KG) - 4000
LD50 (IPR-MOUSE)(MG/KG) - 933

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION OF VAPORS MAY CAUSE HEADACHE, NAUSEA, DIZZINESS, FATIGUE AND WEAKNESS IN ARMS AND LEGS.
INHALATION OF VAPORS MAY CAUSE SEVERE IRRITATION OF THE RESPIRATORY SYSTEM.
LIQUID MAY BE IRRITATING TO SKIN AND EYES.
INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTROINTESTINAL IRRITATION.
INGESTION MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION.

CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS

YES, SKIN, RESPIRATORY SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

SKIN DISORDERS, EYE DISORDERS, RESPIRATORY SYSTEM DISEASE

ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER. INDUCE VOMITING
.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT O
CCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, AMINES AND AMMONIA, STRONG ACIDS, STRONG BASES, ALKALIES, ALUMINUM

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP L
EAK
IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE
UP
WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001 (IGNITABLE WASTE)

SECTION VIII - PROTECTIVE EQUIPMENT

TILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEE TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, RUBBER GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED,

AMMABLE LIQUID STORAGE AREA OR CABINET.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	DIACETONE ALCOHOL
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1148
LABELS	FLAMMABLE LIQUID

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	DIACETONE ALCOHOL
HAZARD CLASS	3.3
UN/NA	UN1148
LABELS	FLAMMABLE LIQUID

(TM) AND (R) DESIGNATE TRADEMARKS.
N/A = NOT APPLICABLE OR NOT AVAILABLE

THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN CO

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Option [illegible]

File 9: Entry 1: Accession No. 133588
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MATERIAL SAFETY DATA SHEET
24-HOUR EMERGENCY TELEPHONE -- (201) 859-2151

M3588 -03 METHYL ISO-BUTYL KETONE
EFFECTIVE: 01/10/87 ISSUED: 1
0/27/87

SECTION I - PRODUCT IDENTIFICATION

ODUCT NAME: METHYL ISO-BUTYL KETONE
ORMULA: CH3COCH2CH(CH3)2
FORMULA WT: 100.16
CAS NO.: 108-10-1
NIOSH/RTECS NO.: SA9275000
COMMON SYNONYMS: 4-METHYL-2-PENTANONE; ISOPROPYLACETONE; HEXONE
PRODUCT CODES: 4855,9322,9212,9320,5384

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 2 MODERATE
FLAMMABILITY - 3 SEVERE (FLAMMABLE)
REACTIVITY - 1 SLIGHT
CONTACT - 1 SLIGHT
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

AFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

2
WARNING
FLAMMABLE
CAUSES IRRITATION
HARMFUL IF SWALLOWED OR INHALED
KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING.
AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE.

USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE.
FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SECTION II - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
METHYL ISO-BUTYL KETONE	90-100	1 08-10-1

SECTION III - PHYSICAL DATA

BOILING POINT: 116 C (241 F)
VAPOR PRESSURE(MM HG): 15

MELTING POINT: -85 C (-121 F)
VAPOR DENSITY(AIR=1): 3.5

SPECIFIC GRAVITY: 0.79
(H2O=1)
EVAPORATION RATE: 1.6
(BUTYL ACETATE=1)

SOLUBILITY(H2O): MODERATE (1 TO 10 %)
% VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: COLORLESS LIQUID WITH PLEASANT ODOR.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP 16 C (60 F)
NFPA 704M RATING: 2-3-0

FLAMMABLE LIMITS: UPPER - 7.5 % LOWER - 1.4 %

FIRE EXTINGUISHING MEDIA

USE ALCOHOL FOAM. DRY CHEMICAL OR CARBON DIOXIDE.
(TER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK.
CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.

TOXIC GASES PRODUCED

CARBON MONOXIDE. CARBON DIOXIDE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 205 MG/M3 (50 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 300 MG/M3 (75 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 410 MG/M3 (100 PPM)

TOXICITY: LD50 (ORAL-RAT)(MG/KG) - 2080
LC50 (INHAL-MOUSE) (G/M3) - 23
LD50 (IPR-MOUSE)(MG/KG) - 268

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION OF VAPORS MAY CAUSE HEADACHE. NAUSEA, VOMITING, DIZZINESS. DROWSINESS, IRRITATION OF RESPIRATORY TRACT, AND LOSS OF CONSCIOUSNESS.

LIQUID MAY BE IRRITATING TO SKIN, EYES, AND MUCOUS MEMBRANES.
LIQUID MAY CAUSE DERMATITIS.
INGESTION MAY CAUSE NAUSEA. VOMITING, HEADACHES, DIZZINESS,
STROINTESTINAL IRRITATION.
GESTION MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION.
HRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS

RESPIRATORY SYSTEM, EYES, SKIN, CENTRAL NERVOUS SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

EYE DISORDERS, SKIN DISORDERS, RESPIRATORY SYSTEM DISEASE

ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER. INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, STRONG BASES, AMINES AND AMMONIA, STRONG ACIDS

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP LEAK
IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP
WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

```
EPA HAZARDOUS WASTE NUMBER:          U161 (TOXIC WASTE)
  ========================================================================
  =====

SECTION VIII - PROTECTIVE EQUIPMENT
==========================================================================
========

VENTILATION:                  USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEE
T
TLV REQUIREMENTS.

RESPIRATORY PROTECTION:  RESPIRATORY PROTECTION REQUIRED IF AIRBORNE
CONCENTRATION EXCEEDS TLV.  AT CONCENTRATIONS UP
TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH
ORGANIC VAPOR CARTRIDGE IS RECOMMENDED.  ABOVE
THIS LEVEL. A SELF-CONTAINED BREATHING APPARATUS
IS RECOMMENDED.

EYE/SKIN PROTECTION:     SAFETY GOGGLES. UNIFORM. APRON, POLYVINYL ALCOH
OL
GLOVES ARE RECOMMENDED.
==========================================================================
========

SECTION IX - STORAGE AND HANDLING PRECAUTIONS
  ========================================================================
  ======

SAF-T-DATA(TM) STORAGE COLOR CODE:     RED (FLAMMABLE)

SPECIAL PRECAUTIONS
-------------------
BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID.  KEEP CONTAINER
TIGHTLY CLOSED.  STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID

STORAGE AREA.
==========================================================================
========

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION
==========================================================================
========

DOMESTIC (D.O.T.)
-----------------

PROPER SHIPPING NAME      FLAMMABLE LIQUID, N.O.S. (METHYL ISO-BUTYL KETO
NE)
HAZARD CLASS              FLAMMABLE LIQUID
UN/NA                     UN1993
LABELS                    FLAMMABLE LIQUID

 INTERNATIONAL (I.M.O.)
 ---------------------

PROPER SHIPPING NAME      METHYL ISO BUTYL KETONE
HAZARD CLASS              3.2
UN NO                     UN1245
```

```
LABELS                 FLAMMABLE LIQUID

(TM) AND (R) DESIGNATE TRADEMARKS.
N/A = NOT APPLICABLE OR NOT AVAILABLE
-----
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MPILED
FROM OUR EXPERIENCE AND DATA PRESENTED IN VARIOUS TECHNICAL PUBLICATIONS
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                File  #: Entry      1: Accession No.      203913
J.T.BAKER INC.  222 RED SCHOOL LANE, PHILLIPSBURG, NJ  08865
M A T E R I A L   S A F E T Y   D A T A   S H E E T
24-HOUR EMERGENCY TELEPHONE -- (201) 859-2151

T3913 -02                           TOLUENE
EFFECTIVE: 09/08/86                                          ISSUED: 1
0/27/87
============================================================================
========

SECTION 1 - PRODUCT IDENTIFICATION
============================================================================
========

  ODUCT NAME:        TOLUENE
FORMULA:             C6H5CH3
FORMULA WT:            92.14
CAS NO.:              108-88-3
NIOSH/RTECS NO.:     XS5250000
COMMON SYNONYMS:     METHYLBENZENE;  PHENYLMETHANE;  TOLUOL
PRODUCT CODES:       9472,9456,9462,V963,9351,9460,9457,9459,9336,9461,9458
,5375
============================================================================
========

PRECAUTIONARY LABELLING
============================================================================
========

BAKER SAF-T-DATA(TM) SYSTEM
---------------------------

HEALTH          -  2  MODERATE
FLAMMABILITY    -  3  SEVERE (FLAMMABLE)
REACTIVITY      -  0  NONE
CONTACT         -  1  SLIGHT
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT
 -------------------------------

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS
------------------------------
```

APPENDIX D

APPENDIX D

Data Management Plan

Red Oak Landfill
Red Oak, Iowa

Red Oak Landfill
Red Oak, Iowa

APPENDIX D
Data Management Plan
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TABLES

FIGURES

1. INTRODUCTION

This Data Management Plan outlines the procedures to be followed for the inventory, control, storage and retrieval of data collected during the performance of the remedial investigation/feasibility study at the Red Oak Landfill, Red Oak, Iowa. This plan was prepared in a manner consistent with the provisions of USEPA Guidance Document USEPA/540/G-85/002 (Remedial Investigations under CERCLA).

During the performance of the RI, technical data will be generated by several contractors and agencies. The procedures contained in the plan are designed in order to maintain the integrity of data collected for subsequent use. Moreover, project tracking data (e.g., schedules, progress reports and financial reporting) will be maintained to monitor, manage and document the progress of the RI and FS.

2. ORGANIZATION

The Respondent's Project Coordinator has overall responsibility for the management and direction of the RI/FS and has contracted with Geraghty &C Miller, Inc. (G&M) to perform the tasks outlined in the Work Plan. Project files containing data and reports generated during the RI/FS will be maintained at Geraghty & Miller, Inc., Milwaukee, Wisconsin according to the procedures outlined in this document.

Geraghty & Miller field observations will be recorded in bound field books. Preprinted forms will be used for soil boring, monitoring well construction, water quality sampling logs, and laboratory chain of custody. Examples of these forms are shown in Figures D-1, D-2, D-3 and D-4.

Data generated by the drilling contractor and analytical laboratory will be submitted directly to Geraghty & Miller, Inc. A list of all contractors and contacts anticipated to be used during the RI/FS, is included in Table D-1.

All documentation received from the contracted laboratory will be filed at Geraghty & Miller in Milwaukee, Wisconsin. Laboratory documentation (e.g. chromatograms, results of spiked samples, etc.) will be maintained for purposes of validating analytical data collected during the RI/FS. All summary reports will be kept in Geraghty & Miller's project file.

GERAGHTY
& MILLER, INC.
Ground-Water Consultants

FIGURE D-1

SAMPLE/CORE LOG

Boring/Well __________ Project/No. ______________________________ Page ________ of ________

Site Location ______________________________ Drilling Started ______________ Drilling Completed ______________

Total Depth Drilled ________ feet Hole Diameter ________ inches Type of Sample/ Coring Device ______________

Length and Diameter of Coring Device ______________________________ Sampling Interval ______________ feet

Land-Surface Elev. __________ feet ☐ Surveyed ☐ Estimated Datum ______________

Drilling Fluid Used ______________________________ Drilling Method ______________

Drilling Contractor ______________________________ Driller ______________ Helper ______________

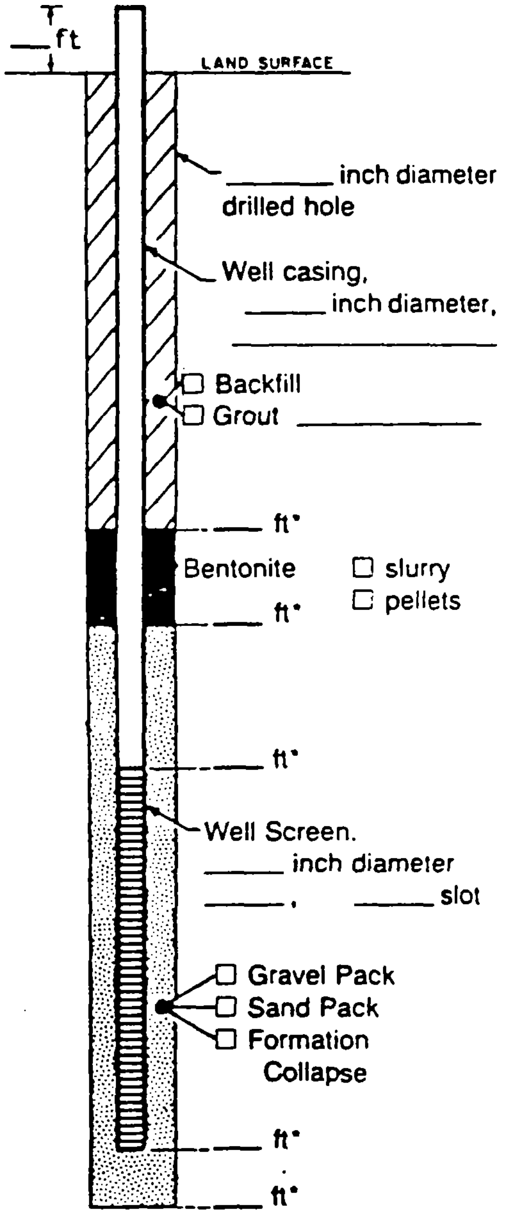
Prepared By ______________________________ Hammer Weight ________ Hammer Drop ________ inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
From	To			

GERAGHTY
& MILLER, INC.
Ground-Water Consultants

FIGURE D-2

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project ____________________ Well ____________

Town/City ____________________________________

County ____________________ State ____________

Permit No. ____________________

Land-Surface Elevation

and Datum __________ feet ☐ surveyed

____________________ ☐ estimated

Installation Dates(s) ____________________________

Drilling Method ____________________________

Drilling Contractor ____________________________

Drilling Fluid ____________________________

____

Development Techniques(s) and Date(s)

____

____

____

Fluid Loss During Drilling ____________________ gallons

Water Removed During Development ______________ gallons

Static Depth to Water ____________________ feet below M.P.

Pumping Depth to Water ____________________ feet below M.P.

Pumping Duration ______________ hours

Yield ______________ gpm Date __________

Specific Capacity ______________ gpm/ft

Well Purpose ____________________________________

____

____

Remarks ____________________________________

____

____

____

____

____

Prepared by ____________________________

GERAGHTY
& MILLER, INC.
round-Water Consultants

FIGURE D-3

WATER SAMPLING LOG

Project/No. ______________________ Page ______ of ______

Site Location ______________________

Site/Well No. ____________ Coded/ Replicate No. ____________ Date ____________

Weather ____________ Time Sampling Began ____________ Time Sampling Completed ____________

EVACUATION DATA

Description of Measuring Point (MP) ______________________

Height of MP Above/Below Land Surface ________ MP Elevation ____________

Total Sounded Depth of Well Below MP ________ Water-Level Elevation ____________

Held ______ Depth to Water Below MP ________ Diameter of Casing ____________

Wet ______ Water Column in Well ________ Gallons Pumped/Bailed Prior to Sampling ____________

Gallons per Foot ________

Gallons in Well ________ Sampling Pump Intake Setting (feet below land surface) ____________

Evacuation Method ______________________

SAMPLING DATA/FIELD PARAMETERS

Color ____________ Odor ____________ Appearance ____________ Temperature ______ °F/°C

Other (specific ion; OVA; HNU; etc.) ______________________

____

Specific Conductance, umhos/cm ____________ pH ____________

Sampling Method and Material ______________________

Constituents Sampled	Container Description From Lab ____ or G&M ____	Preservative

Remarks ______________________

Sampling Personnel ______________________

WELL CASING VOLUMES

GAL./FT	1-¼" = 0.077	2" = 0.16	3" = 0.37	4" = 0.55
	1-½" = 0.10	2-½" = 0.24	3-½" = 0.50	6" = 1.46

GERAGHTY & MILLER, INC.
Ground-Water Consultants

FIGURE D-4
CHAIN-OF-CUSTODY RECORD

Page______ of______

Project Number ____________________

Project Location ____________________

Laboratory ____________________

Sampler(s) ____________________

____

SAMPLE IDENTITY	Date Sampled	SAMPLE BOTTLE / CONTAINER DESCRIPTION										TOTAL
											Total No. of Bottles/ Containers	

Relinquished by: ____________ Received by: ____________	Organization: ____________ Organization: ____________	Date__/__/__ Time______ Date__/__/__ Time______	Seal Intact? Yes No N/A
Relinquished by: ____________ Received by: ____________	Organization: ____________ Organization: ____________	Date__/__/__ Time______ Date__/__/__ Time______	Seal Intact? Yes No N/A

Special Instructions/Remarks: ____

____

Delivery Method: ☐ In Person ☐ Common Carrier ______ SPECIFY ☐ Lab Courier ☐ Other ______ SPECIFY

TABLE D-1
Contractors Involved with the RI/FS

Respondent's Project Coordinator	Contacts
Ralston Purina Company St. Louis, Missouri	Frank H. Hackmann
Contractors	
Geraghty & Miller, Inc. Milwaukee, Wisconsin	Brad Berggren Ed Rothschild
[Drilling Contractor]	
Environmental Treatment and Technologies Corporation (Laboratory)	Marilyn Bracken Jack Farrel Steve Ruducker

3. DATA TRANSFER

Procedures controlling the receipt and distribution of all incoming and outgoing data and reports from Geraghty & Miller, Inc. related to the RI/FS are outlined below.

3.1. Receipt of Data and Reports

All data and reports will be logged and dated. A Document Control Clerk will be responsible for recording the type of document received and its author, and a control number will be assigned. The document control numbers will be organized in the following format; E1131R001-(XXXX)-(YYYY) where:

E1131R001 - is the project number

(XXXX) - refers to the originating organization.

(YYYY) - is the sequential serial number assigned to each particular document

Codes will be assigned as follows:

G&M - Geraghty & Miller, Inc.

[Driller] - Driller

ETTC - Laboratory

Incoming documents will also be date stamped and filed. If distribution is required, the appropriate number of copies will be made and distributed. The original document received will not be distributed to project personnel.

3.2. Outgoing Data and Reports

All outgoing project data and reports will be assigned a document control number by the Document Control Clerk. The document control numbers will be organized according to the following format, E1131R001-(XXXX), where:

(XXXX) - is the sequential serial number assigned to a particular document

The Document Control Clerk will maintain a log of all project data and reports sent out. All outgoing reports and maps will be reviewed by the project manager and officer. All final reports will be signed by the author(s).

3.3. Telephone Logs and Meetings Notes

All notes from project meetings and telephone conversations will be maintained by personnel assigned to the project. These notes will be retained by project personnel until the conclusion of the project when they will be filed along with other project documents. An example of a telephone conversation log is shown in Figure D-5.

GERAGHTY
& MILLER, INC.
Ground-Water Consultants

FIGURE D-5

TELEPHONE CONVERSATION RECORD

DATE: ______________________ TIME: __________ PROJECT: __________

FROM: ______________________ TO: ______________________

COMPANY: ______________________ COMPANY: ______________________

TELE NO: ______________________ TELE NO: ______________________

RE: ____

4. DATA INVENTORY

Procedures for the filing, storage and retrieval of project data and reports are discussed below.

4.1. Document Filing and Storage

As previously discussed, project files will be maintained at Geraghty & Miller, Inc. The project files will include all raw analytical data for data validation purposes. Files will be organized by project tasks and maintained by the Document Control Clerk. The organization of the project files is listed in Table D-2.

4.2. Access to Project Files

Access to the project files will be controlled and limited to Geraghty & Miller, Inc. personnel. A computer log will be maintained for all documents contained in the file to facilitate retrieval. Project documents will be listed according to tasks and will contain a document control number.

It will be the responsibility of the project staff and the document control clerk to ensure that all project documents are promptly returned after use.

TABLE D-2

File Structure for the RI/FS

PREVIOUS INVESTIGATIONS

- Consultants' Reports
- Data Compilation and Validation

PROJECT MANAGEMENT

- Memos
- Correspondence
- Budget Summaries (monthly)

ADMINISTRATIVE CONSENT ORDER

INITIAL DISCOVERY

- USEPA Site Inspection Report
- Hazardous Ranking System
- Sampling and Analyses
  - USEPA Data
  - Respondent's Splits

REMEDIAL INVESTIGATION PLANNING

- [Drilling] Standard Operating Procedures
- ETTC Standard Laboratory Operating Procedures

COMMUNITY RELATIONS

- Newsletters
- Press Releases

REMEDIAL INVESTIGATION

- Hydrogeological Investigation
- Well Construction
- Geologic Logs
- Identification of Sources
  - Records Review
  - Interviews
  - Aerial Photo Interpretation

Table D-2
(Continued)

File Structure for the RI/FS

- SAMPLING
  - Ground Water
    - Sampling Logs
    - Chain of Custody Forms
    - Analytical Data
    - Water Level Data
    - Aquifer Testing
  - Surface Water
    - Sampling Logs
    - Chain of Custody Forms
    - Analytical Data
    - Stream Gauging
  - Soils
    - Sampling Logs
  - Air/Health and Safety
    - Equipment Calibration
    - Monitoring Results
  - Air/Climatology
    - Meteorological Data
    - Air Sampling Data
- DATA REDUCTION
  - Maps
  - Reports
- QA/AC
  - Audit Reports

4.3. Computer Data Storage

Chemical and physical data will be stored and managed using dBASE III and LOTUS computer programs. Data entry will be performed by a designated person so access to the data base is limited. Data stored in DBase III and LOTUS will be checked against the original data to ensure that it was entered correctly. Data entered on the computer database will include chemical analyses, water-level and permeability data (laboratory and field measurements).

The use of the computer database will facilitate data analysis, enabling data to be reduced to tabular or graph form.

5. DATA REDUCTION AND ANALYSIS

The Project Manager and Hydrogeologist are responsible for data review and validation. Data validation procedures are outlined in detail in the QA/QC plan. The analysis of project data is likely to require data reduction for the preparation of tables, charts, maps, etc. To ensure that data are accurately transferred during the reduction process, all reduced data will be checked by someone other than the person that prepared the map, table or chart. All items checked will be initialed and dated. Any incorrect transfers of data will be highlighted and changed.