File on eDOCs X Yes ______ No

Site Name Enarc-O Machine Products

Site No. 826011

County Livingston

Town Lima

Foilable ______ Yes ______ No

File Name report.hw826011.1995-04.

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Report No.: 8003-355

FINAL
SITE INSPECTION REPORT
NORTH BLOOMFIELD
LIMA, LIVINGSTON COUNTY, NEW YORK

PREPARED UNDER

WORK ASSIGNMENT NO. 038-2JZZ
CONTRACT NO. 68-W9-0051
REV. NO. 2

November 30, 1994
Updated: April 10, 1995
Volume: 2 of 4

8106

REFERENCE NO. 7

NOV 2 5 1985

EXPRESS MAIL --
RETURN RECEIPT REQUESTED

Mr. Ronald Iannucci
President
Enarc-O-Machine Products, Inc.
Subsidiary of Kaddis
  Manufacturing Corp.
1175 Bragg Street
Honeoye Falls, New York 14472

Re: Groundwater Contamination in North Bloomfield, Town of
Lima, New York

Dear Mr. Iannucci:

The U.S. Environmental Protection Agency ("EPA") has documented the release of hazardous substances into the groundwater underlying the Enarc-O-Machine Products facility in North Bloomfield, New York ("facility") and the neighboring area. Volatile organic chemicals have been found in a number of residential wells in the area, and in the well located at your facility, at levels exceeding New York State Department of Health Drinking Water Guidelines for potable water. In response to these releases of hazardous substances and the threat of future such releases, EPA has spent public funds and anticipates spending additional public funds. These actions have been and will be taken by EPA pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 ("CERCLA"), 42 U.S.C. §§9601 et seq.

Under CERCLA and other laws, responsible parties may be held liable for monies expended by the federal government in taking necessary response actions at and around sites where hazardous substances have been released, including investigative, planning, removal, remedial and enforcement actions. Responsible parties may also be subject to Orders requiring them to take remedial actions themselves. Responsible parties under CERCLA include, among others, the current and past owners or operators of the facility where the discharge occurred, and persons who were involved in the treatment or disposal of hazardous substances at the site.

EPA has reason to believe that your company is a responsible party within the intent of CERCLA. By this letter, we notify you of our intent to take Immediate Removal Action, as defined

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1 of 3

in the National Oil and Hazardous Substances Contingency Plan, 40 CFR Part 300, to abate the significant threat to human health posed by the groundwater contamination in North Bloomfield. The specific removal actions contemplated by EPA fall into two phases Under Phase I, the thirty-three homes threatened by the aforementioned groundwater contamination will be provided with bottled drinking water.[1] Phase II will consist of the installation of water mains and residential hookups to provide these homes with a permanent alternative water supply.[2]

In addition to the immediate removal steps outlined above, EPA expects that additional corrective measures may be required to mitigate the continued release of hazardous substances into the groundwater and to protect the public health, welfare, and the environment.

EPA intends to proceed immediately with the first removal action referred to above -- that is, the provision of bottled water to the threatened residents. You may come forward and volunteer to undertake this action yourself by responding to this letter by close of business on December 3, 1985 by (1) stating unambiguously that your company will undertake voluntarily to properly perform this work in accordance with EPA plans, and (2) supplying the name, address and telephone number of a representative of your company who will coordinate the commencement and completion of this work. This reply should be sent by expedited means to:

Mr. Charles Dolan
Site Investigation and Compliance Branch
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
26 Federal Plaza - Room 737
New York, New York 10278
(212) 264-7662

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1 It is our understanding that you are already providing your employees with bottled water for drinking purposes. Inasmuch as some of the highest contaminant levels in the area have been found in the well at your facility, we strongly recommend that you continue supplying bottled water to your employees until a more long-term solution can be adopted.

2 Should any additional homes be determined to be at risk, these would also have to be served by Phase I and II.

Any agreement by you to undertake Phase I must be memorialized in a Consent Order issued pursuant to Section 106 of CERCLA, 42 U.S.C. §9606. Should you decline to volunteer to carry out Phase I and should EPA be required to take this or any other response actions itself, you may be subject to a cost recovery action in accordance with Section 107 of CERCLA, 42 U.S.C. §9607.

EPA considers the second contemplated removal action referred to above -viz., the installation of water mains and residential hookups to serve the homes threatened by the groundwater contamination in North Bloomfield -- to be a somewhat longer-term project. EPA is prepared to perform this work itself. However, because we have reason to believe that you are a responsible party within the intent of CERCLA, we expect to be forwarding to you a proposed Order, to be issued pursuant to Section 106 of CERCLA, 42 U.S.C. §9606, which would require you to both supplant EPA as the supplier of bottled water to the threatened residents (should you not volunteer to perform this work immediately in response to this letter) and undertake Phase II of the Immediate Removal Action referred to above (if necessary). As is our custom, we will provide you with a reasonable opportunity to confer with us regarding this Order and to consent to its issuance.

If you have any questions regarding this letter, you may contact Paul Simon, Assistant Regional Counsel, EPA, Region II, at (212) 264-5340.

I hope that you will give this matter your immediate attention.

Sincerely yours,

William J. Librizzi
Director
Emergency and Remedial
Response Division

cc: Neal D. Madden, Esq.
Norman Nosenchuck

bcc: Charles Dolan, 2 ERRD-SIC
Joseph Rotola, 2 ERRD-RP

REFERENCE NO. 8

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

IN THE MATTER OF Kaddis Manufacturing Corp., Respondent Proceeding Under Sections 104 and 122 of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9604, 9622	ADMINISTRATIVE ORDER ON CONSENT Index No. II-CERCLA-90204

JURISDICTION

1. This Administrative Order on Consent ("Order") is issued to Kaddis Manufacturing Corp. (hereinafter referred to as "Respondent") pursuant to the authority vested in the President of the United States under Sections 104(a) and (b), 122(a) and 122(d)(3) of the Comprehensive Environmental Response, Compensation and Liability Act, as amended ("CERCLA"), 42 U.S.C. §§9604(a), 9604(b), 9622(a), 9622(d)(3), which authority was delegated to the Administrator of the United States Environmental Protection Agency ("EPA") and duly redelegated to the Regional Administrators of EPA. Notice of this Order and the negotiations preceding its issuance were provided to the New York State Department of Environmental Conservation ("NYSDEC").

FINDINGS OF EPA

The following findings have been made by EPA. Respondent does not join in or admit these findings.

2. Respondent is the owner and operator of a manufacturing plant located at 1175 Bragg Street in the Town of Lima, Livingston County, New York. The plant is used for the manufacture of screw machine products and drain and shut-off valves. The plant and the property upon which it is located constitute a "facility" within the meaning of Section 101(9) of CERCLA, 42 U.S.C. §9601(9) (These premises are hereinafter referred to as "the Facility.").

3. Manufacturing operations have been conducted at the Facility since approximately 1960. The operators of the Facility have

included Wesley Crane (from 1960 to 1962), Enarc-O Machine Products, Inc. ("Enarc-O") (from 1962 to 1986), and Respondent (from 1986 to the present). Between 1973 and 1986, Enarc-O was a wholly-owned subsidiary of Respondent. In 1986, Enarc-O was merged into Respondent. Respondent is a corporation organized and existing under the laws of the State of New York.

4. Prior to 1973, the property which, together with the manufacturing plant located thereon, constitutes the Facility was owned by Wesley and Olive Crane. Between 1973 and 1984, the property was owned by Respondent. Since 1984, the property has been owned by Country Lane Associates, a partnership of which Respondent's president is one of the two members.

5. The Facility, which covers approximately six acres, is situated in a small residential community in the Town of Lima known as "North Bloomfield." In addition to the Facility, the area includes an automotive repair shop, Crane's Collision, Inc., a number of residences and farmland. The community is bisected by Honeoye Creek, which flows north to the Town of Honeoye Falls, New York.

6. The geology in the area of North Bloomfield consists of shale and is characterized by vertical and horizontal fractures. In addition, the soil overlying the shale in the area belongs to the Palmyra fine sandy loam series. Having developed from a parent material of glacial outwash consisting of sand and gravel, this soil is well-drained down to the water table or rock.

7. During the months of March through November of 1985, NYSDEC, the New York State Department of Health ("NYSDOH"), and the Livingston County Department of Health ("LCDOH") conducted sampling of a potable water supply well at the Facility and thirty-eight private residential wells located nearby, also in North Bloomfield. The results of this sampling indicated the presence of varying concentrations of a number of volatile organic compounds ("VOCs"), including, but not limited to, trichloroethylene ("TCE") and 1,1,1-trichloroethane, in twenty-two of these wells.

8. The highest concentrations of VOCs found as a result of the groundwater sampling in North Bloomfield in 1985 were in the well at the Facility. Sampling conducted at that well by NYSDEC on March 22, 1985 showed TCE at 1800 parts per billion (ppb) and 1,1,1-trichloroethane at 370 ppb. In addition, sampling conducted there by NYSDOH on June 19, 1985 revealed the presence of 1,1,1-trichloroethane at 560 ppb, as well as other VOCs. The aforementioned concentrations exceed the Maximum Contaminant Levels ("MCLs") established for those substances under the Safe Drinking Water Act, 42 U.S.C. §§300f, et seq.

9. The VOCs referred to above are hazardous substances, as defined in Section 101(14) of CERCLA, 42 U.S.C. §9601(14).

10. Exposure to the VOCs referred to above by ingestion, direct contact, or inhalation can result in a number of adverse human health effects.

11. At the time of the discovery of the volatile organic groundwater contamination described above, the residents in the area threatened by that contamination were relying upon wells for their drinking water. In November, 1985 and June, 1986, EPA authorized the performance of two removal actions pursuant to Section 104 of CERCLA, 42 U.S.C. §9604, and Section 300.65 of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 CFR §300.65. These removal actions included the installation of water mains and hookups to provide the residences in the area threatened by the aforesaid groundwater contamination with a safe alternate supply of water, and, as an interim measure, the provision of bottled water to those residences. These removal actions were completed in 1988.

12. A January 20, 1986 response by Enarc-O to an EPA request for information (hereinafter "Enarc-O's information request response") indicates that between 1960 and 1980, a substantial quantity of TCE was used at the Facility. Enarc-O's information request response also indicates that from 1980 to 1985, the company used substantial quantities of 1,1,1-trichloroethane.

13. Enarc-O's information request response indicates that a spill of 1,1,1-trichloroethane occurred at the Facility on June 18, 1985. Further, although the response indicates that at least some of the contaminated soil was excavated and treated by aeration, no soil sampling was conducted to determine whether the cleanup conducted was adequate.

14. EPA has also received information indicating that in addition to the spill referred to in paragraph 13 above, disposal of waste materials containing spent TCE and/or 1,1,1-trichloroethane occurred at the Facility on a number of other occasions in the past, including the period after Enarc-O became a wholly-owned subsidiary of Respondent.

15. The volatile organic groundwater contamination detected at and near the Facility, and the spills and disposal events referred to in paragraphs 13 and 14 above constitute "releases" within the meaning of Section 101(22) of CERCLA, 42 U.S.C. §9601(22).

16. Based on the information available to date, EPA believes that the private residential drinking water wells in North Bloomfield that have been found to be contaminated with VOCs are hydraulically downgradient of the Facility. In addition, the only other commercial or industrial establishment in the area, Crane's Collision, Inc., has not used chlorinated solvents, according to that company's response to an EPA Request for Information. These facts, together with those set forth in paragraphs 12 through 14 above, and the fact that the well at the Facility was found to have the highest VOC concentrations of any well sampled during the groundwater sampling referred to in paragraph 7 above, support the conclusion that releases from the Facility are the likely source of the volatile organic groundwater contamination affecting the area. Further groundwater and other investigations at the Facility should provide additional information relating to this issue and regarding the nature and extent of contamination at the Facility. Respondent has submitted a work plan for such investigations, which is attached hereto as Appendix 1.

17. Respondent is a "person" within the meaning of Section 101(21) of CERCLA, 42 U.S.C. §9601(21). In addition, as an owner and operator of the Facility at the time of the disposal of hazardous substances there, and as a current owner and operator of the Facility, Respondent is a responsible party under Section 107(a) of CERCLA, 42 U.S.C. §9607(a).

18. Respondent has been given an opportunity to discuss with EPA the basis for issuance of this Order and its terms.

ORDER

19. Based on the foregoing and upon the entire administrative record, it is hereby ordered and agreed that Respondent shall conduct an investigation with respect to the Facility in accordance with the requirements set forth below. All activities required by this Order shall be completed as soon as possible even though maximum time periods for their completion are set forth herein and in the EPA-approved Interim Technical Memorandum referred to below.

Description of Work

20. The work plan attached hereto as Appendix 1 (hereinafter, the "Work Plan") calls for the performance of an investigation designed to determine, among other things, the hydrogeologic setting of the Facility and the nature and extent of contamination of soil and groundwater at the Facility. The Work Plan is also intended to provide further information as to the issue of whether releases at or from the Facility are the source

of the volatile organic groundwater contamination referred to in paragraphs 7 and 8, above.

21. Within seventy (70) days of the effective date of this Order, Respondent shall complete the activities comprising Tasks 1 and 2 of the Work Plan and shall submit to EPA for review and approval a detailed Interim Technical Memorandum ("ITM") for the performance of the remaining tasks described in the Work Plan. The ITM shall describe the results of Tasks 1 and 2, and describe how the activities comprising Tasks 4 through 7 of the Work Plan will be carried out, and shall include, but not necessarily be limited to, the following:

a. a map depicting all sampling locations;

b. the number and types of samples to be obtained at each sampling location and the analyses to be performed;

c. a detailed schedule for the performance of the specific tasks set forth in the ITM;

d. the overall management plan, including identification of contractors and subcontractors and their respective responsibilities for performance of the specific tasks set forth in the ITM;

e. a Quality Assurance/Quality Control ("QA/QC") plan for all investigations to be performed, which shall be prepared in conformance with the EPA publication entitled "Test Methods for Evaluating Solid Waste" ("SW-846"), 3d ed. (or as further revised and updated), and the EPA document entitled "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans" (QAMS-005/80). The QA/QC plan shall insure that within three weeks of completion of the laboratory analyses of each round of samples collected, a QA/QC evaluation of laboratory data and sampling and analytical procedures is done for each sample;

f. a description of the chain of custody procedures to be followed, which shall conform to those set forth in SW-846;

g. a Health and Safety Plan prepared in accordance with the EPA guidance document, "Standard Operating Safety Guides" (OSWER, 1988), and 29 CFR §1910.120.

h. a Contingency Plan for conducting site activities; and

i. the _curricula vitae_ of all professionals expected to participate in the investigation together with a description of the responsibilities and the anticipated levels of effort of each of those professionals.

22. EPA will review the ITM and comment thereon in writing. Within thirty (30) days of receipt of EPA's comments, Respondent shall amend the ITM as required by EPA's comments or as otherwise agreed upon by EPA, and shall submit the amended ITM to EPA. EPA's comments will not be inconsistent with the purposes of the investigation called for by this Order, which purposes are referred to in paragraph 20 above, and will not require the performance of field investigations which go beyond the scope of the Work Plan.

23. EPA remains the final arbiter in any dispute regarding the sufficiency or acceptability of the ITM, and EPA may modify it unilaterally. At such time as EPA determines that the ITM is acceptable, EPA will transmit to Respondent a written statement to that effect.

24. Respondent shall perform the investigation called for by the Work Plan and the EPA-approved ITM in conformance with those approved plans (including the implementation schedule contained in the Work Plan and EPA-approved ITM). Respondent shall complete all activities specified in the Work Plan and EPA-approved ITM and, in conformance with the schedule included in the Work Plan and approved ITM, shall submit to EPA for review and approval a draft report detailing the results of the investigation ("Draft Report"). The Draft Report shall include, among other things, the raw data obtained, QA/QC documentation, and Respondent's evaluation of the sampling data.

25. Upon receipt of the Draft Report, EPA will review the report and comment thereon in writing. Within twenty (20) days of receipt of EPA's comments, Respondent shall amend the Draft Report as required by those comments or as otherwise agreed upon by EPA, and shall submit the amended report to EPA.

26. EPA's comments on the Draft Report may require Respondent to perform such additional investigatory work (including work which goes beyond the scope of the Work Plan) as EPA finds necessary in order to properly assess hydrogeologic conditions at the Facility, determine the nature and extent of contamination at the Facility, or provide information going to the issue of whether releases at or from the Facility are a source of the volatile organic groundwater contamination referred to in paragraphs 7 and 8 above. Such work (including any necessary work plans, field work and reports) shall be performed by Respondent in a manner approved by and in conformance with a schedule approved by EPA.

27. EPA shall remain the final arbiter in any dispute regarding the sufficiency or acceptability of the Draft Report and any supplementary submissions prepared in accordance with paragraph

26 above, and EPA may modify them unilaterally. At such time as EPA determines that the Draft Report is acceptable, EPA will transmit to Respondent a written statement to that effect. Neither this Order nor EPA's determination that the Draft Report is acceptable should be construed as a determination by EPA that the investigation conducted by Respondent pursuant to this Order constitutes an acceptable Remedial Investigation, as defined in CERCLA and the NCP.

Notification and Reporting Requirements

28. Until the termination of this Order, Respondent shall prepare and provide to EPA written monthly progress reports which: (1) describe the actions which have been taken toward achieving compliance with this Order during the previous month; (2) include all results of sampling and tests and all other data received by Respondent during the previous month in the implementation of the work required hereunder; (3) describe all actions, data and plans which are scheduled for the next month and provide other information relating to the progress of the work as is customary in the industry; (4) include information regarding percentage of completion, all delays encountered or anticipated that may affect the future schedule for completion of the work required hereunder, and a description of all efforts made to mitigate those delays or anticipated delays. These progress reports are to be submitted to EPA by the tenth day of every month following the effective date of this Order.

29. Upon the occurrence of any event during performance of the work required hereunder which event, pursuant to Section 103 of CERCLA, requires reporting to the National Response Center, Respondent shall, within 24 hours, orally notify the EPA Project Coordinator (or, in the event of the unavailability of the EPA Project Coordinator, the Chief of the New York/Caribbean Compliance Branch of the Emergency and Remedial Response Division of EPA Region II), in addition to the reporting required by Section 103. Within 20 days of the onset of such an event, Respondent shall furnish to EPA a written report setting forth the events which occurred and the measures taken, and to be taken, in response thereto.

30. All work plans, reports, notices and other documents required to be submitted to EPA under this Order shall be sent to the following addressees:

3 copies: (including 1 un-bound copy)	Chief, New York/Caribbean Compliance Branch Emergency and Remedial Response Division U.S. Environmental Protection Agency 26 Federal Plaza, Room 747 New York, NY 10278

<u>Attention</u>: North Bloomfield Site Project Manager

1 copy: Chief, New York/Caribbean Superfund Branch
Office of Regional Counsel
U.S. Environmental Protection Agency
26 Federal Plaza
New York, NY 10278

Attention: North Bloomfield Site Attorney

31. Respondent shall give EPA at least five (5) business days advance notice of all non-sampling field activities and at least fifteen (15) business days advance notice of all sampling activities to be performed by Respondent pursuant to this Order.

Respondent's Project Coordinator, Other Personnel

32. Not later than seven (7) days after the effective date of this Order, Respondent shall select a Project Coordinator and shall notify EPA in writing of the name, address, qualifications, job title and telephone number of that Project Coordinator. Respondent's Project Coordinator shall be responsible for oversight of the implementation of this Order. He or she shall have technical expertise sufficient to adequately oversee all aspects of the work contemplated by this Order. EPA correspondence to Respondent with respect to this Order will be sent to Respondent's Project Coordinator, with a copy to:

William H. Helferich, III, Esq.
Harter, Secrest & Emery
700 Midtown Tower
Rochester, N.Y. 14604-2070

Respondent shall have the right to change its Project Coordinator. However, Respondent shall notify EPA in writing at least seven (7) days prior to any such change.

33. Respondent shall provide a copy of this Order to each contractor and subcontractor retained to perform the work required by this Order. Respondent shall include in all contracts or subcontracts entered into for work required under this Order provisions stating that such contractors or subcontractors, including their agents and employees, shall perform all activities required by such contracts or subcontracts in compliance with this Order and all applicable laws and regulations. Respondent shall be responsible for ensuring that its contractors and subcontractors perform the work contemplated herein in accordance with this Order.

34. All activities required of Respondent under the terms

of this Order shall be performed only by qualified persons possessing all necessary permits, licenses, and other authorizations required by federal, state and local governments.

Oversight

35. During the implementation of the requirements of this Order, Respondent and its contractors and subcontractors shall be available for such conferences and inspections with EPA as are necessary for EPA to adequately oversee the work being carried out.

Access and Availability of Data

36. Respondent shall obtain, in a timely fashion, such access to the Facility as is necessary for Respondent to carry out the requirements of this Order. Respondent shall also use its best efforts to obtain, in a timely fashion, such access to any other premises where work under this Order is to be performed as is necessary for Respondent to carry out the requirements of this Order. This Order does not convey any rights of access to Respondent. If such access cannot be obtained despite best efforts by Respondent, Respondent shall so notify EPA in writing. EPA shall then, at its discretion and as appropriate, assist Respondent in obtaining access to the premises in question.

37. EPA and its designated representatives, including but not limited to their employees, agents, contractors and consultants, shall be permitted to observe the work carried out pursuant to this Order. Respondent shall permit EPA and its designated representatives to have full access to and freedom of movement at the Facility and any other premises where work under this Order is to be performed, at all times, including, but not limited to, any time that work under this Order is being performed, for purposes of inspecting or observing Respondent's progress in implementing the requirements of this Order, verifying the information submitted to EPA by Respondent, conducting investigations relating to contamination at the Facility, or for any other purpose reasonably related to EPA oversight of the implementation of this Order; provided that Respondent does not agree, under this Order, to provide EPA and its representatives with access to the plant building at the Facility except during all working hours and times when work under this Order is being performed.

38. All data, information and records created, maintained or received by Respondent or its contractors or consultants in connection with implementation of the work under this Order, including but not limited to contractual documents, invoices, receipts, work orders and disposal records, shall, without delay, be made available to EPA on request. Further, EPA shall be permitted to copy all such documents. In addition, no such data,

information, or records shall be destroyed for six years after completion of the work required by this Order without either the express written approval of EPA or a written offer by the Respondent to provide such material to EPA, followed by EPA's written rejection of that offer. Following that six-year period, Respondent shall notify EPA at least 30 days prior to the destruction of any such documents.

39. Upon request by EPA, Respondent shall provide EPA or its designated representatives with duplicate and/or split samples of any material sampled in connection with the implementation of this Order.

40. All data, reports and other documents submitted to EPA by or on behalf of Respondent pursuant to this Order shall be available to the public unless identified as confidential by Respondent and determined by EPA to merit confidential treatment, in accordance with Section 104(e)(7) of CERCLA and 40 CFR Part 2, Subpart B. No sampling and monitoring data or hydrological or geological data or other information specified under Section 104(e)(7)(F) of CERCLA shall be considered confidential.

41. Notwithstanding any other provision of this Order, EPA hereby retains all of its information gathering, access and inspection authority under CERCLA, the Solid Waste Disposal Act, 42 U.S.C. §6901, et seq., and any other applicable statute or regulations.

General Provisions

42. Except where expressly stated otherwise herein, all time periods referred to in this Order shall be construed as calendar days, rather than business days.

43. If the date for submission of any item or notification required by this Order falls upon a weekend or federal holiday, the time period for submission of that item or notification is extended to the next working day following the weekend or holiday.

44. This Order shall apply to and be binding upon Respondent and Respondent's receivers, trustees, successors and assigns. Respondent agrees to instruct its officers, directors, employees and agents involved in the performance of the work required by this Order to cooperate in carrying out the obligations of Respondent under this Order. Respondent agrees that its officers, directors, employees and agents involved in the performance of the work required by this Order shall take all necessary steps to accomplish the performance of said work in accordance with this Order.

45. All actions performed by Respondent pursuant to this Order shall be carried out in conformance with all applicable federal, state and local laws, regulations, and requirements, including, but not limited to, the NCP and any amendments thereto. Notwithstanding any other provision in this Order, in accordance with Section 121(e)(1) of CERCLA, no federal, state or local permits shall be required for any portion of the work required hereunder that is conducted entirely on the North Bloomfield Superfund Site. Respondent shall obtain all permits necessary for off-site work under federal, state or local laws and shall submit timely applications and requests for any such permits. This Order is not, nor shall it act as, a permit issued pursuant to any federal or state statute or regulation.

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

47. All plans, reports and other submittals required to be submitted to EPA pursuant to this Order shall, upon approval by EPA, be deemed to be incorporated in and an enforceable part of this Order.

48. Neither the United States Government nor any agency thereof shall be liable for any injuries or damages to persons or property resulting from acts or omissions by Respondent or Respondent's officers, directors, employees, agents, contractors, consultants, receivers, trustees, successors or assigns in carrying out any action or activity pursuant to this Order; nor shall the United States Government or any agency thereof be construed or held out as a party to any contract entered into by Respondent in carrying out any activities pursuant to this Order.

49. Respondent agrees to indemnify and hold harmless EPA and the United States Government, its agencies, departments, agents and employees, from all claims, causes of action, damages and costs of any type or description by third parties for any injuries or damages to persons or property resulting from acts or omissions of Respondent or its officers, directors, officials, agents, servants, receivers, trustees, successors or assigns, as a result of the fulfillment or attempted fulfillment of the terms and conditions of this Order by Respondent.

50. Nothing herein shall constitute or be construed as a satisfaction or release from liability for Respondent or Respondent's directors, officers, employees, agents, contractors, consultants, receivers, trustees, successors or assigns or for any other individual or entity. Nothing herein shall constitute a finding that Respondent is the sole responsible party with respect to the release and threatened release of hazardous substances at and from the Facility or the North Bloomfield Superfund Site.

51. Nothing contained in this Order shall affect any right, claim, interest, defense, or cause of action of any party hereto with respect to third parties.

52. Respondent agrees 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, or any other provision of law, either directly or indirectly, for reimbursement from the Hazardous Substance Superfund of costs incurred by Respondent in complying with this Order.

53. Nothing in this Order shall be construed to constitute preauthorization under Section 111(a)(2) of CERCLA, 42 U.S.C. §9611(a)(2), and 40 CFR §300.25(d).

54. No informal advice, guidance, suggestions or comments by EPA shall be construed to relieve Respondent of any of its obligations under this Order.

55. a. Respondent's activities under this Order shall be performed within the time limits set forth herein, or otherwise established or approved by EPA, unless performance is delayed by events which constitute a force majeure. For purposes of this Order, "force majeure" is defined as any event arising from causes beyond Respondent's control. "Force majeure" shall not include inability of Respondent to pay the costs or expenses associated with complying with this Order or increases in such costs or expenses. When an event constituting a force majeure occurs, Respondent shall perform the affected activities within a time period which shall not exceed the time provided in this Order together with the period of delay attributed to the force majeure; provided, however, that no deadline shall be extended beyond a period of time that is reasonably necessary. Respondent shall use its best efforts to avoid or minimize any delay or prevention of performance of its obligations under this Order. In addition, Respondent shall use its best efforts to discover and keep apprised of any and all circumstances which may result in a delay or prevention of performance of the work required under this Order.

b. Respondent shall verbally notify the EPA Project Manager as soon as possible after discovering that circumstances have occurred or are likely to occur which may delay or prevent the performance of any activity required by this Order, regardless of whether those circumstances constitute a force majeure or not. If the Project Manager cannot be reached, Respondent shall leave a message at his or her office. In addition, Respondent shall notify EPA in writing within seven (7) calendar days after the date when Respondent first becomes aware of the circumstances which may delay or prevent performance. Such written notice shall be accompanied by all available pertinent documentation including, but not limited to, third-party correspondence, and shall contain the following: 1) a description of the circumstances, and Respondent's rationale for interpreting such circumstances as being beyond its control (should that be Respondent's claim); 2) the actions (including pertinent dates) that Respondent has taken and/or plans to take to minimize any delay; and 3) the date by which or the time period within which Respondent proposes to complete the delayed activities. Such notification shall not relieve Respondent of any of its obligations under this Order. Respondent's failure to timely and properly notify EPA as required by this paragraph shall render the remaining provisions of this paragraph 55 null and void insofar as they may entitle Respondent to an extension of time. The burden of proving that an event constituting a force majeure has occurred shall rest with the Respondent.

56. This Order may be amended by mutual agreement of EPA and Respondent. Such amendments shall be in writing and shall have as their effective date that date on which such amendments are signed by EPA.

Reimbursement

57. Respondent hereby agrees to reimburse EPA for all costs not inconsistent with the NCP which are incurred by EPA in overseeing Respondent's implementation of the requirements of this Order. EPA will periodically transmit to Respondent accountings of the costs incurred by EPA. Such costs will include both direct and indirect costs. Respondent shall, within forty-five (45) days of receipt of each such accounting, remit a cashier's or certified check for the amount of those costs, made payable to the "Hazardous Substance Superfund." Such payment shall contain a reference to the index number of this Order and shall be mailed to the following address:

EPA - Region 2
Attn: Superfund Accounting
P.O. Box 360188M
Pittsburgh, PA 15251

Such payment shall also be accompanied by a letter of explanation including the name and address of Respondent, the name of the Site (North Bloomfield Site), and the EPA Region number (EPA Region II); a copy of the letter and a copy of the check shall be sent to the addressees listed in paragraph 30 above.

Enforcement

58. EPA reserves the right to carry out any or all of the work required of Respondent hereunder if, for example (and without

limitation), Respondent fails to comply with any of the requirements of this Order.

59. If Respondent fails, without prior EPA approval, to comply with any of the requirements or time limits set forth in or established pursuant to this Order, other than the reimbursement requirement established by paragraph 57 above, and such failure is not excused under the terms of paragraph 55, above, Respondent shall, upon receipt of a written demand from EPA, pay a stipulated penalty to EPA in the amount indicated below for each day of noncompliance:

Days After Required Date	Stipulated Penalty
1 to 10 days	$ 500.00/day
11 to 20 days	$1,000.00/day
21 to 30 days	$2,000.00/day

Any such penalty shall accrue as of the first day after the applicable deadline has passed, and shall continue to accrue until the noncompliance is corrected, or until the expiration of thirty (30) days, whichever is earlier. Such penalties shall be due and payable ten (10) days following Respondent's receipt of a written demand from EPA. Payment of any such penalty to EPA shall be made by cashier's or certified check made payable to the "Hazardous Substance Superfund," with a notation of the index number of this Order, and shall be mailed to the address set forth in paragraph 57 above. A letter stating the basis for the penalties, the name and address of Respondent, the name of the Site, and the EPA Region number shall accompany each such payment; a copy of the letter and a copy of the check shall be mailed to the addressees listed in paragraph 30 above. Payment of penalties shall not alter in any way Respondent's obligation to comply with this Order.

60. Notwithstanding any other provision of this Order, EPA reserves its right to bring an action against Respondent (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 Respondent's implementation of this Order, and any other response costs incurred by EPA with respect to the Facility or the North Bloomfield Superfund Site.

61. Notwithstanding any other provision of this Order, EPA reserves its right to take enforcement actions against Respondent (or any other responsible parties), including, but not limited to, actions for monetary penalties for any violation of law or this Order. Such enforcement actions may include, though need not be limited to, actions pursuant to Sections 107(c)(3) and/or 109 of CERCLA, 42 U.S.C. §§9607(c)(3), 9609.

62. Nothing herein shall preclude EPA from taking any additional enforcement actions and/or additional removal or remedial actions as it may deem necessary or appropriate for any purpose, including, but not limited to, the investigation, prevention or abatement of a threat to the public health, welfare, or the environment arising from conditions at the Facility or the North Bloomfield Superfund Site.

Termination and Satisfaction

63. When Respondent concludes that it has completed the work required under this Order, Respondent shall so notify EPA by submitting a written report demonstrating that Respondent has complied with and completed the implementation of this Order. That report shall be accompanied by appropriate documentation which substantiates Respondent's assertion that the work required hereunder has been completed. The report shall further include a certification statement, signed by a responsible corporate officer of Respondent, which states the following:

> "I certify that the information contained in or accompanying this submission is true, accurate and complete.
>
> "As to (the) (those) identified portion(s) of this submission for which I cannot personally verify (its) (their) truth and accuracy, I certify, as the company official having supervisory responsibility for the person(s) who, acting under my direct instructions, made the verification, that this information is true, accurate and complete."

If, following receipt of the aforementioned report, EPA determines that the work required hereunder has been fully carried out in accordance with this Order, EPA will so notify Respondent in writing.

Effective Date and Effect of Consent

64. This Order shall become effective immediately upon Respondent's receipt of written notice from EPA that the Order has been signed by the Regional Administrator of EPA Region II, and all times for performance of actions or activities to be performed under this Order shall be calculated from said effective date.

65. Nothing contained in this Order shall constitute or be construed as an admission by Respondent with respect to any factual finding or legal determination. However, Respondent agrees not to contest the authority or jurisdiction of the Regional Administrator of EPA Region II to issue this Order, and

also agrees not to contest the validity or terms of this Order in any action to enforce its provisions. Further, by consenting to this Order, Respondent waives any right it may have to seek reimbursement pursuant to Sections 106(b)(2), 111 and/or 112 of CERCLA for the response costs incurred by it in complying with this Order.

U.S. ENVIRONMENTAL PROTECTION AGENCY

WILLIAM J. MUSZYNSKI, P.E.
Acting Regional Administrator
U.S. Environmental Protection Agency
Region II

9-25-89
Date of Issuance

CONSENT

The Respondent identified below has had an opportunity to confer with EPA to discuss this Order. The Respondent hereby consents to the issuance of this Order and to its terms. Furthermore, the individual signing this Order on behalf of Respondent certifies that he or she is fully authorized to agree to the terms and conditions of this Order and to legally bind Respondent.

KADDIS MANUFACTURING CORPORATION

Ronald Iannucci
(signature)

Sept. 20, 1989
DATE

RONALD IANNUCCI
(printed name of signatory)

PRESIDENT
(title of signatory)

REFERENCE NO. 9

OIL & HAZARDOUS MATERIALS SPILL - FACT SHEET

REVIEWED BY
REGIONAL WATER ENGINEER________
REGIONAL ENGINEER______________
REGIONAL DIRECTOR______________

FILE: MATLACK TRUCKING
SPILL NUMBER: 85-1281
SPILL DATE: 85-06-18
SPILL TIME: 1450

REGIONAL NOTIFICATION
DATE: 85-06-18 TIME: 1450 WHO: VAL VELEY
CALLER: GARY BALL REPRESENTING: ENARCO MACHINE (716-624-3070)

INITIAL AGENCY NOTIFIED
DATE: TIME: WHO:
CALLER: REPRESENTING:

MATERIAL SPILLED: 1,1,1 TRICHLOROETHANE
QUANTITY SPILLED: <50 GALS ; LOST: RECOVERED:
LOCATION: ENARCO MACHINE PRODUCTS, 175 BRAGG (AT MARTIN ST)
TOWN: LIMA COUNTY: LIVINGSTON
RESOURCE AFFECTED: GROUND DRAINAGE AREA:
EXTENT OF SPILL: IN SOIL UNDER TANK
WEATHER AND WATER CONDITIONS: DRY
PROBABLE SOURCE OR CAUSE OF SPILL: MATLACK TANK TRUCK OVERFILLED A 1000 GALLON ABOVEGROUND STORAGE TANK AT ENARCO. TANK INTIALLY HAD 180 GALLONS AND 700 WAS ORDERED. TANKER HAD 1386 GALLONS, 620GALS REMAINED IN COMPARTMENT AFTER DELIVE

NOTIFICATION

DOT	DATE:	TIME:	WHO:
LOCAL UNIT	DATE:	TIME:	WHO:
OIL/HAZMAT LINE	DATE:	TIME:	WHO:

CONTAINMENT ACTION: ENARCO PERSONNEL DUG OUT CONTAMINATED SOIL AND SPREAD IT O FLAT ON PARKING LOT TO DRY OUT IN STRONG WINDS. FOLLOWUP AT 2000 SHOWED
CLEANUP ACTION: ADDITIONAL BLACK PRODUCT WHICH MANAGER WAS ADVISED TO REMOVE. DAVE KISER ADVISED SAME ON SUBSEQUENT VISIT ADVISED ADDITIONAL SOIL REMOVED.

PERSONNEL ON SCENE: PAUL LINDENFELSER, DAVE KISER, DEC

VIOLATIONS AND LEGAL ACTION:

PENALTY COLLECTED:
---NOTES---; MATLACK TRACTOR, AA-10777 (PA), TRAILER, TH-57831 (PA) LEE SCANDRELL, DRIVER

REPORT SUBMITTED BY: JIM COOKE DATED: 85/06/[illegible]

TO: Charles Dolan

1 of 1

REFERENCE NO. 10

FILE.

REMOVAL ACTION FACT SHEET (2/26/93)
NORTH BLOOMFIELD
TOWN OF LIMA, LIVINGSTON COUNTY, NEW YORK

REGION: II
ESTIMATED PROJECT COST: $760,000
INCIDENT CATEGORY: Groundwater contamination

NPL: No
OSC: Pane/Rotola Agnihotri/ Hensley/ Makarewicz/ Shaw

START DATE: December 2, 1985 (PRP) November 26, 1990
COMPLETION DATE: June 3, 1988 February 26, 1991

INCIDENT DESCRIPTION:
Potable water wells, at the North Bloomfield site, were found to be contaminated with Volatile Organic Compounds (VOCs). One industry and 33 residences were identified as being in the affected area.

The USEPA officially recognized two potentially responsible parties (PRPs): Enarc-O-Machine Products, Inc., and its parent company, Kaddis Manufacturing Corporation. The PRPs denied resposibility. The highest contamination found was at the Enarc-O-Machine Products, Inc. facility.

MATERIALS:
VOCs--the contaminant of highest concentration was trichloroethylene (1,800 ppb). Other contaminants are 1,1-trichloroethane, trans 1,2-dichloroethene, 1,1,2-trichloroethane and tetrachloroethylene in the well water.

THREATS:
Direct exposure to VOCs through ingestion and inhalation.

ACTIONS:
Bottled water delivery was initiated on December 2, 1985, and was maintained until a permanent supply of safe drinking water was provided. The installation of a water main in the affected area and area at risk began on July 13, 1987.

Due to the presence of a highly resistant dolomitic rock formation, the progress slowed, requiring additional time and funds for completion of the project. A ceiling increase was submitted for $289,100 and was approved on January 19, 1988. Its approval raised the existing ceiling of $553,000 to $842,100.

A total of 4,700 linear feet of water main, nine fire hydrants and 34 service connections were installed, providing a permanent potable water supply to the affected 33 homes and one industry.

The USEPA then began enforcement actions to recover the funds expended during the Removal Action. An Administrative Order on Consent was issued on September 25, 1989 requiring the PRPs to perform a testing program to verify whether they had indeed caused the contamination.

This program included the construction of test wells and the sampling thereof.

The PRPs performed investigative work designed to determine, among other things, the hydrogeologic setting of their facility and the nature and extent of contamination of soil and groundwater at the facility and to determine whether releases at or from their facility were the source of the volatile organic groundwater contamination in the area. Upon completion of the investigative work, a Draft Report was issued to the EPA and after modifications was accepted. The Draft Report and all previous evidence confirmed that the PRPs were the source of the groundwater contamination.

PRESENT STATUS:
The removal actions are complete and no further removal activity is anticipated. OSC Report for the construction of the water main was issued on September 23, 1991.

All actions stipulated in the original Action Memorandum and in the Administrative Order on Consent have been successfully completed.

The Region 2 of the USEPA and US Attorneys reached a settlement with the PRPs in a cost recovery case. The settlement provides for the reimbursement of approximately $1 million in emergency response costs incurred by the government at the North Bloomfield Site.

New York State is pursuing an RI/FS.

REFERENCE NO. 11

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DEC 19 1985

North Bloomfield, Town of Lima, NY Action Memorandum - Bottled Water Supply

Joseph Rotola, Environmental Scientist
Response and Prevention Branch

File

The intent of this memo is to explain a variance for the action memorandum approved by William Librizzi on Nov. 27, 1985 which addresses the supply of bottled water to residents of North Bloomfield, NY.

Regional management decisions concerning provisions of bottled water to potential responsible parties has concluded that neither Enarc-O-Machine Co. or Crane's Collision should receive bottled water at this time.

cc: W. Librizzi, 2ERR
F. Rubel, 2ERR-RP
G. Pavlou, ERR-NYCRA
S. Luftig, 2ERR-DD
W. Hugdan, ORC-WTS
J. Marshall, 2OEP
G. Zachos, 2ERR-RP
V. Pitruzzello, 2ERR-SIC
M. Mjoness, WH-548B

1 of 2

CONCURRENCES

FILE: North Bloomfield, Town of Lima

2ERR:RP:ROTOLA:340-6739:DI:12/9&17/85:#4

SYMBOL	2ERR-RP	2ERR-RP	2ER-RP					
SURNAME	Rotola	Zachos	Rubel					
DATE		H.N. Zachos 12/17/85	12/17/85					

EPA Form 1320-1 (12-70)

OFFICIAL FILE COPY

*U.S. GPO : 1984-436-836

BOTTLED WATER LIST

No.	Name	Address
1	Boonstra	#7859 Martin Road
2	Bush	#7787 Martin Road
3	Cavalier	#7865 Martin Road
4	Chambers	#1091 Ideson Road
5	Colavito	#1090 Ideson Road
6	Cooper	#1121 Ideson Road
7	Endicott	#1108 Ideson Road
8	Fessler	#7783 Martin Road
9	Freedman	#1147 Ideson Road
10	Garvey	#7883 Martin Road
11	Ghoatlaw	#7808 Martin Road
12	Hart	#1111 Ideson Road
13	Hopkins	#7852 Martin Road
14	Johnson	#1129 Ideson Road
15	Johnson	#7820 Martin Road
16	Maloy	#1116 Ideson Road
17	Miller	#1081 Ideson Road
18	O'Brien	#7801 Martin Road
19	Reano	#1146 Ideson Road
20	Rogers	#7880 Martin Road
21	Sackett	#1140 Ideson Road
22	Saunders	#7838 Martin Road
23	Shellman	#1154 Ideson Road
24	Vacant	#1110 Ideson Road
25	Smith	#1167 Bragg Street
26	Swanger	#7750 Martin Road
27	Tompkins	#1155 Ideson Road
28	Tondryk	#1191 Bragg Street
29	Vellekoop	#7886 Martin Road
30	Yearas	#7873 Martin Road
31	Slade	#7796 Martin Road
32	Neverett	#7829 Martin Road

2 of 2

REFERENCE NO. 12

JUL 29 1986

EXPRESS MAIL

Richard S. Mayberry, Esq.
Mayberry, Licht & Goldman
Suite 800
47 South Fitzhugh Street
Rochester, N.Y. 14614-2280

Re: North Bloomfield Action Memorandum

Dear Mr. Mayberry:

This is to confirm that on June 11, 1986, the Regional Administrator of Region II of the U.S. Environmental Protection Agency (EPA) signed an Action Memorandum calling for the installation of water mains and residential hookups to provide the residences threatened by the volatile organic groundwater contamination in North Bloomfield, Town of Lima, New York with a permanent, safe alternative source of drinking water. As was noted in the Action Memorandum, however, EPA cannot carry out this project until funds for its implementation become available. In the meantime, EPA will continue to provide bottled water to the residences at risk.

Sincerely yours,

Paul Simon
Assistant Regional Counsel
New York/Caribbean Superfund Branch
Office of Regional Counsel

bcc: Charles Dolan, 2ERRD-SIC
Joseph Rotola, 2ERRD-RP

1 of 1

REFERENCE NO. 13

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF NEW YORK

UNITED STATES OF AMERICA, Plaintiff, v. KADDIS MANUFACTURING CORP.; COUNTRY LANE ASSOCIATES; RONALD IANNUCCI; REGINA IANNUCCI; THOMAS A. SOLBERG; and MICHAEL TEDESCHI, Defendants.	CIVIL ACTION NO. 91-CV-6213

CONSENT DECREE

This Consent Decree ("Decree") is entered into by and between Plaintiff United States of America ("United States") and Defendants Kaddis Manufacturing Corp., Country Lane Associates, Ronald Iannucci, Regina Iannucci, Thomas A. Solberg, and Michael Tedeschi (collectively "Settling Defendants").

The United States, on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), filed a Complaint in this action concurrently with the lodging of this Consent Decree, alleging that the Settling Defendants are jointly and severally liable to the United States, pursuant to Section 107 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §9607, for costs incurred by the United States in responding to the release or threat of release of hazardous substances at the North Bloomfield Site (the "Site").

Between 1985 and 1988, EPA conducted two removal actions at the Site pursuant to Section 104 of CERCLA, 42 U.S.C. §9604. These removal actions included, inter alia, the provision of bottled water and the extension of a municipal water main so as to provide residences at the Site with an alternate supply of water.

The objective of this Decree is to settle the United States' claims against the Settling Defendants under Section 107 of CERCLA for the reimbursement of Response Costs, as defined herein, incurred by the United States at the Site prior to and including September 23, 1989.

The parties have entered into this decree in good faith to avoid expensive and protracted litigation and to settle the claims raised by the United States in this action. The parties agree that settlement of this action is in the public interest.

Settling Defendants deny any and all legal or equitable liability under any federal, state or local statute, regulation, ordinance, or common law for any response costs, damages or claims caused by or arising out of conditions at or arising from the Site. By entering into this Decree, or by taking any action in accordance with it, Settling Defendants do not admit any allegations contained herein or in the complaint, nor do Settling Defendants admit liability for any purpose or admit any issues of law or fact or any responsibility for the alleged release or threat of release of any hazardous substance into the environment.

NOW, THEREFORE, before adjudication of the merits of this case and with the consent of the parties to this Decree, it is ORDERED, ADJUDGED, AND DECREED as follows:

I. JURISDICTION

This Court has jurisdiction over the subject matter of this action and over the parties to this Decree, pursuant to 28 U.S.C. §§1331, 1345 and 1391(b) and Section 113(b) of CERCLA, 42 U.S.C. §9613(b). The Complaint states a claim upon which the Court may grant relief. Settling Defendants waive any objection they may have to the jurisdiction of the Court or to venue for the purpose of entry, enforcement, or modification of this Consent Decree. Settling Defendants waive service of summons.

II. PARTIES BOUND

A. This Decree shall apply to and be binding upon the Settling Defendants, their directors, officers, employees, agents successors in interest, assigns, receivers and trustees and upon all firms, subsidiaries, divisions, affiliates, parent corporations, and all corporations acting under or for them. This Decree also is binding upon the United States on behalf of EPA.

B. Until termination of this Decree, each Settling Defendant agrees to provide its successors and assigns written notice of this Consent Decree and to provide notice to EPA, in accordance with Section VII, of such successorship or assignment.

C. Each undersigned representative of Settling Defendants certifies that he or she is fully authorized to enter into this Decree, to execute this Decree, and to bind that party to this Decree.

III. DEFINITIONS

The following definitions shall apply in this Decree:

A. "Response Costs" shall mean all costs and expenses incurred by the United States pursuant to Section 104 of CERCLA, 42 U.S.C. §9604, prior to and including September 23, 1989, whether known or unknown, with respect to the North Bloomfield Site, including, but not limited to, all direct and indirect costs and expenses incurred (including administrative, investigative, legal expenses and attorneys' fees and overhead) and pre-judgment interest thereon, in connection with the provision of bottled water to residents of the Site and the extension of a municipal water main so as to provide residences at the Site with an alternative supply of water.

B. "North Bloomfield Site" or "Site" shall refer to the manufacturing plant operated by the Kaddis Manufacturing Corp., located at 1175 Bragg Street in the Town of Lima, New York, and the surrounding area.

C. Titles of sections in this Consent Decree are for convenience only and neither limit, amplify, nor construe the provisions of this Consent Decree.

D. Terms not otherwise defined herein shall have their ordinary meaning unless defined at Section 101 of CERCLA, 42 U.S.C. §9601, or in the National Contingency Plan ("NCP"), 40 C.F.R. Part 300, in which case the definition in Section 101 or the NCP shall control.

IV. REIMBURSEMENT OF RESPONSE COSTS

A. The Settling Defendants shall pay to the United States the sum of nine-hundred and eighty-three thousand, seven hundred and fifty-eight dollars and ninety-eight cents ($983,758.98) within thirty (30) days of entry of this Decree.

Payments made pursuant to this Section shall be made by certified or cashier's check payable to the "EPA Hazardous Substance Superfund" and shall be transmitted by certified mail, return receipt requested, to the following address:

U.S. Environmental Protection
Agency - Region II
Attention: Superfund Accounting
P.O. Box 360188M
Pittsburgh, PA 15251

A notice shall accompany the transmittal of such payment which shall state that it pertains to the North Bloomfield Site and shall include the case name, the court, the civil action number, the Department of Justice file number (#90-11-3-777), and the name of each Settling Defendant on whose behalf the payment of the amount specified in this Section has been made. Any Settling Defendant whose name does not appear on said notice shall not be deemed to have resolved its liability to the United States within the meaning of Section 113(f) of CERCLA, nor shall any such Settling Defendant receive the benefit of the Covenant Not to Sue contained in Section V. Copies of the check and transmittal notice shall be concurrently transmitted to the court and to counsel for the United States identified in Section VII.

B. The Settling Defendants represent that the contributions that each of them will make pursuant to this settlement have been separately agreed upon by the Settling Defendants. The United States is not a party to and does not approve or disapprove of any allocation agreed upon by the Settling Defendants. The Settling Defendants are jointly and severally liable for making the payments required by this Section. Any claims or agreements among the Settling Defendants or between the Settling Defendants and their insurers are not governed by this Decree.

C. If payment is not received on or before the due date, interest shall be assessed at the annual rate established pursuant to 31 U.S.C. §3717 on the overdue amount from the due date given in this Consent Decree through the date of payment. A penalty of up to 6% per annum also may be applied on any principal amounts not paid within ninety (90) days of the due date, which penalty will be charged for the entire period after the due date. After a failure by the Settling Defendants to make payment as required by this Decree, Settling Defendants shall be liable for all litigation and other enforcement costs incurred by the United States to enforce this Decree or otherwise obtain such payment.

V. COVENANT NOT TO SUE

A. In consideration of the entry of this Decree, the Settling Defendants covenant not to assert any claims or demands against the United States that seek to recover or recoup any sums paid under this Decree for Response Costs, as defined herein. Further, Settling Defendants agree not to assert any causes of action, claims or demands against the United States for reimbursement from the EPA Hazardous Substance Superfund, 26 U.S.C. §9507, including claims pursuant to Sections 111 and 112 of CERCLA, 42 U.S.C. §§9611 and 9612, for Response Costs at the North Bloomfield Site, or assert any other claims or demands for sums paid in settlement of this matter.

B. Upon payment of the amount specified in Section IV, the United States agrees not to take further civil judicial or administrative action against the Settling Defendants for reimbursement of Response Costs, as defined herein.

C. This covenant not to sue shall not extend to any persons or legal entities other than the Settling Defendants.

D. Upon receipt by the United States of the payment required by Section IV, the Settling Defendants will have resolved their liability to the United States for the Response Costs, as defined herein, and pursuant to CERCLA §113(f), shall not be liable for claims for contribution for Response Costs as so defined.

E. Nothing in this Consent Decree shall be deemed to constitute a preauthorization of a CERCLA claim within the meaning of 40 C.F.R. §300.700(d).

F. Settling Defendants hereby agree to pay their own attorneys' fees and costs that have been incurred in this action.

VI. RESERVATION OF RIGHTS

A. Notwithstanding any other provision of this Consent Decree, the United States retains all authority and reserves all rights to take any and all response actions authorized by law.

Except as provided in Section V, the United States reserves all claims, demands, and causes of action, past or future, judicial or administrative, in law or equity, including but not limited to, cost recovery and injunctive relief and natural resource damages, against any person or entity, including Settling Defendants. Except as provided in Section V, nothing contained herein shall in any way limit or restrict the response and enforcement authority of the United States to initiate appropriate action, either judicial or administrative, under Sections 104, 106 and 107 of CERCLA, 42 U.S.C. §§9604, 9606 and 9607, or any other provision of law, against Settling Defendants or against any other person or entity not a party to this Decree. Any claim or defense which the Plaintiff or Settling Defendants may have against any other person or entity not a party to this

Decree, including but not limited to claims for indemnity or contribution, is expressly reserved.

B. The United States' covenant not to sue shall not apply, inter alia, to the following:

1) claims based upon failure of Settling Defendants to meet the requirements of this Consent Decree;

2) liability for damages to natural resources, as defined in Section 101(6) of CERCLA, 42 U.S.C. §9601(6);

3) claims based upon criminal liability;

4) liability for costs incurred by the United States in connection with the North Bloomfield Site on or after September 23, 1989; or,

5) liability for any matter not covered by this Consent Decree.

C. In any subsequent administrative or judicial proceeding initiated by the United States for injunctive relief, recovery of response costs or other appropriate relief relating to the release or threatened release of hazardous substances into the environment at the North Bloomfield Site, the Settling Defendants shall not assert that the United States is in any manner precluded or barred from instituting such an action by the principles of res judicata or rules against claim splitting. In addition, Settling Defendants waive the right to contest the validity or terms of this Consent Decree.

VII. NOTICES

Whenever, under the terms of this Consent Decree, written notice is required to be given to the United States, it shall be directed to the following addresses:

As to the EPA:

Chief, New York/Caribbean Superfund Branch
Office of Regional Counsel
United States Environmental Protection Agency
Region II
26 Federal Plaza, Room 437
New York, NY 10278

Attn: Douglas Fischer

As to DOJ:

Chief, Environmental Enforcement Section
Environment & Natural Resources Division
Department of Justice
P.O. Box 7611
Ben Franklin Station
Washington, D.C. 20044

Attn: Gregory Jaffe

VIII. EFFECTIVE DATE

This Consent Decree is effective upon the date of its entry by the Court.

IX. RETENTION OF JURISDICTION

The Court shall retain jurisdiction of this matter for the purpose of enforcing the terms of this Decree.

X. TERMINATION AND SATISFACTION

Upon receipt by the United States of the payment required by Section IV, Settling Defendants shall have satisfied their obligations under this Decree and the Decree shall terminate, provided that the termination shall not alter the provisions of Section V (Covenant Not to Sue) and Section VI (Reservation of Rights) and such other continuing rights of the United States and the Parties Bound by this Decree.

Dated and entered this 31 day of May, 1991.

David G. Larimer

UNITED STATES DISTRICT JUDGE

WE HEREBY CONSENT to the entry of this Decree:

FOR THE UNITED STATES OF AMERICA:

5-30-91
Date

RICHARD B. STEWART
Assistant Attorney General
Environment and Natural Resources
Division
U.S. Department of Justice

5/23/91
Date

Gregory Jaffe
Environmental Enforcement Section
U.S. Department of Justice
P.O. Box 7611
Ben Franklin Station
Washington, DC 20044

DENNIS VACCO
United States Attorney
Western District of New York

5/31/91
Date

CHRISTOPHER V. TAFFE
Assistant United States Attorney
Western District of New York
233 U.S. Courthouse
100 State Street
Rochester, New York 14614

MAY 22 1991

Date

CONSTANTINE SIDAMON-ERISTOFF
Regional Administrator
U.S. Environmental Protection
Agency
Region II
26 Federal Plaza
New York, NY 10278

FOR SETTLING DEFENDANTS:

5/24/91
Date

By: [signature]
Ronald Iannucci, President
KADDIS MANUFACTURING CORPORATION

5/24/91
Date

By: [signature]
Ronald Iannucci, Partner, on behalf of
COUNTRY LANE ASSOCIATES

5/24/91
Date

By: [signature]
Ronald Iannucci, Partner
COUNTRY LANE ASSOCIATES

5/22/91
Date

By: [signature]
Regina Iannucci, Partner
COUNTRY LANE ASSOCIATES

5/23/91
Date

By: [signature]
Thomas A. Solberg, Partner
COUNTRY LANE ASSOCIATES

5/22/91
Date

By: [signature]
Michael Tedeschi, Partner
COUNTRY LANE ASSOCIATES

REFERENCE NO. 14

DEC 0 8.
Simo:

City of Rochester

Department of
Environmental Services

Office of the Commissioner
City Hall
30 Church Street
Rochester, New York 14614

November 25, 1986

Paul Simon, Esq.
U.S. Environmental Protection Agency
26 Federal Plaza
New York, N.Y. 10278

Re: Proposed Lima District No. 1

Dear Mr. Simon:

On October 4, 1986, James E. Malone, former Commissioner of Environmental Services offered to recommend to our City Council that the City should contract to sell potable water to the Ideson and Martin Road area within the Town of Lima. This water would be available from Conduit I which is owned by the City of Rochester and crosses Martin Road about 700 feet west of Ideson Road.

The Monroe County Water Authority also has a potable water supply on Bloomfield Road (Route 65) in West Bloomfield. The Authority has agreed to sell supplemental water to the City from this supply, for resale to the customers in Lima and they have further agreed that they will not oppose the City's providing the water supply for this Ideson-Martin Road area.

Therefore, The City of Rochester can provide the only public water supply within a feasible distance from the Ideson-Martin Road area.

Sincerely,

Edward Doherty
Commissioner of Department of
Environmental Services

ED:RCM:ma

1 of 1

REFERENCE NO. 15

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-377

Date: October 3, 1994 Time: 10:25 AM ☑ PM ☐

Outgoing Call

To: Brenda Greene (716) 346-5568
Telephone No.

Affiliation: Livonia Town Water Department

Malcolm Pirnie Staff: Warren K. Parry (WKP) (609) 860-0100
Telephone No.

Summary of Conversation:

I spoke with Ms. Greene concerning the water system for the Town of Livonia. The following communities receive water from Rochester:

Hemlock;
South Livonia;
Livonia Center; and
Village of Livonia.

Lakeville and Tuxedo Park both receive water from Conesus Lake, however, they will be on the Rochester water system in the spring. Approximately 685 people are served by the system on Conesus Lake. The intake is located between Gray Shores and Pebble Beach Road on the west side of the lake. The water is chlorinated prior to distribution. It is tested and they have never had any problems with the water.

There are other communities along the lake that may use lake water, and may have their own intakes. Ms. Greene said there is no way to determine who withdraws water privately. However, she believes most people are on Rochester's system.

Ms. Greene also suggested calling the Village of Livonia to see if they have information on wells or these smaller communities.

REFERENCE NO. 16

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 19, 1994 Time: 11:58 AM ☐ PM ☐

Outgoing Call

To: Linda Banfield (716) 624-2210
Telephone No.

Affiliation: Village of Lima Clerk's Office

Malcolm Pirnie Staff: Warren K. Parry] WKP (609) 860-0100
Telephone No.

Summary of Conversation:

I called the Village to see if they were on public or well water. They are supplied by Rochester water up to the Village Limits.

REFERENCE NO. 17

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 19, 1994 Time: 1:05 AM ☐ PM ☑

Outgoing Call

To: Gregg Wysocki (716) 442-2000
Telephone No.

Affiliation: Monroe County Water Authority

Malcolm Pirnie Staff: Warren K. Parry (609) 860-0100
Telephone No.

Summary of Conversation:

I called Gregg to determine the limits of the Monroe County Water Authority (MCWA) district. He indicated that the Town of Mendon and the Village of Honeoye Falls are both supplied by MCWA water. This includes areas such as Sibleyville, Tomlinson Corners, and Rochester Junction. MCWA also services the area of North Bloomfield on the east side of Honeoye Creek. Their water main runs just beyond the intersection of Quaker Meeting-house Road and Route 65. Additionally, the MCWA also services Rush. The MCWA obtains its water from Lake Ontario, and from Rochester City conduits from Hemlock Lake.

REFERENCE NO. 18

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 19, 1994 Time: 1:30 AM [ ] PM [✓]

Outgoing Call

To: Town Clerk (716) 624-2914
Telephone No.

Affiliation: Town of West Bloomfield

Malcolm Pirnie Staff: Warren K. Parry (609) 860-0100
Telephone No.

Summary of Conversation:

The Town of West Bloomfield is served by water from Hemlock Lake. There is also some MWCA water blended into the system. This is the only major community southeast of the site.

REFERENCE NO. 19

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 19, 1994 Time: 1:46 AM [] PM [✓]

Outgoing Call

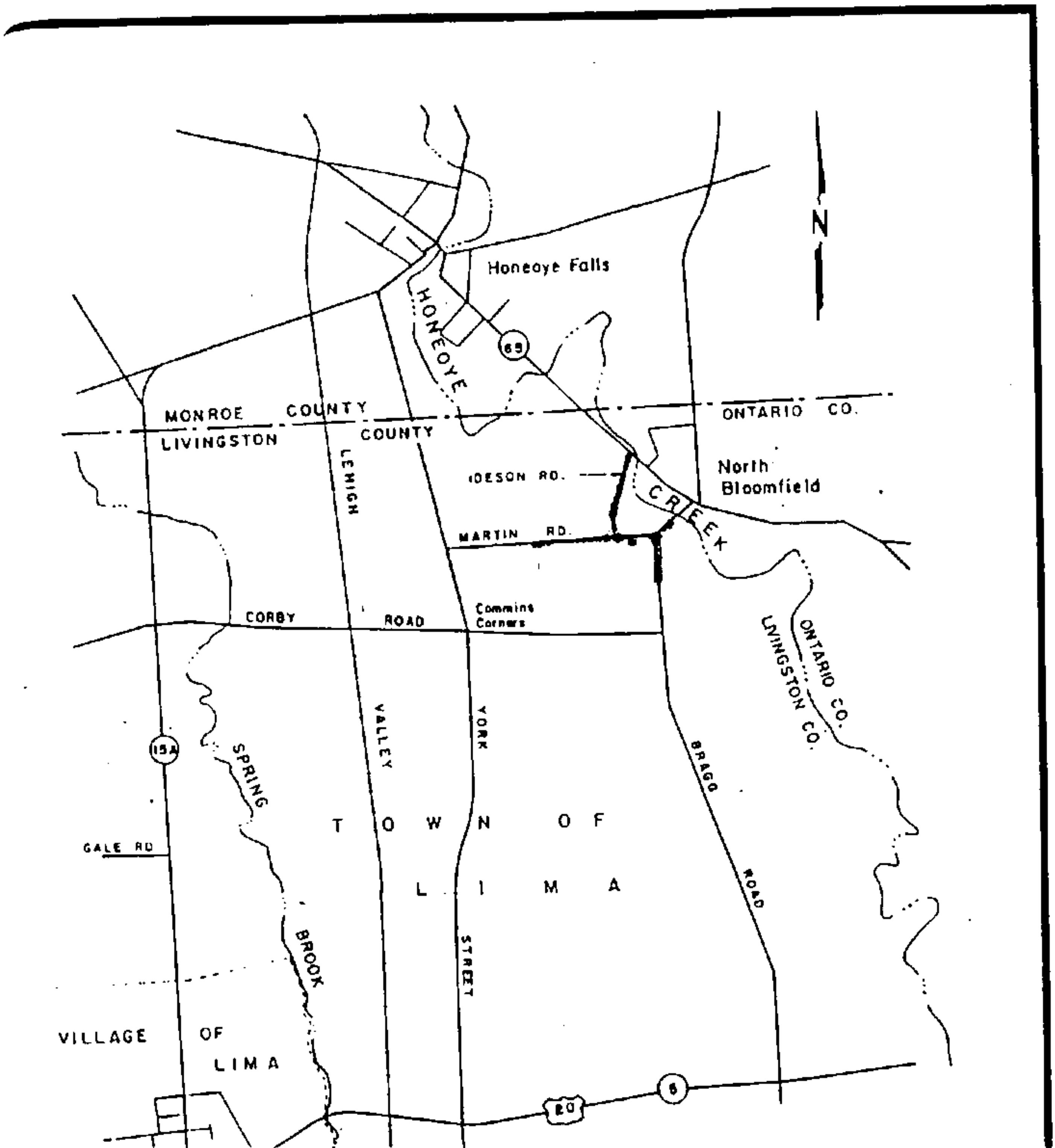
To: Ralph VanHouten (716) 243-7270
Telephone No.

Affiliation: Livingston County Health Department

Malcolm Pirnie Staff: Warren K. Parry (609) 860-0100
Telephone No.

Summary of Conversation:

Mr. VanHouten indicated that the area of North Bloomfield served by Rochester water is correct as indicated by the dark lines on the attached map. Those who live on York Road and south on Bragg Street are on well water. There are no surface water intakes on Honeoye Creek in Livingston County.



N
Honeoye Falls
HONEOYE
69
MONROE COUNTY
ONTARIO CO.
LIVINGSTON COUNTY
LENIGH
IDESON RD.
North Bloomfield
CREEK
MARTIN RD.
CORBY ROAD
Commins Corners
ONTARIO CO.
LIVINGSTON CO.
VALLEY
YORK
15A
SPRING
BRAGG
TOWN OF LIMA
GALE RD
ROAD
BROOK
STREET
VILLAGE OF LIMA
6
20

REFERENCE NO. 20

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 19, 1994 Time: 2:35 AM [] PM [✓]

Outgoing Call

To: George Fedoriw (716) 274-6000
Telephone No.

Affiliation: Monroe County Health Department

Malcolm Pirnie Staff: Warren K. Parry (609) 860-0100
Telephone No.

Summary of Conversation:

I called Mr. Fedoriw to find out if there were any surface water intakes on Honeoye Creek in Monroe County. There are no surface water intakes. All water is supplied by Lake Ontario, Conesus Lake, or Hemlock Lake.

REFERENCE NO. 21

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 20, 1994 Time: 9:48 AM [] PM []

Outgoing Call

To: Eunice (716) 428-7568
Telephone No.

Affiliation: Rochester Water Works - Engineering Department

Malcolm Pirnie Staff: Warren K. Parry WKP (609) 860-0100
Telephone No.

Summary of Conversation:

I called the RWW to confirm their source of water. Their main source is Hemlock Lake, however, they do use some water from Lake Ontario.

REFERENCE NO. 22

TITLE:
FIFTEEN–MILE SURFACE WATER PATHWAY MAP

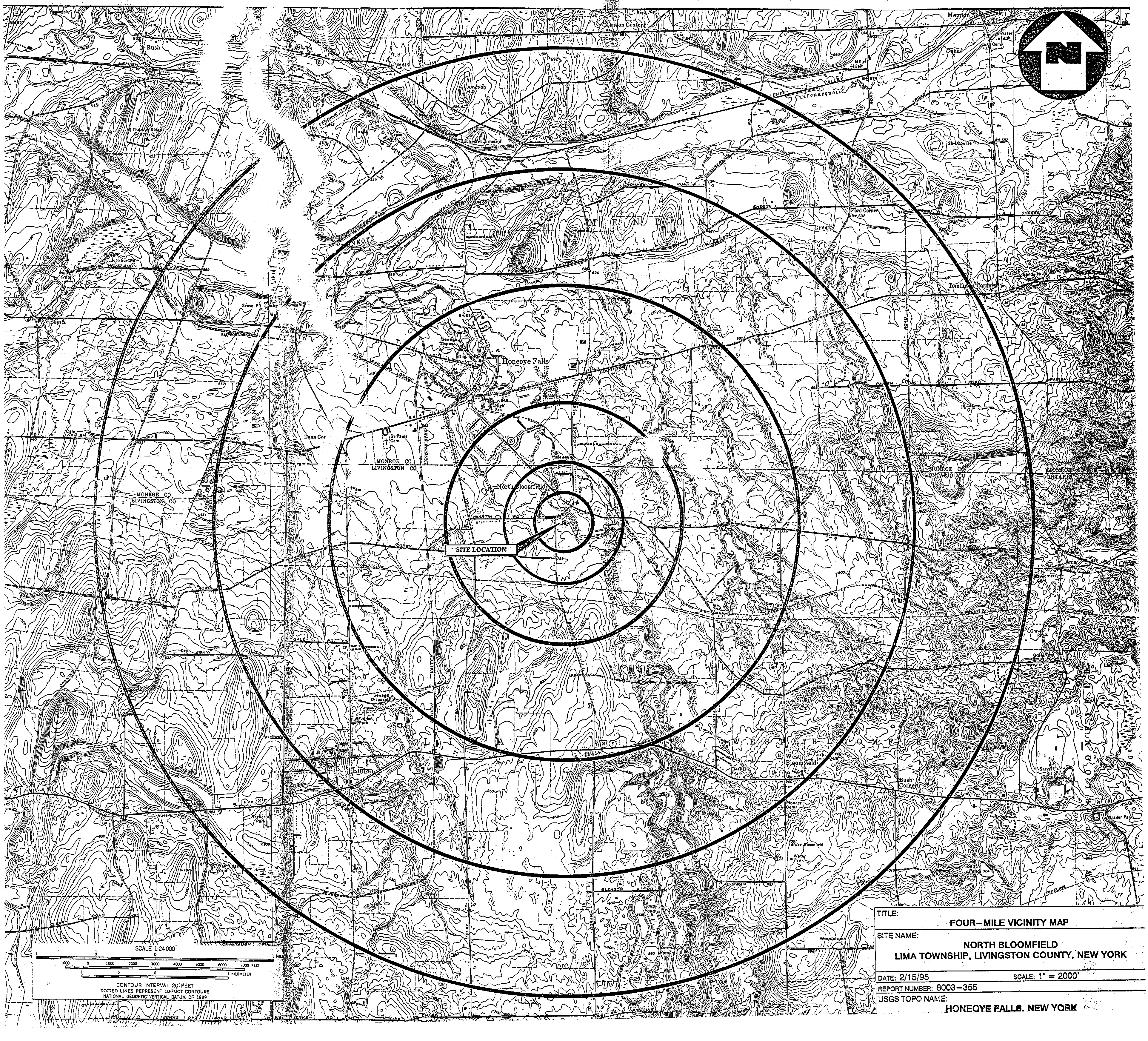
SITE NAME:
NORTH BLOOMFIELD
LIMA TOWNSHIP, LIVINGSTON COUNTY, NEW YORK

DATE: 1/5/95 SCALE: 1" = 2000'

REPORT NUMBER: 8003-355

USGS TOPO NAME:
HONEOYE FALLS, NEW YORK

REFERENCE NO. 23



TITLE:

FOUR–MILE VICINITY MAP

SITE NAME:

NORTH BLOOMFIELD
LIMA TOWNSHIP, LIVINGSTON COUNTY, NEW YORK

DATE: 2/15/95 | SCALE: 1" = 2000'

REPORT NUMBER: 8003–355

USGS TOPO NAME:

HONEOYE FALLS, NEW YORK

REFERENCE NO. 24

MALCOLM PIRNIE, INC.	PROJECT NOTE

TO:	Project File	**DATE:**	December 21, 1994
FROM:	Warren K. Parry	**PROJECT #:**	8003-355
SUBJECT:	Stream Flow Rates	**SITE NAME:**	North Bloomfield Site

This project note summarizes information contained in the USGS Water-Data Report NY-90-3 (Attached).

USGS gauging station 04229500 is located on Honeoye Creek, at Honeoye Falls, NY. The mean flows for this gauging station for water years 1989 and 1990 are 122 and 163 cubic feet per second (cfs), respectively. The average, therefore, over the two years is 143 cfs. This gauging station is approximately 2.5 miles down the 15-mile surface water pathway.

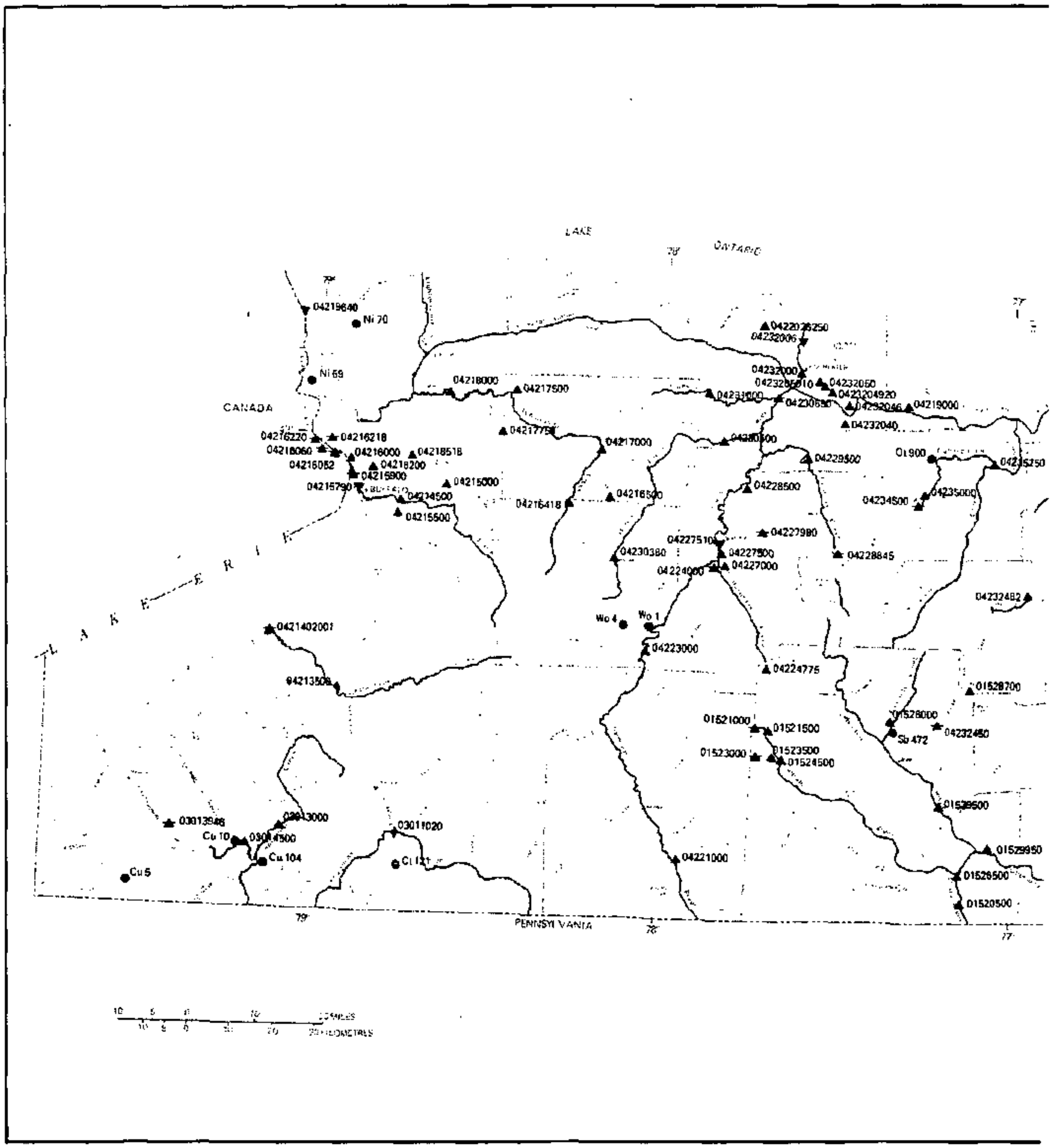
Stream flow rates are also recorded in the Site Assessment report prepared by O'Brien and Gere, dated May 1991. The recorded stream flow rates were 110.6, 251.6, and 286.3 cfs. The average flow is therefore 216.17 cfs. The flow for Honeoye Creek is assumed to be between 143 and 216 cfs.

Water Resources Data New York Water Year 1990

Volume 3. Western New York

by J.B. Campbell, C.O. Szabo, D.A. Sherwood, and D.D. Deloff

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NY-90-3
Prepared in cooperation with the State of New York
and with other agencies



Base from U.S. Geological Survey
State base map
Shaded relief, 1:500,000, 1956

FIGURE 1.-- LOCATION OF GAGING STATIONS AND

04229500 HONEOYE CREEK AT HONEOYE FALLS, NY

LOCATION.--Lat 42°57'26", long 77°35'21", Monroe County, Hydrologic Unit 04130003, on right bank 25 ft downstream from bridge on State Highway 65 at Honeoye Falls, and 15.3 mi upstream from mouth.

DRAINAGE AREA.--196 mi^2.

PERIOD OF RECORD.--October 1945 to September 1970, October 1972 to current year.

REVISED RECORDS.--WSP 2112; WDR NY-82-3: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 610.00 ft above National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1970, water-stage recorder at same site at datum 609.76 ft NGVD.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Outlet of Honeoye Lake not controlled (see station 04228845). Some diversion from and regulation of Hemlock and Canadice Lakes for water supply of city of Rochester. Diurnal fluctuation at low flow caused by mills upstream from station. Prior to 1967 water year, published monthly figures adjusted for change in contents in, and diversion from, Hemlock and Canadice Lakes. During low-water periods the village of Honeoye Falls pumps water from two deep wells with maximum pumping capacity of 600 gal/min (1.33 ft^3/s). This pumped water enters creek upstream from gage. Satellite gage-height telemeter at station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years (water years 1946-70, 1973-90), 123 ft^3/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,630 ft^3/s, Mar. 28, 1950, gage height, 6.42 ft, datum then in use, from rating curve extended above 2,700 ft^3/s by logarithmic plotting; minimum, 0.06 ft^3/s, Aug. 28, 1949.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 23, 1972, reached a stage of about 6.3 ft, current datum; discharge, about 6,600 ft^3/s, from rating curve extended above 2,700 ft^3/s by logarithmic plotting.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,750 ft^3/s, Apr. 11 at 1600 hours, gage height, 4.59 ft; minimum recorded, 5.0 ft^3/s, Sept. 25, 27, gage height, 0.29 ft, but may have been lower during period of no gage-height record July 19-Sept. 19.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1989 TO SEPTEMBER 1990
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	45	e56	e70	126	e140	130	125	160	20	e70	e9.0
2	12	52	e62	e80	435	e150	161	97	130	26	e60	e8.2
3	18	45	e60	e72	492	e200	414	86	116	24	e25	e6.4
4	36	44	e56	e90	401	e160	542	82	110	19	e16	e5.4
5	16	42	e52	e250	271	e130	709	186	96	20	e17	e9.0
6	11	41	e60	e200	246	e100	833	353	81	23	e20	e9.0
7	9.6	46	e54	e180	246	e82	714	241	73	20	e19	e12
8	9.2	66	e52	132	321	e74	590	204	63	16	e18	e9.0
9	8.7	79	e44	108	725	e80	611	173	61	19	e14	e8.2
10	8.2	106	e50	92	1030	e100	730	146	60	31	e12	e11
11	7.5	95	e46	e105	693	e160	2240	217	52	24	e9.8	e30
12	7.3	78	e42	e90	363	312	2160	190	47	16	e9.6	e15
13	7.6	66	e40	e82	269	323	1320	274	41	14	e9.2	e10
14	7.5	57	e35	e76	270	234	924	876	36	13	e12	e8.0
15	8.5	56	e31	e80	221	183	764	525	33	12	e24	e8.2
16	6.7	68	e35	e80	457	156	645	384	29	12	e16	e8.0
17	11	126	e42	165	1470	246	587	909	27	13	e13	e15
18	78	102	e40	295	1050	432	538	934	25	10	e9.0	e9.0
19	76	76	e38	252	565	250	457	670	26	e9.0	e8.4	e8.6
20	113	72	e37	163	388	235	403	530	27	e8.4	e9.2	7.2
21	262	169	e35	138	285	227	411	703	26	e10	e8.0	7.2
22	160	121	e33	127	335	210	441	623	26	e14	e11	7.0
23	94	e70	e31	127	785	188	336	501	27	e20	e11	6.3
24	66	e66	e28	145	e500	165	274	400	26	e25	e10	5.6
25	54	e62	e26	224	e300	148	243	325	27	e40	e9.0	5.2
26	48	69	e28	214	e200	135	243	272	25	e21	e8.0	5.6
27	43	81	e30	170	e170	122	239	239	20	e15	e7.0	5.7
28	39	e70	e32	140	160	110	217	206	17	e13	e6.2	7.5
29	36	e66	e33	117	---	106	205	182	16	e12	e6.0	6.1
30	34	58	e35	87	---	105	170	220	17	e11	e12	12
31	33	---	e44	132	---	127	---	207	---	e20	e10	---
TOTAL	1332.8	2194	1287	4283	12774	5390	18251	11080	1520	550.4	489.4	274.4
MEAN	43.0	73.1	41.5	138	456	174	608	357	50.7	17.8	15.8	9.15
MAX	262	169	62	295	1470	432	2240	934	160	40	70	30
MIN	6.7	41	26	70	126	74	130	82	16	8.4	6.0	5.2

CAL YR	1989	TOTAL 44581.0	MEAN	122	MAX	1420	MIN	3.1
WTR YR	1990	TOTAL 59426.0	MEAN	163	MAX	2240	MIN	5.2

e Estimated

REFERENCE NO. 25

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 20, 1994 Time: 2:10 AM [] PM []

Outgoing Call

To: Gardiner Cross (518) 457-3373
Telephone No.

Affiliation: NYSDEC Remedial Action Group

Malcolm Pirnie Staff: Warren K. Parry (609) 860-0100
Telephone No.

Summary of Conversation:

I called Mr. Cross to determine the type of work being conducted in conjunction with their RI/FS. According to Mr. Cross, the RI/FS was begun in April, 1994, and is primarily focused on the Enarc-O-Machine Products property, and not with the off-site wells. They are looking at the off-site wells to determine where the contamination plume is at present. He indicated that an Interim Technical Memorandum was written and submitted to the EPA by O'Brien and Gere. Mark Grainger, the USEPA project manager (212-264-9588) should have a copy of this report. He also suggested that the plume probably is entering Honeoye Creek, however, most likely through rock faces of water falls. This would greatly increase the volatilization. He also indicated that the aquifer in this area exhibits some semi-karst characteristics. There are some definite limestone formations below the site.

REFERENCE NO. 26

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 20, 1994 Time: 2:15 AM [] PM [✓]

Outgoing Call

To: Mark Grainger (212) 264-9588
Telephone No.

Affiliation: USEPA Federal Plaza

Malcolm Pirnie Staff: Warren K. Parry (609) 860-0100
Telephone No.

Summary of Conversation:

I called Mr. Grainger to see if he could get me a copy of the Interim Technical Memorandum prepared by O'Brien and Gere. He told me that he could get it, but I should talk to the project manager at NYSDEC. I told him I spoke with Gardener Cross. He told me Mr. Cross is not the project manager, but a hydrogeologist. The project manager is David Shazano. He also told me the report I'm talking about didn't investigate soil, but investigated groundwater.

REFERENCE NO. 27

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-355

Date: December 20, 1994 Time: 3:12 AM ☐ PM ☑

Incoming Call

From: David Shazano (518) 457-9280
Telephone No.

Affiliation: NYSDEC Construction Division

Malcolm Pirnie Staff: Warren K. Parry (609) 860-0100
Telephone No.

Summary of Conversation:

Mr. Shazano returned my call concerning the North Bloomfield site. He is no longer project manager, but does have extensive knowledge concerning what was done. He indicated to me that the Technical Memorandum is the report I'm looking for. He does believe there were some soil samples collected during that time. I should be able to get a copy of that from the USEPA. Mr. Shazano also indicated that the RI/FS currently being conducted is being done through a consent order with Enarc-O-Machine Products. The facility is the primary concern for this RI/FS.

REFERENCE NO. 28

INTERIM TECHNICAL MEMORANDUM

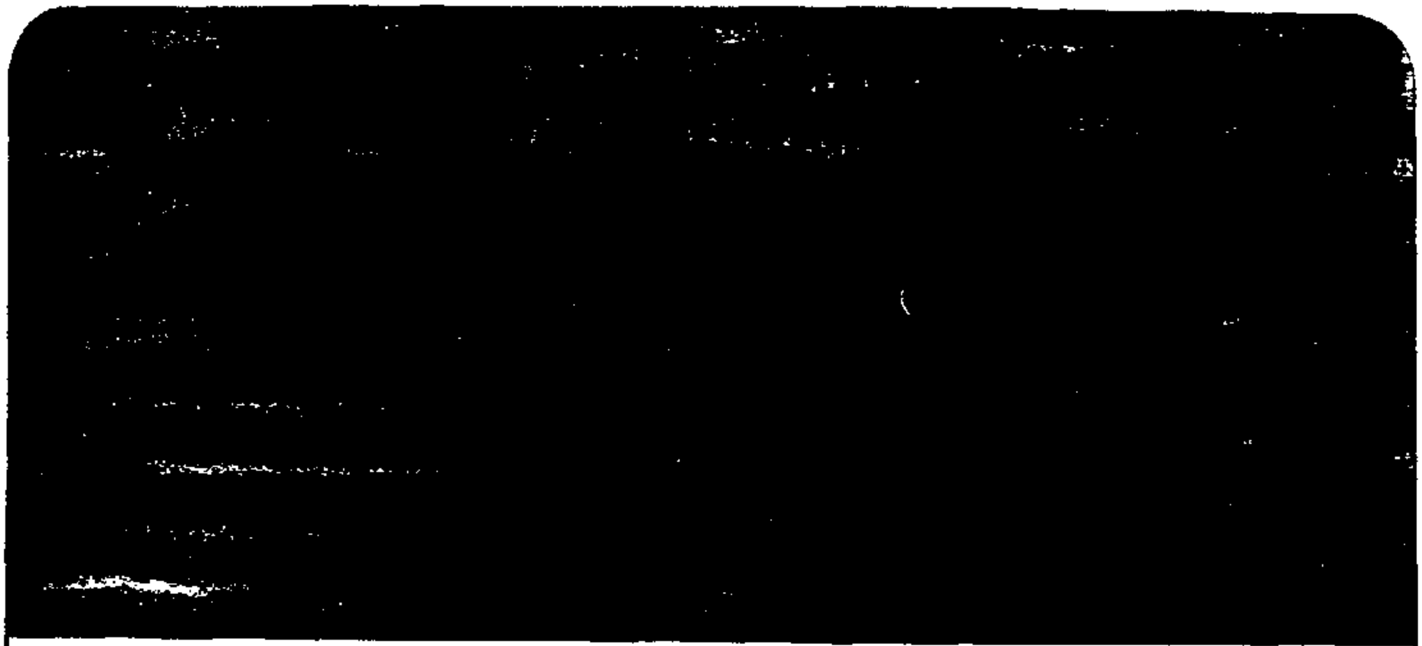
ENARC-O MACHINE PRODUCTS
DIVISION OF KADDIS MANUFACTURING CORPORATION

E.P.A ID#
NYD982181414

NORTH BLOOMFIELD, NEW YORK

DECEMBER, 1989

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221



Enarc-O Machine Products Division of Kaddis Manufacturing Corporation North Bloomfield, New York

December 1989

O'BRIEN & GERE

TABLE OF CONTENTS

SECTION 1 - INTRODUCTION

1.01 Background

Kaddis Manufacturing Corporation (Kaddis) owns and operates a metal machining facility, Enarc-O Machine Products. (Enarc-O), located at 1175 Bragg Street, community of North Bloomfield, Town of Lima, Livingston County, New York (Figure 1). This facility is situated approximately one mile southeast of the village of Honeoye Falls, about 400 feet west and south of Honeoye Creek, at an approximate elevation of 722 feet above mean sea-level (MSL). The site encompasses an area slightly larger than six acres in size.

In 1985, sampling and analysis of several residential wells in the area surrounding the Enarc-O property was conducted by the New York State Department of Health (NYSDOH), the New York State Department of Environmental Conservation (NYSDEC), and the Livingston County Department of Health (LCDOH). The results of these analyses revealed detectable concentrations of chlorinated solvents, including 1-1-1 trichloroethane and trichloroethylene, in the ground water beneath the Enarc-O facility and some of the neighboring properties.

As a result of the discovery of volatile organic compounds (VOC's) in the ground water in the United States Environmental Protection Agency (USEPA) Region II, in July 1987, requested that Enarc-O develop a site assessment work plan to evaluate the general hydrogeologic characteristics and, in particular, the ground water quality of the property. Specifically, USEPA identified areas on the Enarc-O property which were to be targeted for investigation. A proposed work plan was subsequently prepared and was submitted to the USEPA in August,

1987. Comments to the August 1987 work plan were received from USEPA on October 22, 1987 and on February 1, 1988. These comments were incorporated into a revised work plan which was resubmitted in March, 1988. Comments to the revised work plan were received From USEPA on June 30, 1988. These comments were addressed in a letter to USEPA dated July 21, 1988. On February 2, 1989 USEPA comments were received and subsequently were incorporated in another work plan revision dated March, 1989. This work plan was accepted by USEPA on July 31, 1989 and was appended to an Administrative Order on Consent between USEPA and Kaddis (Index No. II-CERCLA-90204) which became effective on September 28, 1989.

1.02 Objective

The approved work plan discussed above is divided into several work tasks requiring specific efforts. These tasks include a Background Information Review, a Fracture Trace Analysis and Geophysical Survey, an Internal Technical Memorandum, Soil Sampling and Analysis, Ground Water Monitoring Well Installations, Ground Water Sampling and Analysis, and Data Interpretation and Report Preparation.

Tasks 1 and 2 (Background Information Review and Fracture Trace Analysis and Geophysical Survey) have been completed. This Interim Technical Memorandum is being submitted in fulfillment of Task 3. Results of Tasks 1 and 2 are included in this Internal Technical Memorandum. In addition, information obtained as a result of the completion of Tasks 1 and 2 have been utilized to refine those efforts to be performed in Task 4 (Soil Sampling and Analysis), Task 5 (Ground Water Monitoring Well Installations), Task 6 (Ground Water Sampling and

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Analysis), and Task 7 (Data Interpretation and Report Preparation). Refinements to these work tasks are also presented in this Internal Technical Memorandum.

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SECTION 2 - RESULTS OF SITE ASSESSMENT TASKS 1 AND 2

2.01 Task 1 - Background Review

To identify potential sources of VOC's and to develop an understanding of the regional and local hydrogeology, available information pertaining to the site history, residential wells, and regional and local geology and hydrogeology were assembled and reviewed. Included in this review were documents regarding Enarc-O's solvent use and handling, as well as publicly available reports and papers pertaining to the local geology and hydrogeology. A summary of the reports, papers, and maps used for this work effort is included as Appendix A.

2.01.01 Site History

In December 1985 USEPA submitted a Request for Information Under 42 U.S.C. 9604 and 42 U.S.c. 6927. A response to this Request for Information was submitted by Enarc-O on January 20, 1986. The following discussion of the facility history was obtained from this document.

The area surrounding the Enarc-O facility is predominantly residential. However, the area to the west of the site is agricultural. A small, active auto repair shop is located adjacent and to the south of the Enarc-O property. This shop has reportedly been operating since approximately the mid 1960's.

The former residence of Mr. Wesley P. Crane, founder and previous owner and operator of Enarc-O, is adjacent and to the east of the Enarc-O facility. Enarc-O was started in the basement of this residence in 1954. In 1955 the operations moved into a

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double garage on Mr. Crane's property. In 1960 the operations moved onto the current Enarc-O Machine Products, Inc. property.

Organic solvent use at the Enarc-O facility has been limited to a vapor degreasing process which is used to clean oil residues off of newly machined parts. This vapor degreasing process is a contained, closed loop system which circulates cleaning fluids, allowing these fluids to be continually reused. **Trichloroethylene was used in this system from Enarc-O's inception in 1954, until 1980.** Between 1980 and 1985 1-1-1 trichloroethane was used in this process. Since 1985 Stoddard Solvent (Kensol 30) has been used. No chlorinated solvents have been in use at the facility since 1985. No reported loss of solvents has ever occurred from this system.

On June 18, 1985 a small spill of 1-1-1 trichloroethane (approximately 5 gallons) occurred near the facility's above ground solvent storage tank. This loss resulted from overfilling of the tank by an employee of a solvent supply company. The location of this loss is illustrated on Figure 2. Plant personnel immediately notified NYSDEC of the solvent loss. NYSDEC subsequently sent a representative to the spill site. Upon recommendation of the NYSDEC representative, the soils affected by the solvent spill were excavated to a depth of two feet, and were spread out in the southeast corner of the parking area to allow volatilization to occur. The soils were periodically raked by Enarc-O personnel to enhance the volatilization rate. Shortly thereafter Enarc-O removed the solvent storage tank and discontinued use of chlorinated solvents.

In 1985, subsequent to the release, NYSDOH, NYSDEC, and LCDOH conducted analyses of ground water samples collected from the Enarc-O supply well and 35 area residential wells. Analytical results revealed detectable concentrations of VOC's, primarily 1-1-1 trichloroethane and trichloroethylene, in the Enarc-O well and 21 of the 35 residential wells. The Enarc-O well contained the highest detectable concentration of 1-1-1 trichloroethane. The Enarc-O samples were reportedly collected directly from the well using a bailer without prior purging of the well. Samples collected at individual residences were collected from spigots.

As a result of the detection of VOC's in the ground water in the area, bottled water was subsequently supplied to those residences whose wells showed detectable concentrations. Bottled water was continued until a public potable water system was installed to serve the residences in 1988.

In addition to the Enarc-O facility, other potential sources of VOC's are in the immediate area. The former Crane residence and property, located adjacent and to the east of the Enarc-O property, was the site of a small machining operation which is known to have used solvents for several years. It also is suspected that the auto repair shop located adjacent and to the south of Enarc-O's property may have used solvents in it's operation in the past and also at present.

2.01.02 Regional Physiography

The Enarc-O site lies within the Erie-Ontario Lowlands Physiographic Province. This area is characterized by intensive

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glacial modification which results in an undulating, drumlinized plateau (Muller, 1965).

Topographically, the Enarc-O facility is situated on top of a small ridge at an elevation of approximately 722 feet MSL. Honeoye Creek, located approximately 400 feet to the east and north of the site, is approximately 20 to 25 feet lower in elevation then the Enarc-O property. Surface water runoff from the property will generally flow towards the creek.

Surface features in the region are generally typical of karst terrain. Carbonate solution features such as rectangular drainage patterns, closed depressions, sinkholes, and disappearing and resurgent streams are typical (Acres International Corporation Report, 1988). Karst features are not apparent, however, in the immediate vicinity of the Enarc-O site.

2.01.03 Regional Geology

The geology of the area is characterized by unconsolidated deposits of glacial drift comprised of stratified silt, clay, and fine sand overlying sedimentary Devonian Age bedrock (Fairchild, 1935). Bedrock may be found exposed in drainage channels.

Soils found at the Enarc-O site are the Palmyra Fine Sandy Loam and the Genesee Silt Loam. The Palmyra Fine Sandy Loam is a deep, well drained soil developed from stratified sand and gravel deposited on outwash plains. Genesee Silt Loam is a deep, well drained soil developed from recent alluvium (Soil Survey of Livingston County, 1956).

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The overburden in the area is variable. Lacustrine silt and clay deposits occur and were originally deposited in proglacial lakes. These deposits are generally laminated and calcareous. Outwash sand and gravel deposits laid down in a proglacial fluvial environment are also present and are typically well rounded and stratified (Muller and Cadwell, 1986).

The bedrock beneath the site is the Onondaga Limestone of Middle Devonian age. This formation is a fine to medium grained, crystalline carbonate rock (Rickard and Fisher, 1970). Depth to bedrock is estimated to be approximately 20 to 25 feet and occurs at an approximate elevation of 700 feet MSL (Grossman and Yarger, 1953). The Onondaga Limestone is known to be approximately 100 feet thick in the area and outcrops in Honeoye Creek. Regular joint patterns typically occur in this unit and were confirmed locally by field reconnaissance.

Beneath the Onondaga Limestone lies the Middle Devonian Bertie Formation. This stratigraphic unit consists of interbedded dolostone, shale, and shaly dolostone. The Bertie is estimated to be approximately 80 feet thick.

Bedrock in the region is for the most part undeformed. It has a very gentle regional dip of approximately 1 to 2 degrees to the south. In the vicinity of the Enarc-O site no faults or fold structures are present and no metamorphism of the Paleozoic strata exist (Fisher et.al., 1971; Isachsen and McKendree, 1977).

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2.01.04 Regional Hydrogeology

There is no primary aquifer within the overburden nor the bedrock beneath the Enarc-O site (Grossman and Yarger, 1953; Miller, 1987). Ground water obtained by the Enarc-O supply well and the local residences was withdrawn from the fractured Onondaga Limestone. The overburden typically provides insufficient yields to be used for supply.

Conversations between USEPA and Dr. Richard A. Young of SUNY Geneseo revealed that a significant yield of ground water does occur at the overburden/bedrock interface. A fairly good yield may also be obtained from within the uppermost, weathered portion of the Onondaga Limestone.

Honeoye Creek which is likely the discharge boundary for the shallow ground water in the site area is located north and northeast of the site and flows towards the northwest. As stated previously, the slope of the land surface on the Enarc-O property is in the general direction of the creek. Given this information, it is likely that the ground water flow at the bedrock/overburden interface as well as within the shallow bedrock is towards the north and northeast.

2.02 Task 2 - Fracture Trace Analysis and Geophysical Survey

2.02.01 Fracture Trace Analysis

As ground water flow in bedrock systems is generally confined to fractures, a fracture trace analysis was conducted to evaluate, if possible, the location and pattern of fractures in the study area. The purpose of this analysis was to develop

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information which may be of aid in selecting locations for ground water monitoring well placement.

Subsurface features such as fractures cannot be directly observed on photographs. However, linear surficial features directly influenced by fractures, such as stream channels and linear geomorphic features, can be mapped and typically reflect the underlying bedrock fracture patterns.

Stereoscopic aerial photographs dated June 21, 1938, August 27, 1954, June 26, 1963, October 24, 1975, and May 5, 1982 were reviewed for fracture patterns. Additionally, topographic and drainage patterns were studied on the USGS 7.5 minute topographic map of the Honeoye Falls quadrangle (1951). This was completed to confirm the patterns observed on the photographs, and to reveal fracture traces which may have been obscured on the aerial photographs by vegetation or cultural features.

On both the aerial photographs and the USGS topographic map an area with a radius of several miles centered around the Enarc-O property was selected for study. Linear features were defined and their orientations measured. These data have been graphically illustrated in rose diagrams presented in Figures 3a through 3f. Additionally, a composite rose diagram which summarizes all of the aerial photographic data is presented as Figure 3g.

The composite rose diagram for the aerial photographs (Figure 3g) indicates two major sets of lineations. A primary lineation pattern trends from N 20 to 60 degrees W. A secondary, conjugate set of linear features strikes from N 40 to 50 degrees E.

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The rose diagram for the USGS topographic map (Figure 3a) identifies the primary set of lineations, but the orientation is less defined than those observed on the aerial photographs. The USGS map does not reveal the secondary set of lineations.

To confirm the orientation of these lineations, a field reconnaissance was conducted which evaluated the orientation of the joint fractures within the Onondaga Limestone exposed in Honeoye Creek. These joint fractures appear to control the stepped nature of the stream channel. The orientation of these fractures strike from N 57 to 75 degrees E. These data generally fall within the range for the secondary set of lineations identified in the aerial photographs. The Honeoye Creek channel is nearly perpendicular to these fractures, and therefore consistent in orientation with the primary lineation strike discussed above. No linear feature were observed to cross the Enarc-O property.

The primary set of linear features is also consistent with a major linear topographic feature defined by Isachsen and McKendree (1977). This feature was defined by utilizing either topographic maps, Landsat ERTS) imagery, and Skylab or U-2 photographs in their study. The feature strikes approximately N 15 degrees W (parallel to the flow of Honeoye Creek), is three miles in length, and is located about one mile east of North Bloomfield.

2.02.02 Geophysical Survey

A surficial geophysical survey was conducted on the Enarc-O property to evaluate general bedrock topography, depth to ground water, and fracture traces. This involved completing an electromagnetic (terrain conductivity) survey.

A Geonics model EM-34-3 was utilized to perform horizontal terrain conductivity profiles. Two coil spacings, 10 meters and 20 meters, were used to allow signal penetration to approximate depths of 7.5 meters and 15 meters, respectively using the horizontal dipole mode of operation. A third coil spacing, 40 meters, which would allow signal penetration to approximately 30 meters, was attempted, but was unsuccessful as electromagnetic interference due to background and cultural effects which resulted in erratic instrument readings.

The EM-34 survey was conducted along three lines (Figure 4) which varied in length from 460 feet to 700 feet. The locations of the geophysical survey traverses are illustrated on Figure 4. The locations of the survey lines were related to permanent on-site features and their bearings noted to allow them to be accurately relocated. Lines A-A' and C-C' were oriented perpendicular to the trend of the primary fracture pattern as identified by the fracture trace analysis. Line B-B' was orientated perpendicular to the trend of the secondary fracture pattern. The reading stations along each traverse were separated by 20 feet.

Data obtained during the EM-34 survey have been plotted as vertical profiles which are illustrated in Figure 5. These illustrations suggest that there are locations where overburden thickness increases slightly. These areas are identified as peaks in the 10 M coil spacing curves of Figure 5 (those not influenced by cultural features such as metallic structures or power lines). This increased conductivity is likely a result of an increase in overburden thickness, which is an effect of a lesser volume of the lower conductive bedrock being penetrated by the shorter 10 M coil spacing.

Data obtained from the 20 M spacing are likely more representative of the bedrock material. These data indicate relatively constant conductivity values with the exception of those peaks associated with cultural features. If water-filled fractures are present, a localized increase in conductivity would be expected. In the absence of these variations in conductivity being observed, there does not appear to be large water-filled fractures on-site.

Bedrock appears to be near surface in the southeast corner of the Enarc-O property. In this area conductivity measured by both the short (10 M) and long (20 M) coil spacings reveal similar values.

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SECTION 3 - SITE ASSESSMENT PLAN

The following sections outline specific work efforts which will be completed in this site assessment. Detailed protocols are presented in the Quality Assurance Project Plan (QAPP) included in Appendix A. The site's Health and Safety Plan will be adhered to at all times while performing field activities. This document is presented in Appendix B.

3.01 Task 4 - Soil Sampling and Analysis

As stated in Section 1.01 several areas were identified by USEPA for investigation on the Enarc-O property. These areas were located during the Background Information Review and are illustrated on Figure 2 as follows:

1. Area surrounding a recently excavated and removed gasoline storage tank.
2. Area around the removed above-ground solvent storage tank where the 1985 spill of 1-1-1 trichloroethane occurred.
3. Area where waste oil is retained.
4. Area around Enarc-O's loading dock. EPA reportedly has reason to believe the entire area was covered with an oily residue and was used to store drums at some point in the past.
5. Area of the parking lot where used oils were used for dust control. The southeast corner of this area was where the excavated soils from the 1985 spill were spread out to allow volatilization to occur.

6. Area southwest of the storage building where drums are currently stored.

Soil borings will be completed in each of these areas for the purpose of obtaining soil samples for analysis. The locations will be selected in the field with concurrence of the on-site USEPA representative prior to drilling commencement. One (1) boring will be placed in each location, with the exception of area 5 (parking area). In the parking area, five (5) soil borings will be placed, one in each quadrant (which will place one within the area where soils from the solvent spill were spread), and also one in the center. The soils will be analyzed by EPA Method 8010 and 8020 for VOC's. Analysis for lead will also be performed on those samples collected from area 1 (area of removed gasoline storage tank).

The soil borings will be completed using conventional hollow stem auger drilling methods. Soil samples will be collected continuously to fifteen feet below the ground surface using ASTM method D-1586-84. Samples will be collected at standard five foot intervals thereafter. The split barrel sampler will be cleaned after collection of each sample using a non-phosphate detergent wash followed by a clean water rinse, a methanol rinse, and a final distilled water rinse.

A portion of each sample will be placed in a jar, sealed with aluminum foil and the screw top. The sample will be warmed to room temperatures at which time a photoionization analyzer (PID) will be used to monitor the headspace for volatile organics. The bottom of each boring will be selected in the field at the point which in field screening of the samples reveals levels of total organic vapors equal to a predetermined background concentration, or bedrock or the ground water table is encountered, whichever occurs first.

Two soil samples from each boring will be selected for laboratory analysis. Each selected sample to be submitted for analysis will be placed into one 4 oz. jar with a teflon-lined cover. These sample jars will be packed in coolers with ice for shipment to the laboratory for analysis. Chain-of-custody documents will be initiated at the time of collection and maintained throughout the transport of the samples to the laboratory.

Soil removed during the drilling of these borings will be placed in 55-gallon drums. Soil stored in the drums will be handled in an appropriate manner based on the analytical results and USEPA approval.

Drilling equipment that may have come in contact with potentially contaminated material will be decontamination between borings in accordance with the protocol included in the QAPP (Appendix A). A central location will be set up on-site for the decontamination process. All water generated during decontamination will be contained and placed in 55 gallon drums pending analysis. Following receipt of the analytical results, the water will be disposed of in an appropriate manner.

Quality assurance/quality control procedures will be followed as outline in the QAPP presented in Appendix A.

3.02 Task 5 - Ground Water Monitoring Well Installations

To evaluate the general direction of ground water flow potential and ground water quality on the Enarc-O property, four ground water monitoring wells will be installed. One well will be installed at a location anticipated to be hydraulically upgradient, and the other three wells will be installed on the likely downgradient side of the property.

The locations of these wells are illustrated on Figure 2. Should information obtained during completion of the soil sampling and analysis effort (Task 4) reveal data which would effect the placement of ground water monitoring wells on the property, this information would be used to modify the locations of the wells as required. The ground water monitoring wells will be screened in the first encountered ground water which is anticipated to be at the overburden/bedrock interface and/or within the upper portion of the bedrock.

The borings to facilitate the well installations will be completed through the overburden using conventional hollow stem auger drilling methods. Samples of the overburden will be collected at 5-foot intervals using split-barrel sampling method ASTM D-1586-84. The bedrock will be subsequently drilled using a minimum 3-inch diameter core barrel. A detailed monitoring well drilling and installation protocol is included in the QAPP (Appendix A).

All soils generated during drilling will be placed in 55-gallon drums. Following receipt of the analytical results, the soil will be disposed of in an appropriate manner.

All monitoring wells will be constructed of a 10 foot length of 0.020 inch slot, 2 inch I.D., Schedule 40 PVC screen attached to an appropriate length of solid 2 inch I.D. Schedule 40 PVC riser. Installation will be in accordance with procedures accepted by USEPA and NYSDEC and are outlined in the QAPP (Appendix A). These procedures are consistent with those outlined in the USEPA Region II "CERCLA QAPJP Review Guidance" document dated April, 1987.

Drilling equipment which may have come in contact with potentially contaminated material will be decontaminated between wells in accordance with the protocol included in the QAPP (Appendix A). A central location will be set up on-site for the decontamination process. All water generated during decontamination will be contained and placed in 55-gallon drums pending analysis. Following receipt of the analytical results, the water will be disposed of in an appropriate manner.

The four monitoring wells will be developed in accordance with the protocol presented in the QAPP (Appendix A). The development will continue until the well yields sediment-free ground water. All development water will be placed in 55-gallon drums and stored on-site pending the results of the analyses by EPA Method 601 and 602. This water will then be properly disposed of based on the analytical results and USEPA approval.

A well location and elevation survey will be completed. The top of PVC and top of protective steel casing elevations will be determined to 0.01 feet, and ground elevations determined to 0.1 feet, for each well using an assumed, arbitrary, but permanent on-site datum. The locations will be tied into the currently available property map.

3.03 Task 6 - Ground Water Sampling and Analysis

Two rounds of ground water samples will be collected from all four ground water monitoring wells. The first round will be performed following a two week stabilization period after well development. The second round will occur approximately two weeks after the first round. Ground water samples will be collected with a stainless steel bailer in accordance with procedures outlined in the USEPA Region II "CERCLA QAPJP Review Guidance" document as set forth in the

HALOGENATED VOLATILES

protocols included in the QAPP (Appendix A). Analysis will be by EPA Method 601. The samples will be placed into appropriate containers and placed in a cooler with ice for shipment to the laboratory for analysis. Chain-of-custody documentation will be initiated in the field at the time of sample collection and maintained throughout handling and transport of the samples to the laboratory for analysis. Quality assurance/quality control procedures will be performed as described in the QAPP (Appendix A).

Prior to the initiation of each sampling event, ground water elevations will be collected from all wells to evaluate the direction of potential ground water flow. Water removed from the wells during well purging prior to sample collection will be placed in 55-gallon drums and stored on-site until the analytical results of the ground water samples are obtained. The water will then be properly disposed of following USEPA approval.

The hydraulic conductivity of the four ground water monitoring wells will be evaluated to aid in evaluation of the ground water flow characteristics. This will be accomplished by performance of in-situ hydraulic conductivity tests. The method to perform these tests is presented in the QAPP (Appendix A).

In addition to the ground water samples, USEPA has requested that a sample be collected from the drain system illustrated on Figure 2. This drain is the SPDES approved discharge to Honeoye Creek. A sample of water will be collected from the storm drain collector located near location 2 on Figure 2. This sample will be placed into appropriate containers and placed in a cooler with ice for shipment to the laboratory for analysis. Chain-of-custody documents will be initiated in the field at the time of collection and maintained throughout handling and transport of the sample to the laboratory. This sample will be analyzed for halogenated organics using EPA Method 601 and 602.

3.04 Task 7 - Data Interpretation and Report Preparation

Following completion of the Tasks 1 through 6 as outlined above, the collected data will be evaluated and presented in the form of a report. This report will discuss the field investigation methods, findings of the study, and recommendations for additional investigations if needed. Included in the report will be the drilling and well construction logs, ground water analytical results, a ground water hydraulic potential map, and the ground water elevation monitoring data.

Specifically, the report shall include the following data and illustrations:

- Rose diagrams showing the trend direction of the fracture traces observed during the fracture trace analysis.
- Vertical profiles of the EM-34-3 traverses.
- All geophysical data collected during the surveys.
- Drilling logs and well construction details.
- Results of the ground water sample analyses.
- The direction of ground water flow potential in the upper bedrock.
- Recommendations for additional work if warranted.

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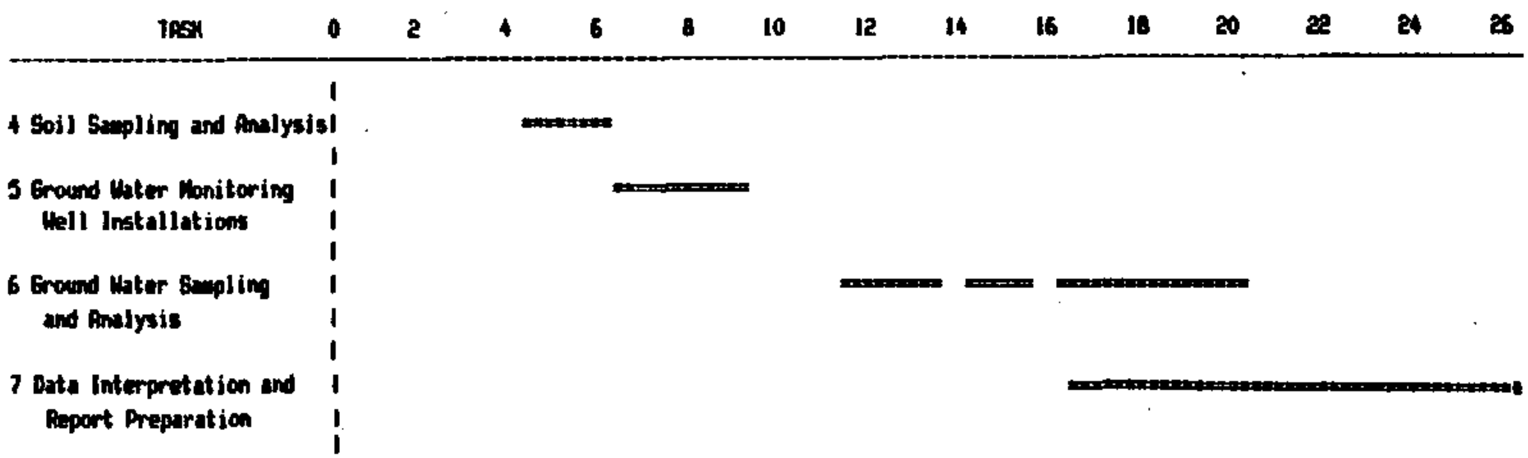
Rickard, L.V. and D.W. Fisher (1970), Geologic Map of New York - Finger Lakes Sheet; New York State Museum and Science Service Map and Chart Series no. 15.

Soil Survey of Livingston County, New York (1956); U.S.

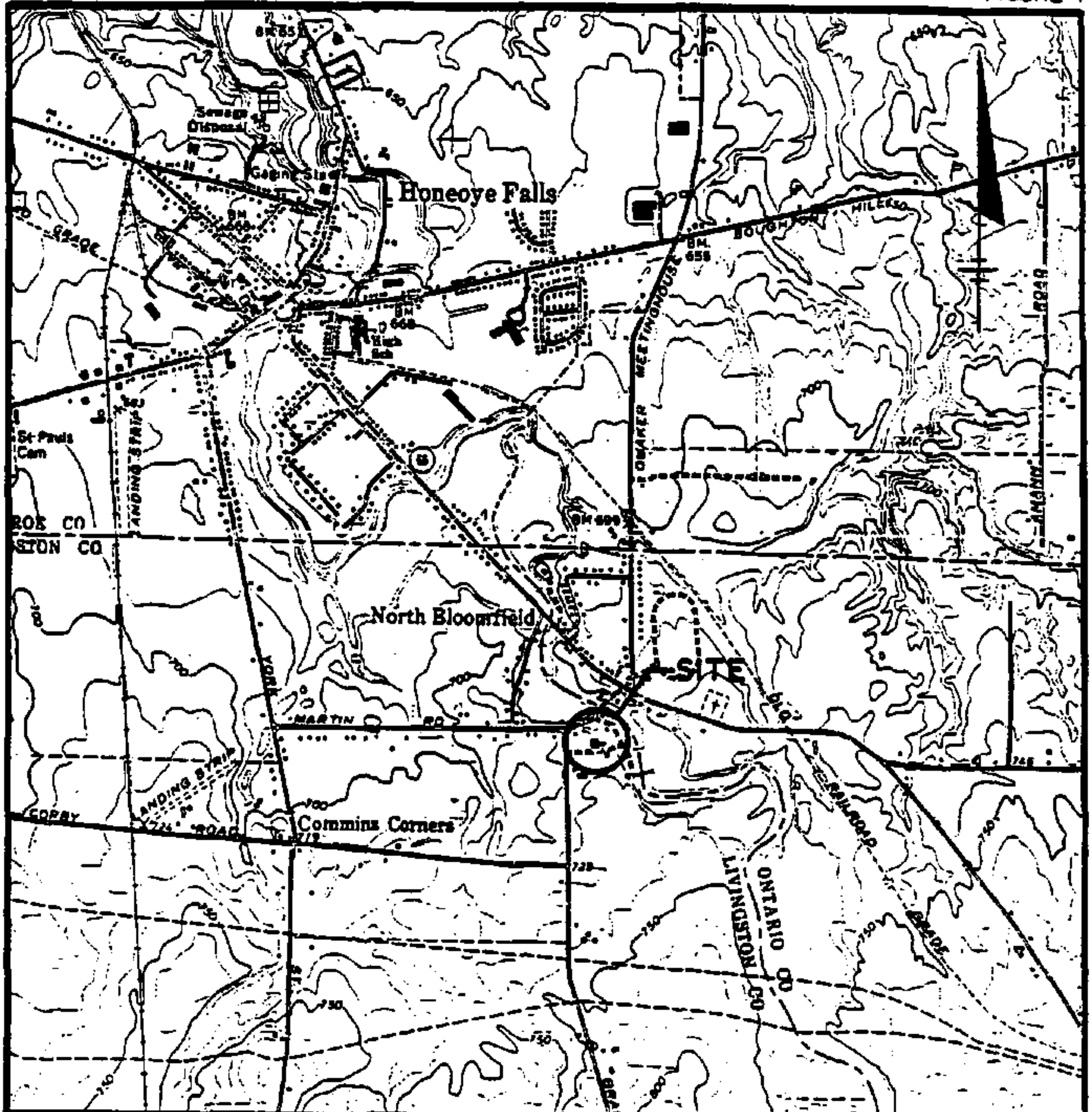
PROJECT SCHEDULE

SITE INVESTIGATION
Enarc-O Machine Products
Division of Kaddis Manufacturing Corporation
North Bloomfield, New York



NOTES: - Sampling Event
* - Submittal to USEPA

FIGURE 1



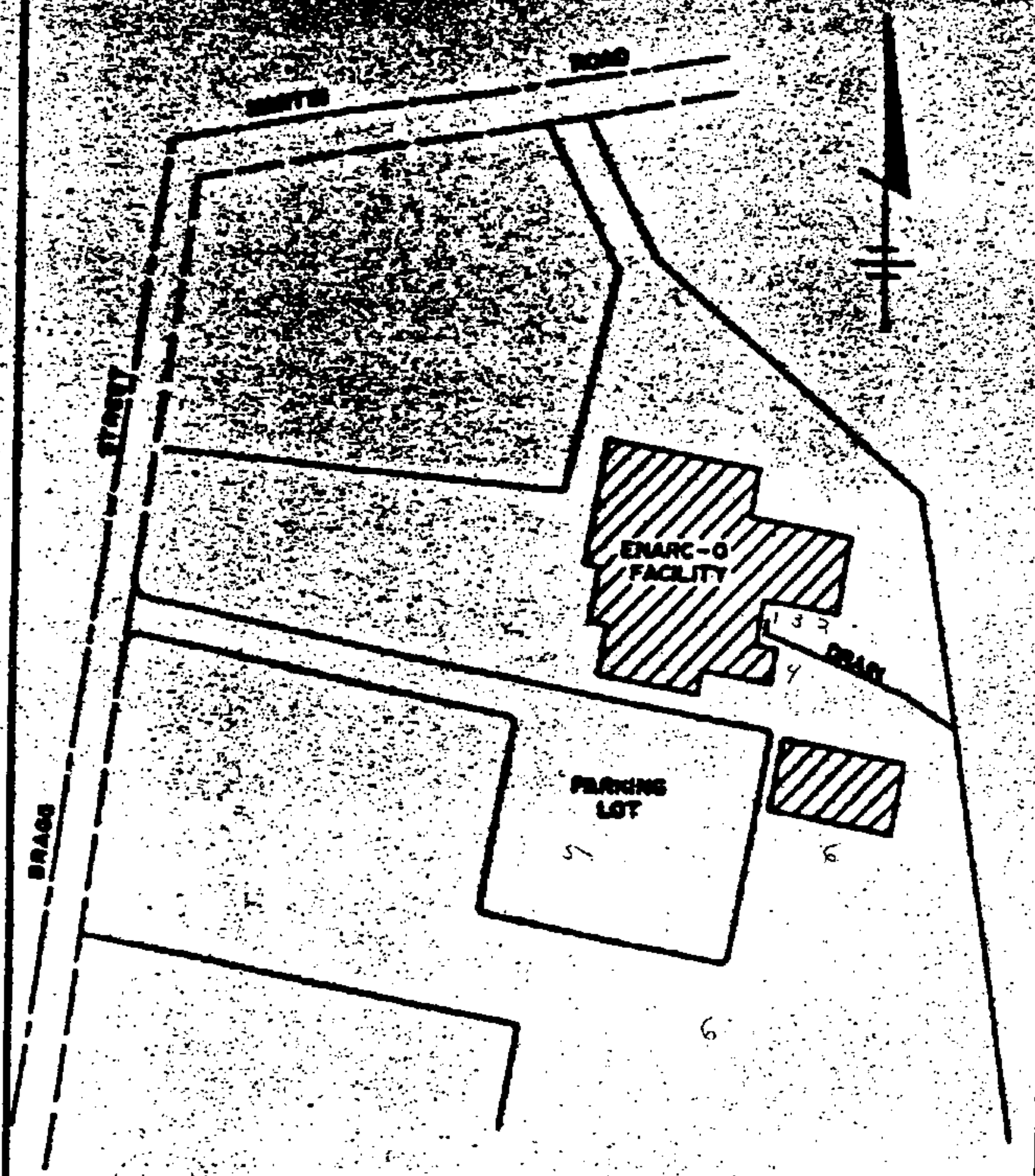
KADDIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

SITE LOCATION MAP

0 2000 4000
SCALE IN FEET

ADAPTED FROM HONEOYE FALLS, NEW YORK 7.5 MIN. U.S.G.S. QUADRANGLE (1971)

O'BRIEN & GERE ENGINEERS, INC.

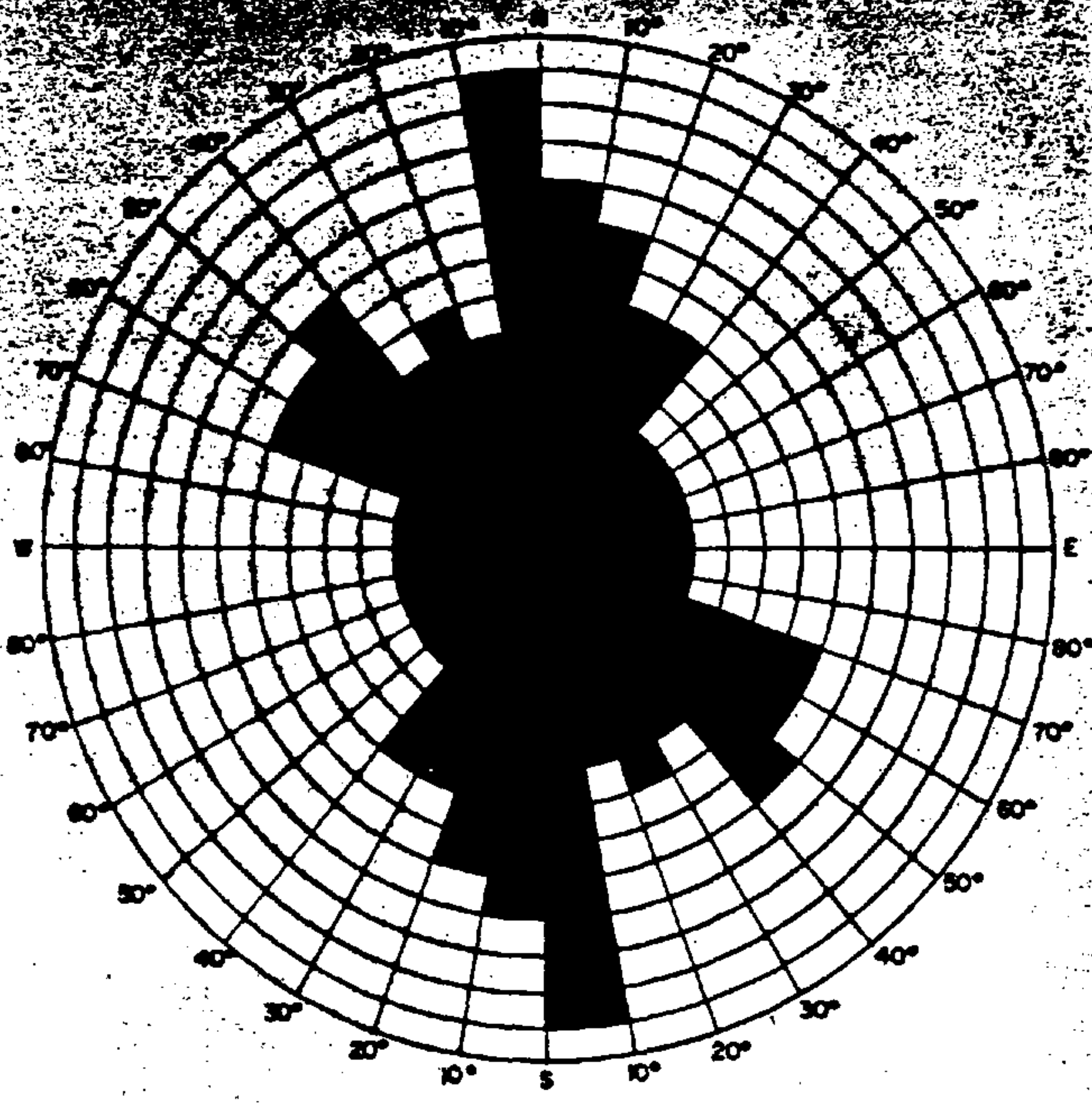


SITE PLAN

0 100' 200'
SCALE IN FT

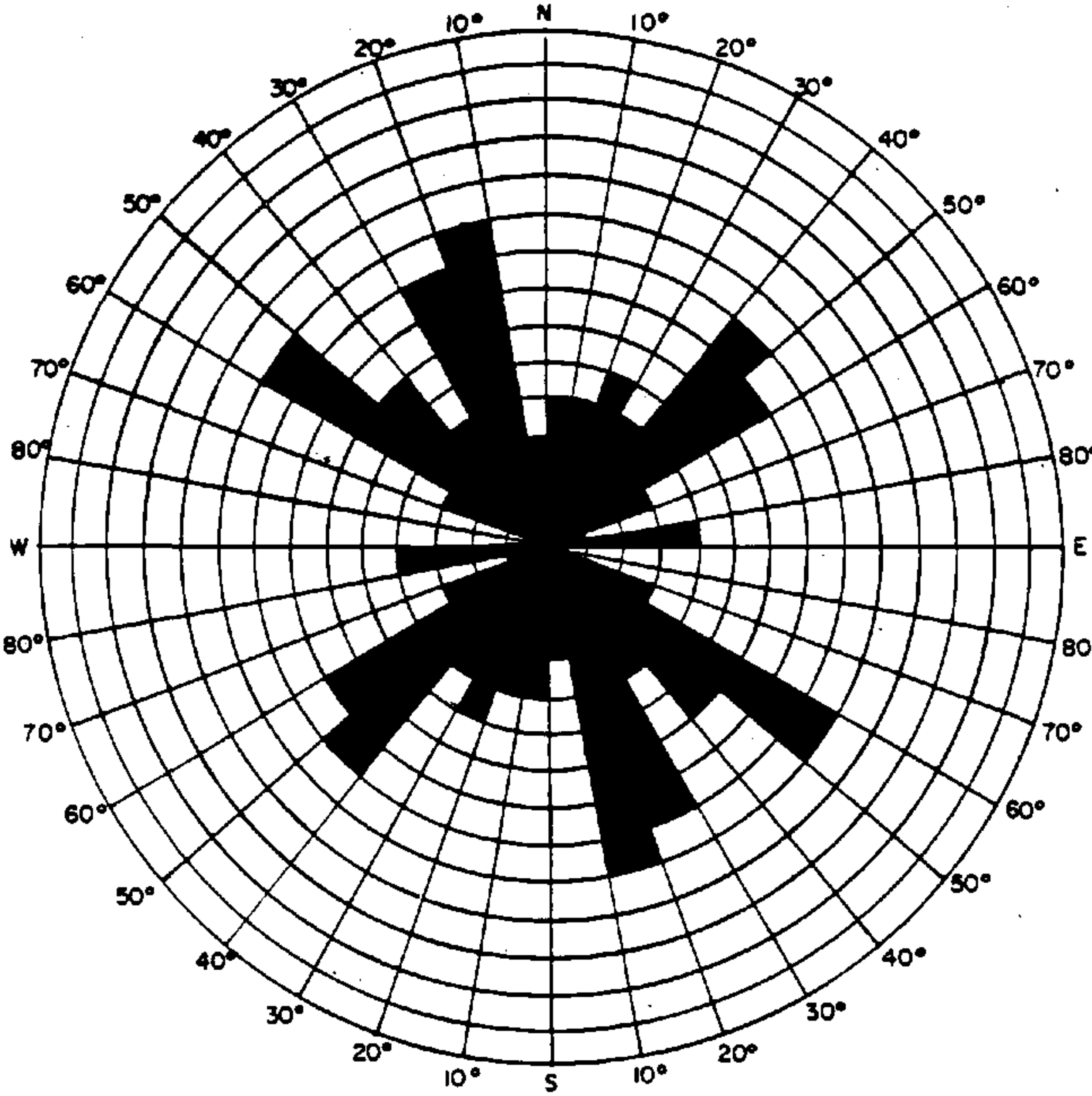
KADDIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

O'BRIEN & GERE ENGINEERS, INC.



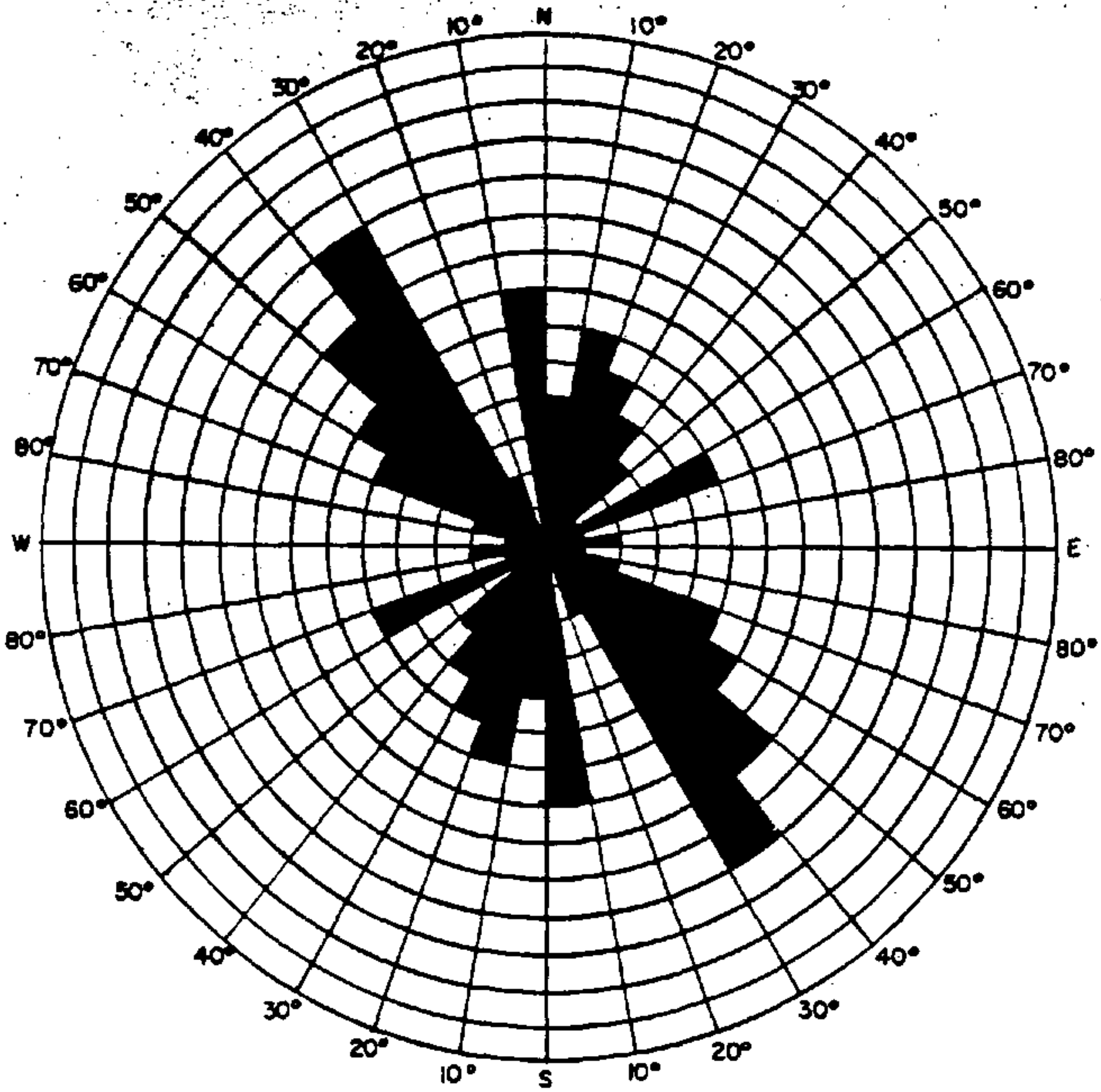
FRACTURE TRACE ANALYSIS
TOPOGRAPHIC MAP
BUDDS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

O'BRIEN & GERE ENGINEERS, INC.



FRACTURE TRACE ANALYSIS
AIR PHOTO AUGUST 27, 1954
KADDIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

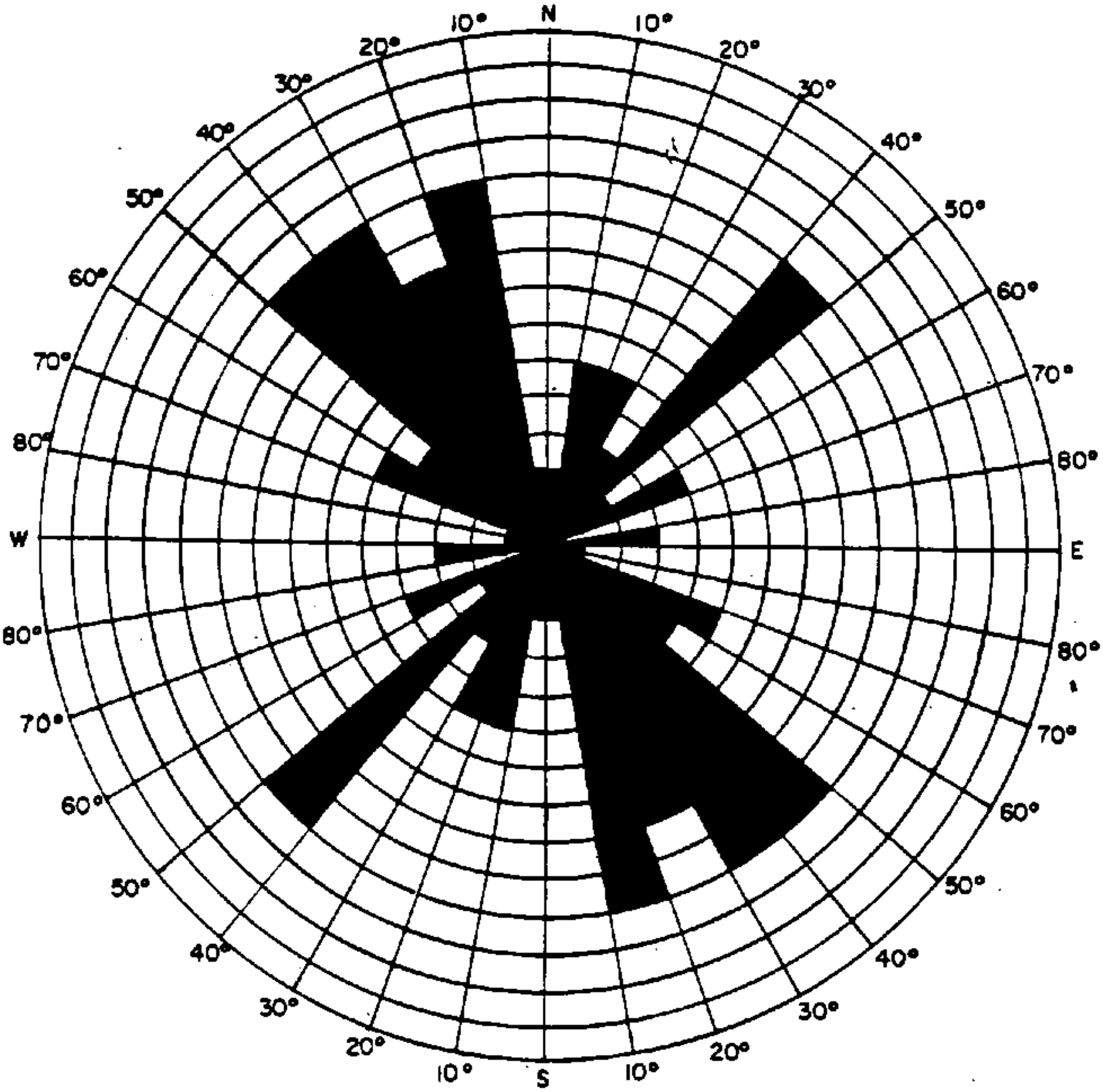
O'BRIEN & GERE ENGINEERS, INC



FRACTURE TRACE ANALYSIS
AIR PHOTO JUNE 21, 1938
KADDIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

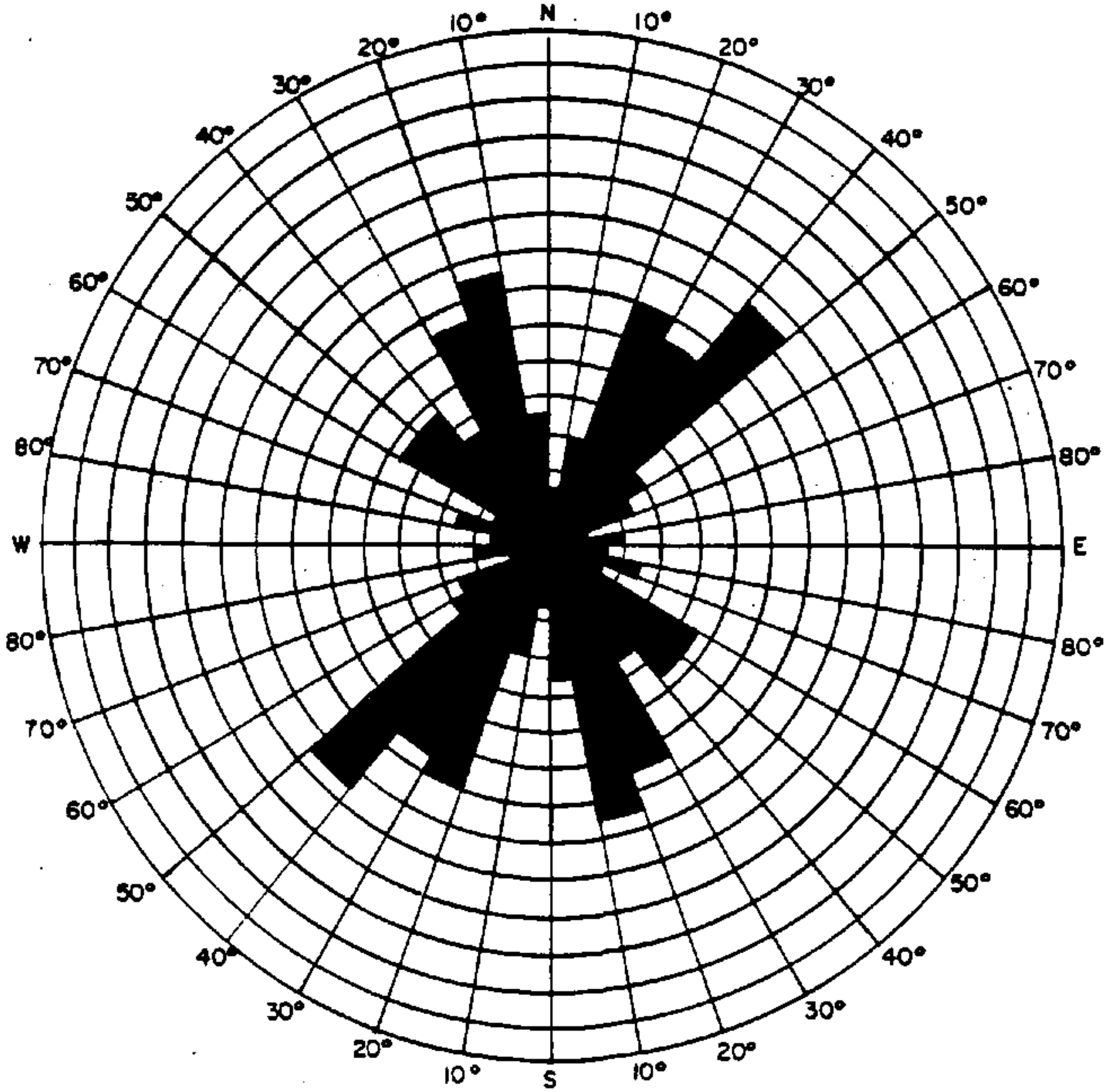
O'BRIEN & GERE ENGINEERS, INC.

FIGURE 3

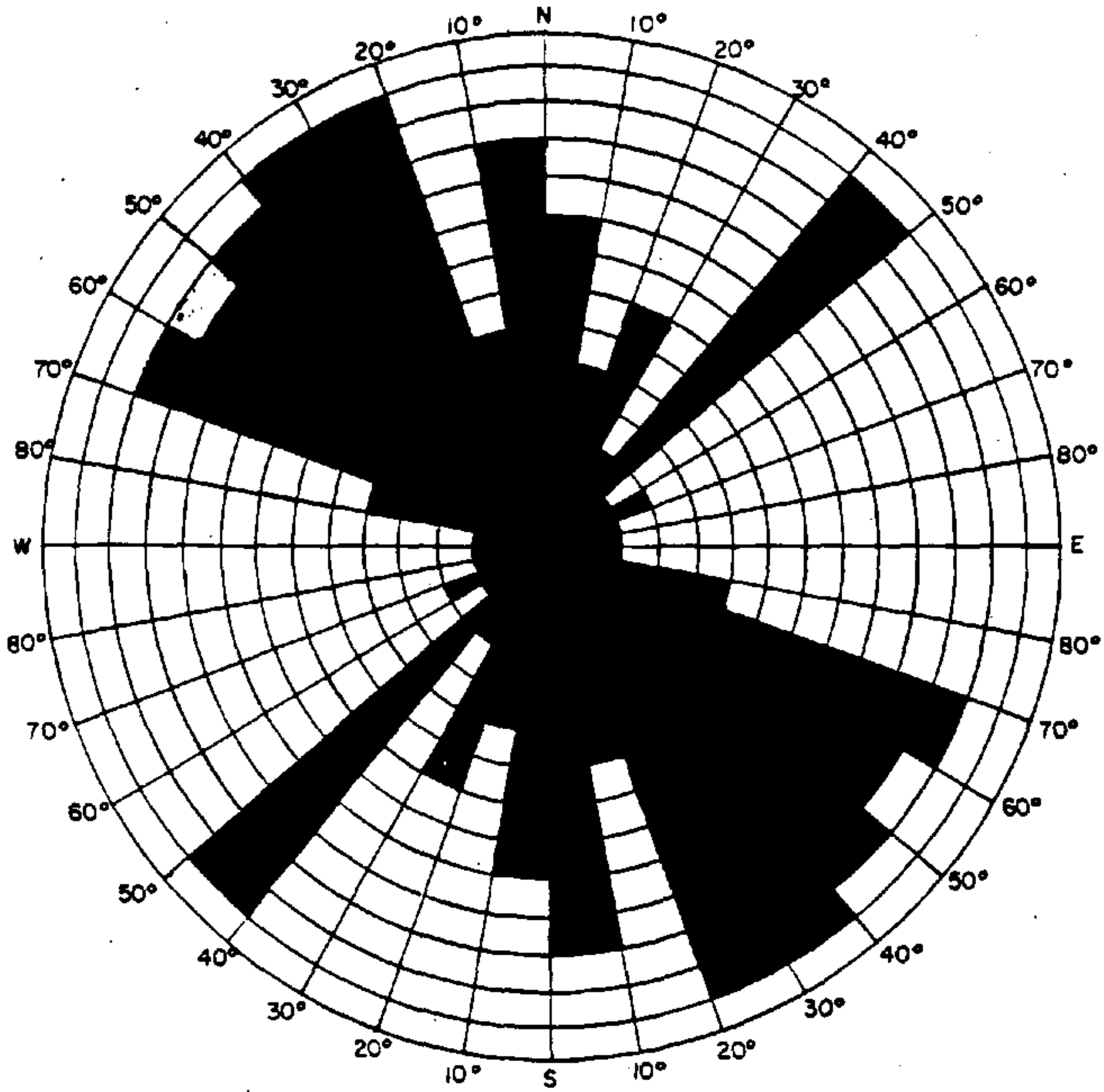


FRACTURE TRACE ANALYSIS
AIR PHOTO JUNE 26, 1963
KADDIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

O'BRIEN & GERE ENGINEERS, INC

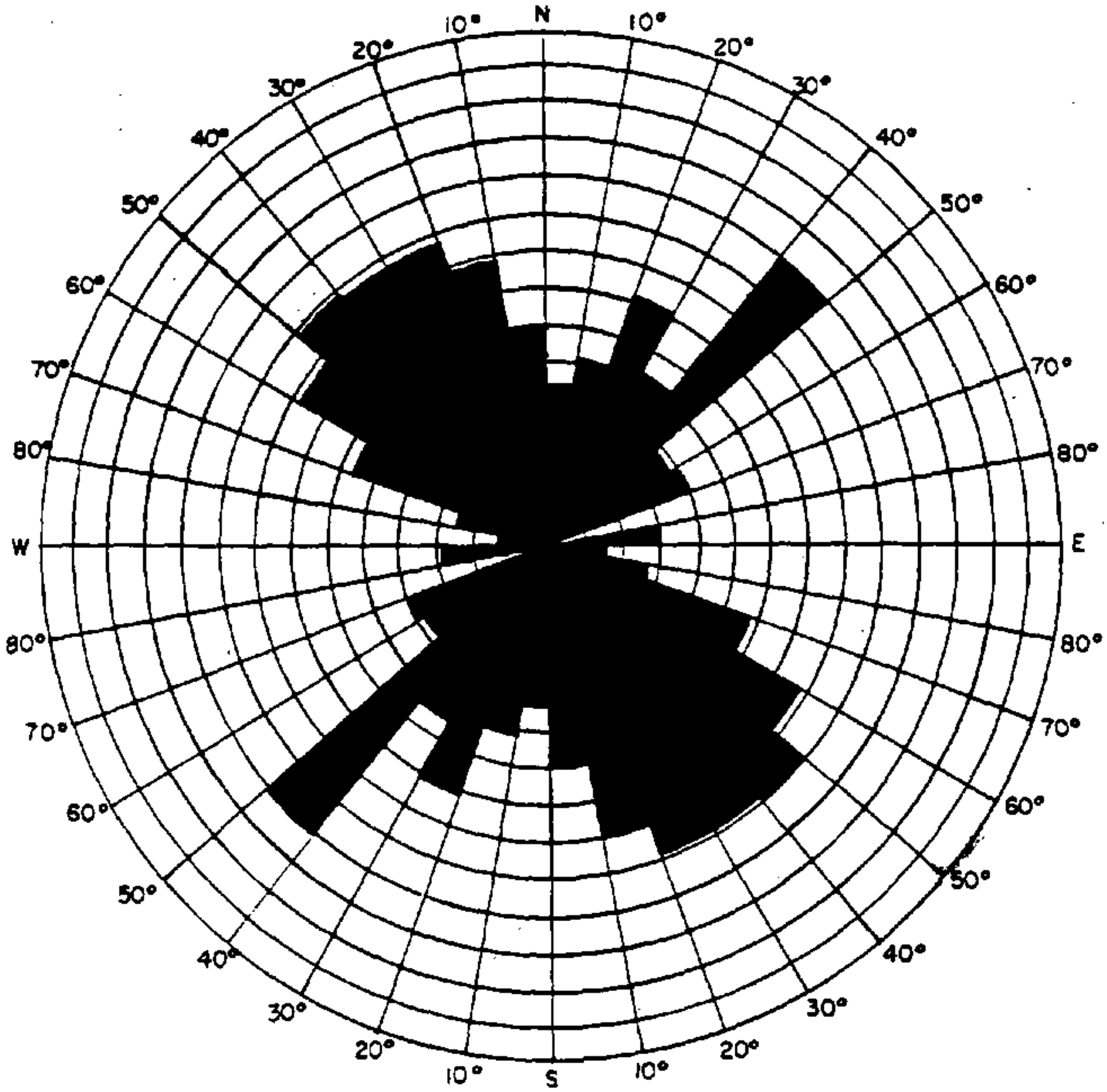


FRACTURE TRACE ANALYSIS
AIR PHOTO OCTOBER 24, 1975
KADDIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK



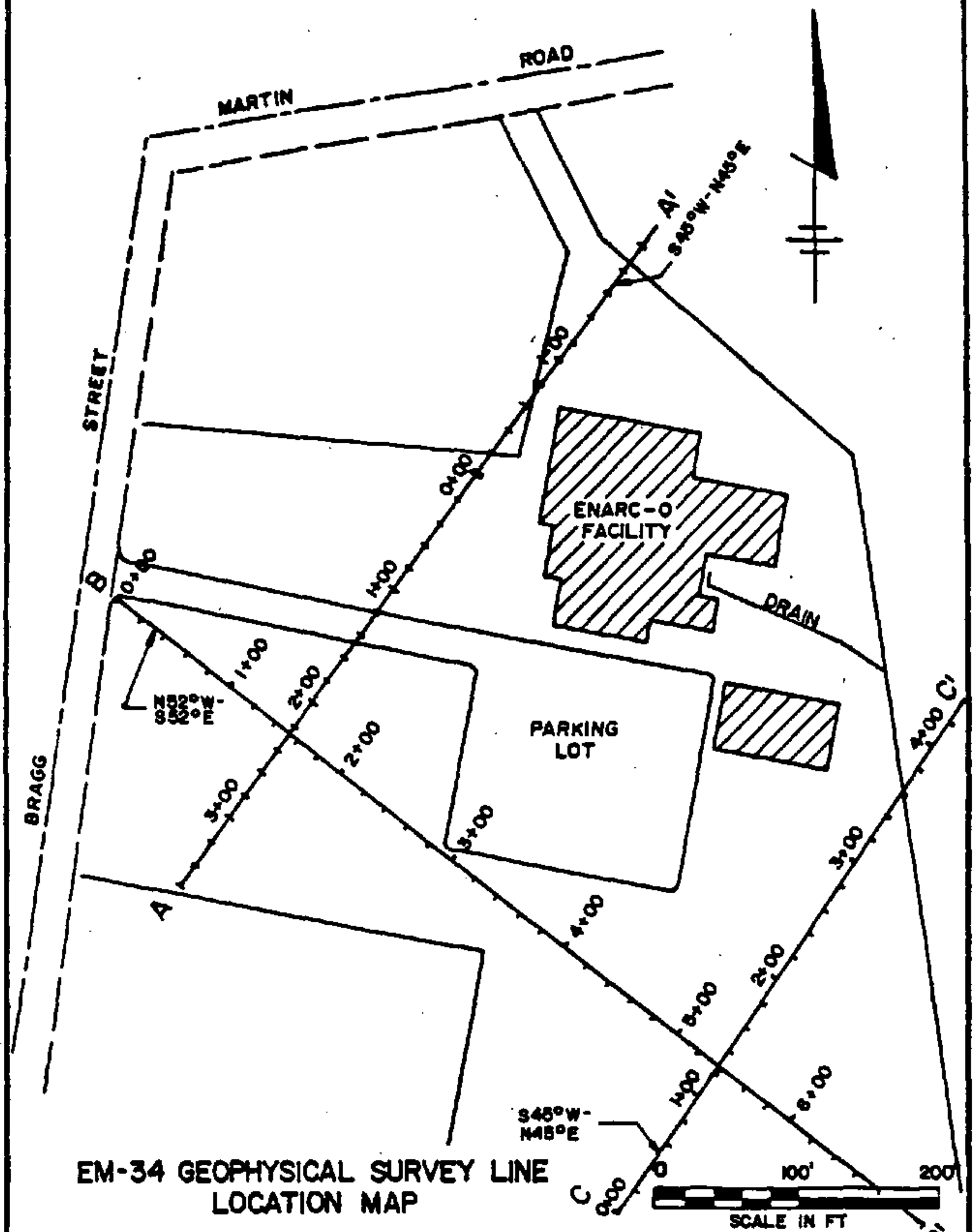
FRACTURE TRACE ANALYSIS
AIR PHOTO MAY 5, 1982
KADDIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

FIGURE 3g



FRACTURE TRACE ANALYSIS
AIR PHOTOS (CUMULATIVE)
KADDIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

O'BRIEN & GERE ENGINEERS, INC



EM-34 GEOPHYSICAL SURVEY LINE LOCATION MAP

KADDIS CORPORATION (ENARC-O)

NORTH BLOOMFELD, NEW YORK

Figures

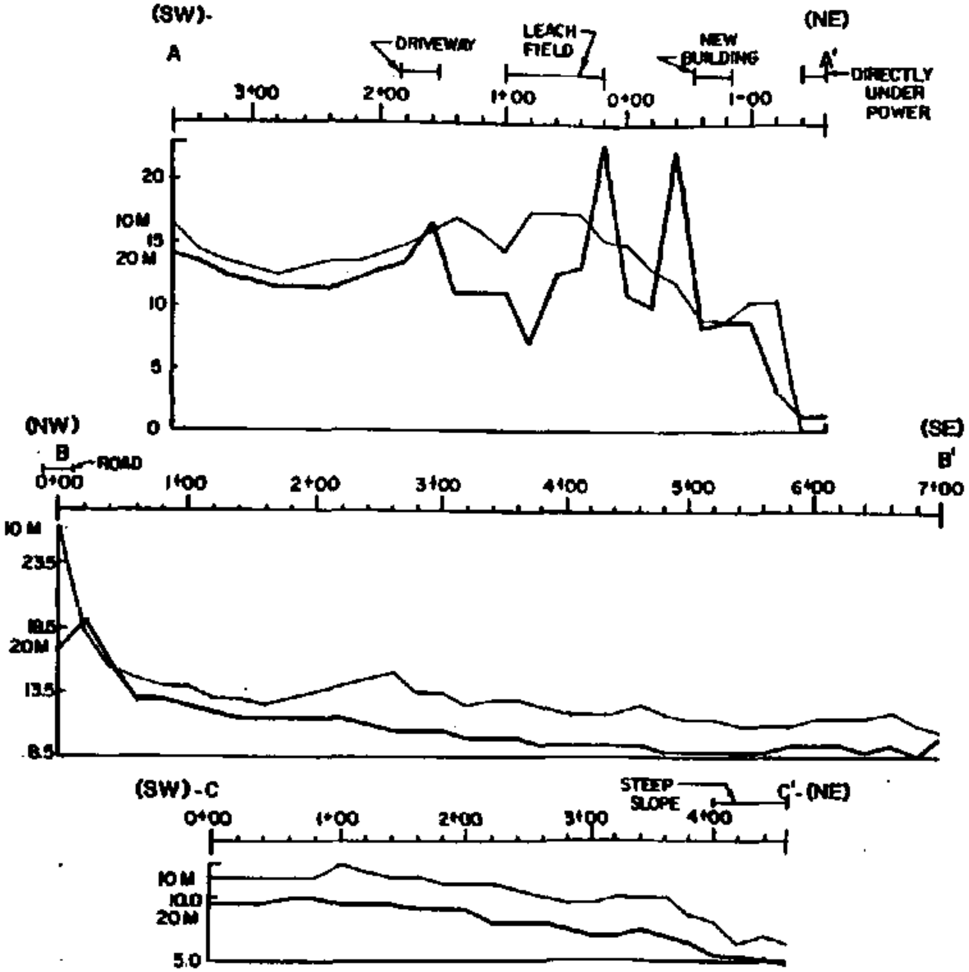


FIGURE 5

KADOIS CORPORATION (ENARC-O)
NORTH BLOOMFIELD, NEW YORK

EM-34 GEOPHYSICAL SURVE VERTICAL PROFILES

LEGEND

10M COIL SPACINGS
20M COIL SPACINGS

NOTE :

VERTICAL SCALE IN mmhos/n

HORIZONTAL SCALE

0 100 200

SCALE IN FEET

O'BRIEN & GERE

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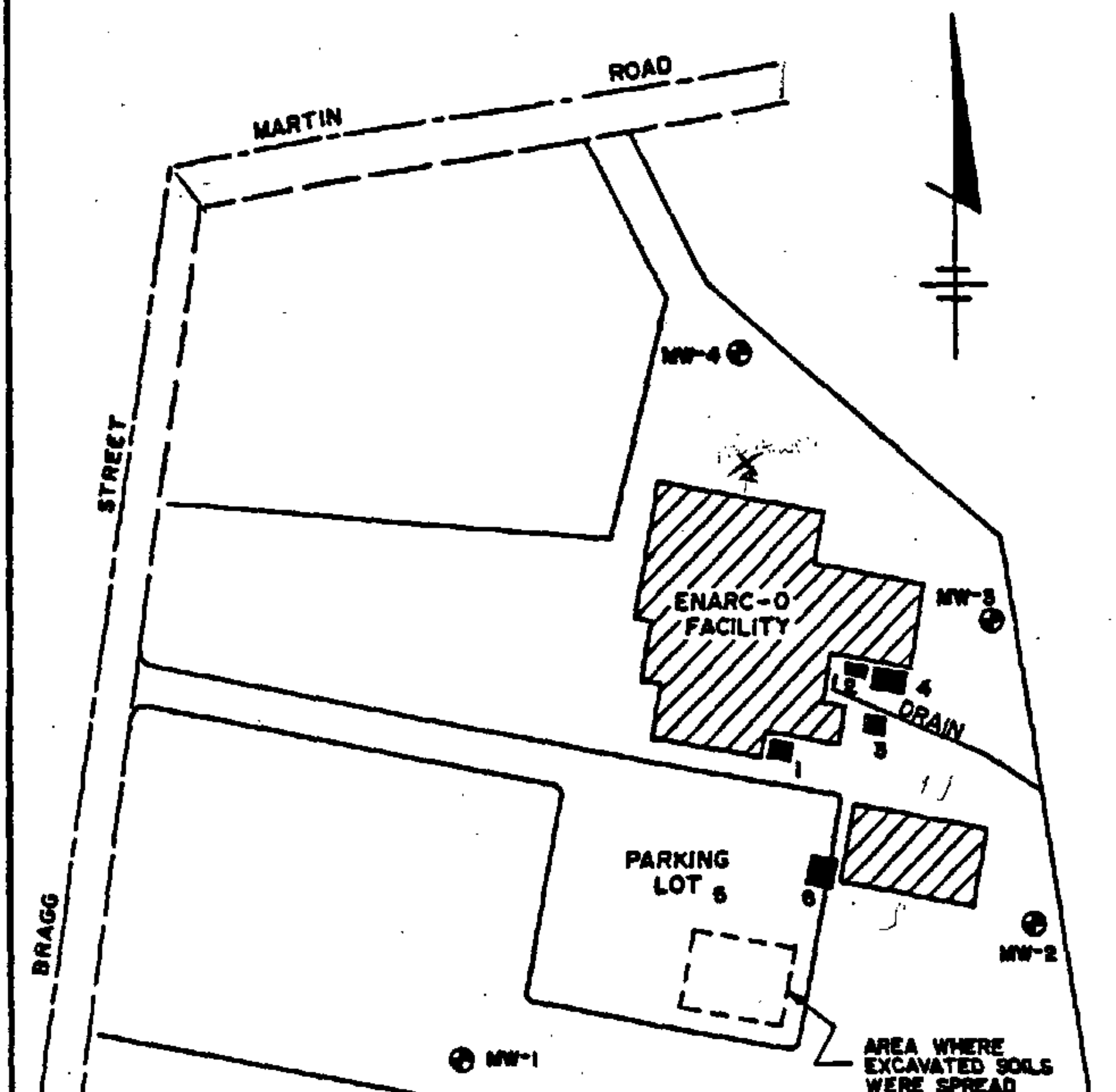
FIGURE 6



LEGEND:

1. AREA SURROUNDING A RECENTLY EXCAVATED AND REMOVED GASOLINE STORAGE TANK.
2. AREA AROUND THE REMOVED ABOVE GROUND SOLVENT STORAGE TANK.
3. AREA WHERE WASTE OIL IS RETAINED.
4. AREA AROUND ENARC-O'S LOADING DOCK.
5. AREA OF THE PARKING LOT.
6. AREA SOUTHWEST OF THE STORAGE BUILDING.

PROPOSED GROUND WATER MONITORING WELL AND SOIL BORING LOCATION MAP

0 100' 200'

SCALE IN FT

KADDIS CORPORATION (ENARC-O)

NORTH BLOOMFIELD, NEW YORK

O'BRIEN & GERE ENGINEERS INC

Appendices

O'BRIEN & GERE

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN (QAPP)

ENARC-O MACHINE PRODUCTS

DIVISION OF KADDIS MANUFACTURING CORPORATION

NORTH BLOOMFIELD, NEW YORK

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ATTACHMENTS

SECTION 1 - INTRODUCTION

The following Quality Assurance Project Plan (QAPP) has been prepared for the Site Assessment at the Kaddis Manufacturing Corporation, Enarc-O Machine Products Facility (Enarc-O) North Bloomfield, New York. It was prepared in accordance with U.S. EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans", QAM-005/80, 29 December 1980. This QAPP addresses sampling efforts associated with the tasks described in the Interim Technical Memorandum (ITM). Analytical methods and QA/QC protocols to be followed during completion of the site investigation are included in this document.

SECTION 2 - PROJECT ORGANIZATION AND RESPONSIBILITY

While all personnel involved in an investigation and in the generation of data are implicitly a part of the overall project and quality assurance program, certain individuals have specifically designated responsibilities. Within O'Brien & Gere these are the Project Manager, the Quality Assurance Coordinator, the Field Operations Manager, and the Field Environmental Technicians. OBG Laboratories, of Syracuse, New York will provide all analytical services for these investigations. Specific laboratory personnel with quality assurance/quality control responsibilities include the Laboratory Quality Assurance Coordinator and Laboratory Sample Custodian. Figure B-1 presents a project organization chart. Resumes of key personnel are included as Attachment A.

2.01 Project Manager/Quality Assurance Officer

Mr. James T. Mickam, CPGS is Project Manager for the Enarc-O site investigations. The Project Manager will maintain routine contact with the investigation's progress, regularly review the project schedule, and review all major work elements prior to submittal. Mr. Mickam will also serve as Quality Assurance Officer (QAO) for this investigation, with the responsibility of overseeing the day-to-day activities of all work to be conducted including that of subcontractor personnel. The Project Manager will oversee the scheduling and budgeting, and serves as the prime contact with state, local and federal agencies. The Quality Assurance Officer has primary responsibility for the project quality assurance activity. The Quality Assurance Officer's responsibilities include coordinating the development, evaluation, and documentation of the Quality Assurance Project Plan and procedures appropriate to the investigation. It is a major responsibility of a Quality Assurance Officer to insure that all personnel have a good understanding of the project quality assurance plan, an understanding of their respective roles relative to one another, and an appreciation of the importance of the roles to the overall success of the program.

2.02 Quality Assurance Coordinator

O'Brien & Gere's Jeffrey Banikowski will serve as Quality Assurance Coordinator. It is the Quality Assurance Coordinator's responsibility to review project plans and revisions to the plans to assure proper quality assurance is maintained. Frequent and regular meetings will take place between the Quality Assurance Coordinator and the Project Quality Assurance Officer to review all quality assurance activities. The Quality Assurance Coordinator is also responsible for all audits, data processing activities, data processing quality control, data quality review, data validating, and overall quality assurance.

Additionally, Mr. Banikowski will serve as the manager of environmental chemistry evaluations for the project and will be responsible for reviewing all chemical data, validating laboratory analytical data and coordinating the efforts between O'Brien & Gere and OBG Laboratories.

2.03 Field Operations Manager/Project Geologist

Deborah Wright, Senior Project Hydrogeologist will serve as the Field Operations Manager/Project Geologist prior to the start of work. The Field Operations Manager/Project Geologist reports directly to the Project Manager and is immediately responsible for the day-to-day activities of all O'Brien & Gere field personnel. In this capacity, the Field Operations Manager/Project Geologist is responsible for all day-to-day quality assurance project activities and reports directly to the Project Manager concerning the maintenance of the Quality Assurance Project Plan. Further responsibilities include the initialing and verification for accuracy of field notebooks, driller's logs, chain-of-custody records, sample labels, and all other field-related documentation.

2.04 Site Geologists and Technicians

Ground water, soil, and air sampling tasks required by this investigation will be conducted by experienced geologists and/or environmental technicians. Their responsibilities will include the documentation of the proper sample collection protocols, sample collection, field measurements, equipment decontamination, and chain-of-custody documentation.

2.05 OBG Laboratories Quality Assurance Coordinator

The volume of analytical work for a project of this size necessitates the subcontract analytical laboratory to specify a Quality Assurance Coordinator whose duties are specific to the project. Mr. David R. Hill will serve as OBG Laboratories' Quality Assurance Coordinator with the responsibility for maintenance of all laboratory quality assurance activities in association with the project. An organization chart for OBG Laboratories, Inc. is attached as Figure B-2.

2.06 Laboratory Sample Custodian

Ms. Wendy Smith will serve as project Laboratory Sample Custodian for OBC Laboratories, Inc. The sample Custodian's responsibilities include insuring proper sample entry and sample handling procedures by laboratory personnel.

SECTION 3 - QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA IN TERMS OF PRECISION, ACCURACY, REPRESENTATIVENESS, COMPARABILITY, AND COMPLETENESS

Data quality requirements are based on the intended use of the data, the measurement process, and the availability of resources. Data quality requirements include detection limits, accuracy, precision, and quality assurance protocols for the analytical method to be used and the analyses to be conducted. Ground water and soil samples collected in association with this investigation will be analyzed for those analytes selected and presented in the ITM. Table B-1 lists the sample container requirements, preservation and holding times for the analyses to be conducted. Analytical methods, data quality requirements, reporting limits, and quality assurance protocols and objectives are also presented in subsequent sections of this document.

The quality of all data generated and processed during this investigation will also be assessed for representativeness, comparability, and completeness based upon the available external measures of quality. The data quality assessments are qualitative determinations. The methods to be used in assessing the data quality relevant to the field-generated data for the investigation (non-analytical) are as follows:

- Representativeness - Use of USEPA recommended procedures for the collection and preservation, referenced in EPA 600/4-79-020, Methods for Chemical Analysis of Water and

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Wastes, the Federal Register, 26 October 1984 and CLP SOWs (8/87).

- Comparability - The use of consistent procedures, reporting units, standardized methods of field analysis, and standardized data format with document control.
- Completeness - Obtaining all required data as outlined in the Work Plan.

Precision and accuracy for the field pH and conductivity are dependent on the type and condition of the instrument used and the care used in the standardization and operation. The precision and accuracy objectives for the instrumentation used are according to manufacturers recommendations as follows:

- pH precision will be ±0.3 pH standard units and an accuracy of ±0.3 pH standard units.
- Conductivity precision will be ±3 umhos/cm on the 500 umhos/cm range, ±25 umhos/cm on the 5,000 umhos/cm range, and ±250 umhos/cm on the 50,000 umhos/cm range.

Trip blanks described in Section 9 of this QAPP will be subjected to the same quality assurance objectives as samples. These blanks are expected to be below detection limits for all analyses.

Data quality assessments (Sections 9, 10, and 12) will be performed on a routine basis to evaluate whether the data quality objectives of the investigation are being met. Should these assessments reveal specific data unacceptable quality, corrective actions will be implemented on a case by case basis as described under Section 13 (Corrective Action).

SECTION 4 - DRILLING AND SAMPLING PROTOCOL FOR GROUND WATER MONITORING WELL INSTALLATIONS

4.01 Bedrock Monitoring Well Installation Procedures

4.01.01 Drilling Procedures

Borings shall be completed through the overburden and bedrock using conventional hollow stem auger or fluid rotary methods to a depth as directed by the supervising hydrogeologist. The minimum diameter of the completed boring shall be six (6) inches. Soil samples will be collected at 5 foot intervals using ASTM Method D-1586.

The bedrock will subsequently be drilled using a nominal 3-inch core barrel. The borehole shall be completed to a depth specified by the supervising hydrogeologist.

Water from a controlled source shall be allowed to be introduced into the borehole during drilling for cuttings displacement and for tool cooling.

4.01.02 Bedrock Monitoring Well Completion

All monitoring wells will be constructed of ten (10) feet of 2 inch ID 0.020 inch slot (TIMCO or equivalent) Schedule 40 PVC well screen and a riser casing that will extend from the screened interval to 2-3 ft above existing grade. Other materials utilized for completion will be washed silica sand (Q-Rock Number 4 or approved equivalent) bentonite grout, Portland Cement and a protective steel locking well casing and cap with locks.

The monitoring well installation method for 2 inch wells shall be to place the screen and riser assembly into the casing once the screen interval has been selected. At that time a washed silica sand pack will be placed around the well screen. Bentonite pellets will then be added to the annulus between the casing and the inside auger to insure proper sealing. Cement/Bentonite grout will continue to be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite pellets frequent measurements will be made to check the height of the sand pack and thickness of bentonite layers by a weighted drop tape measure.

A vented protective steel casing shall be located over the PVC standpipe extending 2 ft below grade and 2-3 ft above grade secured by a Portland Cement seal. The cement seal shall extend laterally at least 1 ft in all directions from the protective casing and shall slope gently away to drain water away from the well. A vented steel cap will be fitted on the protective casing. The cap shall be constructed so it may be secured with a steel lock.

A typical monitoring well detail is provided as Figure B-3. The supervising geologist shall specify the monitoring well design to the Drilling Contractor before installation.

4.03 Well Development Protocol

All monitoring wells will be developed or cleared of all fine grained materials and sediments that have settled in or around the well during installation to insure the screen is transmitting representative portions of the ground water. The development will be by one of three methods, air surging, pumping or bailing ground water from the well until it yields, relatively sediment free water.

Air surging will consist of a clean polypropylene tubing extended to the screen portion of the well, attached to an air compressor and allowed to surge until ground water clears. Clean polypropylene tubing will be used for each well developed by this method.

In pumping or bailing a decontaminated pump or bailer will be used followed procedures outlined in the Decontamination protocol and subsequently decontaminated after each use. Ground water will be pumped from the top of the water column using a pump or bailed using a stainless steel bailer. Clean plastic will be placed on the ground to avoid surface contamination and new polypropylene rope on the bailer will be used for each well. Pumping or bailing will cease when the ground water yields sediment free water.

4.04 Hydraulic Conductivity Tests

The tests will be performed by removing water from the monitoring well in order to create a sufficient hydraulic gradient between the monitoring well and aquifer. The rate of change in water levels will be recorded and analyzed using Hvorslev's or Papadopolous' method.

If no significant drawdown can be obtained by removing water from the monitoring well an Enviro-Labs Model DL-120-MCP pressure transducer system will be utilized. This test will involve inserting a rod made of Teflon or PVC into the well in order to create a positive potential between the well and aquifer. After the Enviro-Labs system records the response to the positive potential, the rod will be removed to create a negative hydraulic potential between the well and aquifer. The rate of ground water recovery will then be recorded using the Environ-Labs system. The data collected from both the positive displacement (slug) and negative displacement will be analyzed using Hvorslev's, Papadopolous' or Bouwer & Rice method.

All equipment which comes in contact with the monitoring well be decontaminated with a methanol swabbing and distilled water rinse between each monitoring well.

SECTION 5 - SAMPLING PROCEDURES

The sampling procedures used by O'Brien & Gere are presented in the following subsection. These procedures have been standardized to allow applicability to a wide type of environmental investigations. Sampling procedures associated with the ground water, soil, and surface water at the Enarc-O site will be conducted as outlined below:

5.01 Ground Water Sampling Procedures

The general site-specific protocols for the Enarc-O site are presented in this section.

5.01.01 Preparation for Sampling

Preparation for sampling includes the acquisition of all necessary monitoring equipment and site-specific information to perform the required monitoring. Prior to initiating any ground water sampling activities, a complete round of depth to water level measurements will be measured to the nearest 0.01 ft.

Total well depths necessary to calculate the required purge volumes will be tabulated following completion of the well installations.

5.01.02 Well Evacuation

Monitoring wells will be evacuated such that a minimum of three well volumes equivalent to the amount of water standing in the well casing is removed or for low yielding wells, until the well goes dry prior to sample acquisition. The volume of water to be purged for each well will be calculated and recorded.

Either a submersible pump, bladder pump, positive displacement pump, foot valve pump, or bailer will be used to evacuate the monitoring wells. Pump placement depth will be dependent on well yields. High yielding wells will necessitate placement of the pump intake at the top of the water column. Low well yields require pump placement to be at the bottom of the well. Proper pump placement will insure complete and proper evacuation. Upon completion of the required purge volume, the pumping system will be removed from the well. Wells that are inaccessible with the pump system will be hand bailed using a bottom-loading stainless steel bailer.

5.01.03 Sample Acquisition

Prior to obtaining ground water samples for laboratory analysis, all monitoring wells must be developed as described in the Well Development Protocol. Either a submersible pump, bladder pump, positive displacement pump, foot valve pump or stainless steel bailer may be used to collect ground water samples for transfer into the proper sample containers. If well yields are low at the site, the samples will be collected as the well recovers and provides a sufficient volume for sample collection. The portion of sample required for analysis of volatiles will be collected first.

Use of the following procedures for the sampling of ground water observation wells is dependent upon the size and depth of the well to be sampled and the volume of ground water in the well.

To obtain representative ground water samples from wells containing only a few gallons of ground water, the bailing procedures is preferred. To obtain representative ground water samples from wells containing more than a few gallons, the pumping procedure generally facilitates more rapid sampling. Each of these procedures is outlined below.

A. Sampling Procedures (BAILER)

1. Identify the well and record the location on the Ground Water Sampling Field Log or in a field notebook.
2. Put on a new pair of disposable gloves.
3. Cut a slit in the center of a clean plastic sheet, and slip it over the well creating a clean surface onto which the sampling equipment can be positioned.
4. Clean all meters, tools, equipment, etc., before placing on the plastic sheet.
5. Disposable shoe covers should be placed over the samplers shoes to prevent potential contamination from dirty shoes contacting the plastic sheet. Do not kick, transfer, drop, or in any way let soils or other materials fall onto this plastic sheet unless it comes from inside the well.
6. Remove the well cap and plug placing both on the plastic sheet.
7. Using an electric well probe, measure the depth to the water table. Record this information in the Ground Water Sampling Field Log or field notebook.
8. Clean the well depth probe with a methanol soaked towel and rinse it with distilled water after use.

9. Compute the volume of water in the well, using the depth to water measurement and the total well depth as recorded on the well log. Record this volume on the Ground Water Sampling Field Log or field notebook.

10. Attach enough polypropylene rope to a bailer to reach the bottom of the well, and lower the bailer slowly into the well making certain to submerge it only far enough to fill one-half full. The purpose of this is to recover any oil film, if one is present on the water table.

11. Pull the bailer out of the well keeping the polypropylene rope on the plastic sheet. Empty the ground water from the bailer into a glass quart container and observe its appearance. NOTE: This sample will not undergo laboratory analysis, and is collected to observe the physical appearance of the ground water.

12. Record the physical appearance of the ground water on the Ground Water Sampling Field Log.

13. Lower the bailer to the bottom of the well, and agitate the bailer up and down to resuspend any material settled in the well.

14. Initiate bailing the well from the top of the water column making certain to keep the polypropylene rope on the plastic sheet. All ground water should be dumped from the bailer into a graduated pail to measure the quantity of water removed from the well.

15. Continue bailing the well from the top of the water column until a sufficient volume of ground water in the well has been

removed, or until the well is bailed dry. If the well is bailed dry, allow sufficient time for the well to recover before proceeding with Step 16. Record this information on the Ground Water Sampling Field Log.

16. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the containers designated for volatile organics analysis first. Filter and/or add preservatives to appropriate samples.

17. To minimize agitation of the water in the well, initiate sampling by lowering the bailer slowly into the well making certain to submerged it only far enough to fill it completely. Fill each sample container following the instructions listed in the Sample Containerization Procedures, Attachment B. Return each sample bottle to its proper transport container.

18. If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled. The vials designated for purgeable priority pollutant analysis should be filled from one bailer then securely capped. NOTE: Samples must not be allowed to freeze.

19. Record the physical appearance of the ground water observed during sampling on the Ground Water Sampling Field Log or field notebook.

20. After the last sample has been collected, record the date and time, and, and if required, empty one bailer of water from the surface of the water in the well into the 200 ml beaker and measure and record the pH, conductivity and temperature of the ground water following the procedures outlined in the equipment operation manuals. Record this information on the Ground Water Sampling Field Log. The 200 ml beaker must then be rinsed with distilled water prior to reuse.

21. Begin the Chain of Custody Record. A separate entry is required for each well with the required analysis listed individually.

22. Replace the well cap, and lock the well protection assembly before leaving the well location.

23. Place the polypropylene rope, gloves, rags, and plastic sheeting into a plastic bag for disposal.

24. Clean the bailer by rinsing with control water, methanol and/or 1% nitric acid, deionized water. Store the clean bailer in a fresh plastic bag.

B. Sampling Procedures (PUMP)

1. Identify the well and record the location on the Ground Water Sampling Field Log or in a field notebook.

2. Put on a new pair of disposable gloves.

3. Cut a slit in the center of a clean plastic sheet, and slip it over the well creating a clean surface onto which the sampling equipment can be positioned.

4. Clean all meters, tools, equipment, etc., before placing on the plastic sheet.

5. Disposable shoe covers should be placed over the samplers shoes to prevent potential contamination from dirty shoes contacting the plastic sheet. Do not kick, transfer, drop, or in any way let soils or other materials fall onto this plastic sheet unless it comes from inside the well.

6. Remove the well cap, and plug placing both on the plastic sheet.

7. Using an electric well probe, measure the depth to the water table. Record this information in the Ground Water Sampling Field Log or field notebook.

8. Clean the well depth probe with a methanol soaked towel and rinse it with distilled water after use.

9. Compute the volume of water in the well using the depth to water measurement and the total well depth as recorded on the well log. Record this volume on the Field Log or field notebook.

10. Attach enough polypropylene rope to a bailer to reach the bottom of the well, and lower the bailer slowly into the well making certain to submerge it only far enough to fill one-half full. The purpose of this is to recover any oil film, if one is present on the water table.

11. Pull the bailer out of the well keeping the polypropylene rope on the plastic sheet. Empty the ground water from the bailer into a glass quart container and observe its appearance. NOTE: This sample will not undergo laboratory analysis, and

is collected to observe the physical appearance of the ground water.

12. Record the physical appearance of the ground water on the Ground Water Sampling Field Log.
13. Prepare the pump for operation.
14. Lower the pump to immediately below the water level and pump the ground water into a graduated pail. Pumping should continue until sufficient well volumes have been removed or the well is pumped dry. If the well is pumped dry, allow sufficient time for the well to recover before proceeding with Step 16. Record this Information on the Ground Water Sampling Field Log.
15. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the vials designated for volatile organics analysis first. Filter and/or add preservatives to appropriate samples.
16. To minimize agitation of the water in the well, initiate sampling by lowering the bottom loading stainless steel bailer slowly into the well making certain to submerge it only far enough to fill it completely. Fill each sample container following the instructions listed in the Sample Containerization Procedures. Return each sampling bottle to its proper transport container. NOTE: While filling the sample vial

designated for purgeable priority pollutant analysis, insure that the submersible pump intakes are located at a sufficient depth below the surface of the water to insure air is not introduced while filling the vials.

17. If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled. NOTE: Samples must not be allowed to freeze.
18. Record the physical appearance of the ground water observed during sampling on the Ground Water Sampling Field Log or field notebook.
19. After the last sample has been collected, record the date and time, and, and if required, empty one bailer of water from the surface of the water in the well into the 200 ml beaker and measure and record the pH, conductivity and temperature of the ground water following the procedures outlined in the equipment operation manuals. Record this information. The 200 ml beaker must then be rinsed with methanol and distilled water prior to reuse.
20. Begin the Chain of Custody Record. A separate entry is recommended for each well with the required analysis listed individually.
21. Remove the pump from the well and clean the pumps and necessary tubing both internally and externally. Cleaning is comprised of rinses with potable water.
22. Replace the well plug, and lock the well protection assembly before leaving the well location.

23. Place the gloves, towels, and plastic sheet into a plastic bag for disposal.

5.02 Subsurface Soil Sampling

Soil borings for collection of subsurface soil samples shall be completed using the hollow stem auger drilling method or rotary drilling method to a depth specified by the supervising geologist/engineer.

Samples of the encountered subsurface materials shall be collected at a minimum of every five (5) feet and/or change in material or at the discretion of the supervising geologist. The sampling method employed shall be ASTM D-1586/Split Barrel Sampling using either a standard 2' long, 2" outside diameter split spoon sample with a 140 lb. hammer or a 3" outside diameter sampler with a 300 lb. hammer. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labelled, stored on site (on ice in a cooler if necessary), and transmitted to the appropriate testing laboratory or storage facility. Chain of custody procedures will be practiced following Section 15, EPA-600/4-82-029, Handbook for Sampling and Sample Preservation of Water and Waste Waters.

A geologist will be on site during the drilling operations to fully describe each soil sample including 1) Soil type, 2) color, 3) percent recovery, 4) moisture content, 5) odor and 6) miscellaneous observations such as organic content. The supervising geologist will be responsible for retaining a representative portion of each sample in a one pint glass jar labelled with 1) site, 2) boring number 3) interval sample/interval preserved, 4) date, and 5) time of sample collection.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the supervising geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts (i.e. the number of blows from a soil sampling drive weight (140 pounds) required to drive the split spoon samples in 6-inch increments and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

5.03 Decontamination

Decontamination procedures will be applicable to all drilling and sampling activities. All drilling and well construction equipment mobilized to the Enarc-O site will receive an initial decontamination. Decontamination will consist of steam cleaning of the entire rig and associated equipment to the satisfaction of the supervising geologist.

The rear portion of the drill rig will be decontaminated by steam cleaning between test borings and/or monitoring well installations. In addition equipment entering a test boring or well boring but not used for sample collection, will be decontaminated using a high pressure steam cleaner to remove soil and volatilize organics. Sample collecting equipment contacting soil and/or rock samples will be decontaminated after each use by a low phosphate detergent wash followed by a clean water rinse.

Carbon steel split spoons will be rinsed in a 1% Nitric Acid solution and rinsed with clean water. A methanol rinse followed by a final rinse with analyte free deionized water will complete the decontamination procedure. Solvents used for decontamination will be pesticide grade or better and will be stored separately from the analyte free deionized water.

It may be necessary to insert hoses and/or narrow diameter pipe into a test boring and/or well during installation, development, purging, and sampling. These items will also be decontaminated prior to, and following each use. The hoses will be cleaned with soapy water and rinsed with deionized water. Decontamination procedures required for site personnel will be described in the Health and Safety Plan.

5.04 Sample Preparation and Preservation

Ground water samples, if collected for metals analysis, will be collected and field filtered. Field filtering will be accomplished through a 0.45 um membrane (cellulose ester) filter prior to preservation to allow determination of dissolved metals. The filtering system used will be cleaned before and between samples with 10% HNO_3 solution and deionized water. Surface water samples will not be filtered.

Immediately after collection, samples will be transferred to properly labeled samole containers with the necessary preservatives as specified in Section 5 of the QAPP. Samples receiving pH adjustment will be checked with pH paper to ensure the proper pH has been achieved. Table B-2 lists the proper container materials, volume requirement, and preservation needed for the MVTC site analyses. Samples requiring refrigeration for preservation will be immediately transferred to coolers packed with ice or ice packs. All samples will be shipped within 24 hours of being collected. Proper chain-of-custody documentation will be maintained as discussed in Section 5 of this QAPP.

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SECTION 6 - SAMPLE CUSTODY

The primary objective of sample custody procedures is to create an accurate written record which can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Sample custody for samples collected during this investigation will be maintained by the Field Operations Manager (FOM) or the field personnel collecting the samples. The FOM or field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are delivered to the laboratory.

Sample bottles and preservatives will be supplied by OBG Laboratories, Inc. A self-adhesive sample label and a sample tag will be affixed to each container before sample collection. At a minimum, the sample tag will contain:

- Client - Job name
- Sample identification station number (place of sampling)
- Date and time collected
- Sampler's signature
- Testing required
- Preservatives added
- Sample Type
- Grab or Composite

Immediately after sample collection, the sample will be placed in an insulated cooler for delivery to the laboratory within 24 hours. O'Brien & Gere field Chain-of-Custody records completed at the time of sample collection will accompany the samples inside the cooler for delivery to the laboratory. The forms will include the project name, sampling station number, and sample location. These record forms will be sealed in a ziplock plastic bag to protect them against moisture. Each cooler will contain sufficient ice and/or ice packs to insure that proper temperature of approximately 4°C is maintained, and will be packed in a manner to prevent damage to sample containers. The shipping container will be secured with nylon strapping tape and custody sealed before shipment. The custody seals will be placed on the containers so they cannot be opened without breaking the seal. The samples will be properly relinquished on the field Chain-of-Custody record by the sampling team to the FOM. The FOM will then, in turn, relinquish the samples to the OBG Laboratories Sample Courier. When routine sampling is performed and the FOM is not present, custody will be relinquished by the responsible field personnel.

OBG Laboratories will provide sample pickup at the O'Brien & Gere office daily or on an as-needed basis. The OBG Laboratories Courier will then relinquish the samples to OBG Laboratories Sample Custodian. Upon receiving the samples, the Laboratory Sample Custodian will inspect the condition of the custody seal and samples, compare the information on the sample label against the field Chain-of-Custody record, assign an OBG Laboratories control number, and log the control number into the OBG Laboratories computer sample inventory system. OBG Labs will maintain custody of samples as described in the above sections.

When samples requiring preservation by either acid or base are received at the laboratory, the pH will be measured and documented. The Laboratory Sample Custodian will then store the sample in a secure sample storage cooler maintained at 4°C and maintain custody until assigned to an analyst for analysis.

The Laboratory Sample Custodian will note any damaged sample containers or discrepancies between the sample label and information on the field Chain-of-Custody record when logging in the sample. This information will be communicated to the FOM or field personnel so proper action can be taken. The Chain-of-Custody form will be signed by both the relinquishing and receiving parties each time the sample changes hands, and the reason for transfer indicated.

A serially numbered internal Chain-of-Custody form will be used by OBC Laboratories to document sample possession from the Laboratory Sample Custodian to Analysts and final disposition. The Chain-of-Custody information will be supplied with the analytical reports for inclusion in the document control file.

SECTION 7 - CALIBRATION PROCEDURES AND FREQUENCY

7.01 Laboratory Calibration Procedures

Equipment Calibration, References and Frequency

All field equipment used during this project will be calibrated and operated in accordance with manufacturer's instructions. Any field equipment used during this project that is not covered by the investigator's standard operating procedures will have a specific calibration and operation instruction sheet prepared for it.

A. General

Standards may be generally grouped into two classifications: primary and secondary. Primary standards include United State Pharmaceutical (USP), National Bureau of Standards (NBS), American Society for Testing and Materials (ASTM) materials, and certain designated EPA reference materials. All other standards are to be considered secondary.

B. Testing

1. Primary: No testing is necessary. Do not use if there is any physical indication of contamination or decomposition (i.e. partially discolored, etc.).
2. Secondary: Examine when first received either by comparison to an existing primary, or comparing known physical properties to literature values. Standards which are less stable will be rechecked at appropriate intervals ranging from approximately six months to one year.

C. Records

1. A records book will be maintained for each grouping of standards (i.e. pesticides, metals, etc.)
2. The record kept for each standard will include:
   a. Name and date received
   b. Source
   c. Code or lot number
   d. Purity
   e. Testing data including all raw work and calculations
   f. Special storage requirements
   g. Storage location
3. These records will be checked periodically as part of the Laboratory Controls Review.

Equipment

A. General

1. Each major piece of analytical laboratory instrumentation used on this project is documented and on file with the analytical laboratory.
2. A form is prepared for each new purchase and old forms will be discarded when the instrument is replaced.

B. Testing

1. Each form details both preventative maintenance activities and the required QA testing and monitoring.
2. In the event the instrument does not perform within the limits specified on the monitoring form, the Laboratory Manager will be notified and a decision made as to what action to take.

3. If repair is deemed necessary, an "out of order" sign will be placed in the instrument until repairs are effected.

7.02 Calibration Records

A bound notebook will be kept with each instrument, requiring calibration, to record all activities associated with a maintained, QA monitoring and repairs program. Additionally, these records will be checked during periodic equipment review.

7.03 Field Calibration

In addition to the laboratory analyses conducted during the course of this investigation, field measurements of pH, specific conductance, and temperature will be taken for all surface and ground water samples. Where necessary, an photoionization detection meter will be used to measure volatile organics in air or soils.

The frequency of field calibration procedures will, at a minimum, include the following:

- The pH and specific conductance meters will be calibrated at a minimum of once daily and documented in a calibrator's field book. Calibration will be checked as necessary to insure proper measurements are taken.
- pH meters will be calibrated using specific techniques according to the manufacturer's instructions and two standard buffer solutions (either 4, 7, or 10) obtained from chemical supply houses. The pH values of these buffers will be compensated for temperature according to the values supplied on

the manufacturer's bottle label. The temperature (measured as below) at which the sample pH was measured will then be used to compensate for temperature on the meter.

- Temperature measurements will be performed using field thermometers (Thomas Science No. 9329A10).
- Specific conductance meters will be calibrated using a 1413.0 umho (KCl) solution prepared by OBG Laboratories according to Standard Methods of the Analysis of Water and Wastewater, 16th Edition, 1985-Method 205, 3b, page 79.

SECTION 8 - ANALYTICAL PROCEDURES

The analytical methods which are to be used for analysis of the sample media collected at the Enarc-O site were chosen based on the substances used at the site as revealed by the background information review. The selected methods are discussed in the Interim Technical Memorandum. Specifically, ground water samples will be analyzed for volatile organics in accordance with EPA methods 601 and 602. The soil samples will be analyzed for volatile organics using EPA methods 8010 and 8020. In addition, the two soil samples collected from the boring located in the vicinity of the removed gasoline storage tank will also be analyzed for lead in accordance with EPA method 7421. A summary of the analytical methods and the detection limits for the individual analytes is included in Table B-4.

SECTION 9 - DATA REPORTING, VALIDATION, AND REDUCTION

9.01 Data Reduction

OBG Laboratories, Inc. will be performing analyses on the environmental samples. The following data handling procedures are employed at OBG Laboratories, Inc.

A. Gas Chromatography/Mass Spectrometry: 1) A Hewlett-Packard Model 5987A GC/MS equipped with a Tekmar Model 400 Dynamic Head Space concentrator and a RTE6 VM Operating System and, 2) a 5996 HP GC/MS with a 7672A HP Auto Sampler and a RTE6 VM Operating System are used for positive identification and quantification of volatile organics and sample extracts. Both instruments use an aquarius software package for data reduction. Output from the GC/MS units is processed for presentation in three formats:

1) A real-time total multiple ion mass chromatogram.

2) A post-run investigation report containing the following:

   a. Retention time

   b. Response factor

   c. Primary, secondary and tertiary ion with their correspondings abundance

   d. Quantitation ion

   e. Reference library name

   f. Concentration

3) A visual comparison of the subject mass spectral output to the library compound.

The post integration report contains the following:

1) Listing of all compounds.

2) Relative retention times.

3) Relative response factor to their internal standards.

Quality Assurance/Quality Control data such as resolution and calibration standards and DFTPP spectra are also processed and stored in the above manner.

B. Gas Chromatography: A Hewlett-Packard Model 5880A Gas Chromatograph (GC) equipped with an Electron Capture Detector and a 7673A H.P. Auto injection system is used for positive identification and quantification of sample extracts.

Output from the GC unit is processed for presentation in two forms:

1) A real time chromatogram

2) A post-run integration report containing the following:

a. Retention time

b. Response factors calculated from standards

c. Surrogate standard reservoir

d. Listing of all positively identified compounds

Quality Assurance/Quality Control data such as spikes, spike duplicates, and calibration curves are also processed and stored in post integration reports.

C. Trace Metals: A Varian model 575 Atomic Absorption Spectrophotometer (AA) and Perkin-Elmer Model 3030B Atomic Absorption Spectrophotometer with an HGA600 furnace are used for the low level detection of metals by conventional flame and graphite furnace techniques.

The atomic absorption spectrophotometer for inorganic pollutants is calibrated using appropriate calibrating standards and blanks. The calibrations are checked by analyzing synthetic standards at five different concentration levels.

The results are used to generate standard curves by least squares fit of the data via computer programs. The deviation of the standards from the least squares fit (standard curves) and the standard deviation of the fit are printed on the daily printout and the data stored accordingly in appropriate computer bases. If deviations from accepted values occur, analysis of sample and instrumental calibrations are repeated. Standard curves are generated regularly.

D. Spectrophotometry: Spectrophotometric instruments are initially calibrated with commercially available standards. To verify the initial calibration, EPA knowns are analyzed and must be within ±10% of the true value. At a frequency of 10% a continuing calibration standard is analyzed and quantitated. If the continuing calibration standard is not within 10% the instrument is recalibrated and the previous 10 samples are reanalyzed. The chemist documents any excursions and continuing calibration on the bench analysis log.

Data validation practices will be followed to insure that raw data are not altered and that an audit trail is developed for those data which require reduction. The field data, such as those generated during field measurements, will be entered directly into a bound field notebook. Each project team member will be responsible for proofing all data transfers made.

OBG Labs group leaders will check and validate all data generated by their group as specified in Attachment 1. The QAO of the laboratory will provide a signed document verifying the validation of the data.

Upon receipt of OBG Labs Analysis Reports and associated data packages, laboratory analyses will be validated by O'Brien & Gere's Quality Assurance Coordinator by reviewing the laboratory quality control data, laboratory method blanks, trip blanks, agreement between samples and duplicates, and surrogate and spike recovery data.

The analytical data obtained during the course of the investigation for ground and surface waters will be reported as ug/L (ppb). Laboratory data for soil analyses will be reported as ug/kg on a dry weight basis. Analyses conducted in association with the investigation will be reported utilizing OBG Laboratories level two data package. Table B-5 lists the deliverables that are included in the OBG Labs data package.

The validation program will incorporate a tracking and filing system for documents generated during the investigation. Documents accounted for in this aspect of the validation program will include items such as log books, field data records, correspondences, chain-of-custody records, analytical reports, photographs, computer disks, and reports. The Project Manager is responsible for maintaining a central file in which documents will be inventoried. The raw data generated during field operations will be filed to eliminate or correct errors arising from the transfer of data.

To avoid errors in the transfer of data, copies of raw data from the field notebooks, and the data as received from the laboratory, will be entered into a data file and assigned an appropriate document control identification number. The data file will serve as the ultimate archive for all information and data generated during this investigation.

The documentation of sample collection will include the use of bound field log books in which the information on sample collection will be entered in indelible ink. Enough information will be given to reconstruct the sampling event, including: site name (top of each page), sample identification, brief description of sample, date and time of collection, sampling methodology, field measurements and observations, and sampler's initials (bottom of each page, and dated).

SECTION 10 - INTERNAL QUALITY CONTROL CHECKS

10.01 Laboratory Internal Quality Control Checks

OBG Laboratories Internal Quality Control Checks will meet or exceed analytical QC requirements set forth by USEPA approved methodologies (e.g. Test Methods for Evaluating Solid Wastes, EPA, 1986). These QC checks will be a continuation of O'Brien & Gere's Field Internal Quality Control Checks presented below.

10.02 Field Internal Quality Control Checks

Field Internal Quality Control Checks will be utilized during this investigation through the use of the following QA/QC samples which are summarized on Tables B-5 and B-6.

- Trip Blanks - These blanks consist of ultrapure, deionized water contained in appropriate sample containers with any preservatives required for the analysis. These blanks will be provided by OBG Labs. They will accompany the samplers during the sampling process and will serve as a QC check on container cleanliness, external contamination, and the analytical method. Trip blanks will be submitted once per day per analysis type for samples involving ground water. A volatile trip blank will be submitted daily for soil/sediment samples.
- Field Equipment Rinse Blanks - These blanks will consist of demonstrated analyte free water passed through sampling equipment and collected in appropriate containers. These blanks will verify decontamination of sampling equipment and eliminate the possibility of cross-contamination. Equipment

blanks will be collected once daily per analysis type for each type of sampling equipment used.

- <u>Duplicate Samples</u> - Duplicate samples will be collected to allow determination of analytical repeatability. One duplicate sample in every twenty (20) ground and surface water samples collected, and one in every twenty (20) soil or sediment samples, will be collected and submitted for analysis. These samples may be run as matrix spike duplicates (see below).
- <u>Matrix Spike Sample</u> - A matrix spike sample will also be submitted as a further QC check. These will be collected at the same frequency as stated above for the duplicate samples. These will allow recovery rates of compounds (the spike and/or surrogate spike compounds defined in the organic and inorganic methods) to be determined for matrix effects specific to the study site through the addition of known concentrations of compounds into the sample (by OBG Labs at the laboratory) and then performing the analysis.

Therefore, from the above discussion, every twentieth sample or five percent, whichever is more frequent, will be analyzed in duplicate (or matrix spike duplicate) and run as a matrix spike sample.

Duplicate and matrix spike samples will be acquired for ground and surface waters by collecting sequential grab samples after collection of the actual sample. Soil duplicate and matrix spike samples will be collected by splitting the sample between the sample container, duplicate container, and matrix spike container. If insufficient soil sample is present at a particular location to collect the three sample volumes, a single liter sample will be split at the laboratory for duplicate and matrix spike analysis.

SECTION 11 - PERFORMANCE AND SYSTEM AUDITS

11.01 On-Site Audit

An on-site system audit will be performed during major field activities to review all field-related quality assurance activities. The system audit will be conducted by O'Brien & Gere's Quality Assurance Coordinator.

Specific elements of the on-site audit include the verification of:

- Completeness and accuracy of sample Chain-of-Custody forms, including documentation of times, dates, transaction descriptions, and signatures.
- Completeness and accuracy of sample identification labels, including notation of time, date, location, type of sample, person collecting sample, preservation method used, and type of testing required.
- Completeness and accuracy of field notebooks, including documentation of times, dates, drillers names, sampling method used, sampling locations, number of samples taken, name of person collecting samples, types of samples, results of field measurements, soil logs, and any problems encountered during sampling.
- Adherence to health and safety guidelines outlined in the Site Health and Safety Plan including wearing of proper protective clothing.
- Adherence to decontamination procedures outlined in Section 4 of this QAPP, including proper decontamination of pumps and pump tubing, bailers, and soil sampling equipment.

- Adherence to sample collection, preparation, preservation, and storage procedures.

11.02 Laboratory Audit

11.02.1 OBG Laboratories Internal Laboratory Audits

OBG Labs performs regular systems and performance audits. O'Brien & Gere's Quality Assurance Coordinator will also conduct a system audit of the laboratory once during the project to evaluate whether proper quality assurance measures are being incorporated into the sample handling and analysis. Table B-7 lists the checklist that will be used for the system audit.

Results of both the field and laboratory audit will be submitted to O'Brien & Gere's Project Manager and Quality Assurance Coordinator for review and incorporation into the status reports prepared by O'Brien & Gere.

If the results of the audit necessitate further action, the Project Manager will be notified of such and will be appraised of any action taken.

SECTION 12 - PREVENTIVE MAINTENANCE

12.01 Laboratory Maintenance

Standard operating procedures for maintenance, including specific routine and preventive procedures, and maintenance logs for all analytical instruments are employed at OBG Labs according to manufacturers' recommendations.

12.02 Field Maintenance

O'Brien & Gere's field equipment is maintained regularly according to the manufacturers specifications. When damaged equipment or equipment in need of repair is returned to the equipment warehouse, it is appropriately flagged for the required maintenance to be performed. This process assures only operable and maintained equipment enters the field. Routine daily maintenance procedures conducted in the field will include:

- Removal of surface dirt and debris from exposed surfaces of the sampling equipment and measurement systems.
- Cleaning of filters in the organic vapor analyzer.
- Storage of equipment away from the elements.
- Daily inspections of sampling equipment and measurement systems for possible problems (e.g. cracked or clogged lines or tubing or weak batteries).

Spare and replacement parts stored in the field to minimize downtime include:

- Appropriate size batteries
- Locks

- Extra sample containers
- Bailer line
- Additional stainless steel bailers
- Additional equipment as necessary for the field tasks.

SECTION 13 - SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

13.01 O'Brien & Gere's Data Quality Assessment

O'Brien & Gere's Quality Assurance Coordinator will review and validate all data as it is received. This validated data will then be incorporated into the next report to be submitted.

The data will be checked by OBG Labs prior to its release to O'Brien & Gere. The main objective of O'Brien & Gere's Quality Assurance Coordinator will be to insure that errors have not been made. This will be accomplished by checking all quality assurance precision and accuracy data and insuring that data packages are complete with information such as:

- Title page
- Chain-of-custody records
- Analytical reports
- Quality control data summary
- Chromatograms
- Methodology summary
- Calibration data

Quality control summary forms will be checked to the specified limits in the required methods. If outliers exist, it will be determined what corrective measures were used to locate the problem or determine if it was sample matrix interference. The following documents will be used in support of the data quality assessment review:

- EPA Region III Data Validation Checklist

- EPA 600/4-79-019, "Handbook for Analytical Quality Control in Water and Wastewater Laboratories".
- Technical Directive Document No. HQ-8410-01, "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses".
- EPA 600/479-020, "Methods for Chemical Analysis of Water And Wastes".
- Federal Register, Friday, October 26, 1984.

13.02 Field Data Quality Assessment

To ensure that all field data are collected accurately and correctly, specific written instructions will be issued to all personnel involved in field data acquisition by the Project Manager. The Quality Assurance Coordinator will then review the field books used by project personnel to insure that all tasks were performed as specified in the instructions.

All raw data and reduced data will be submitted by project personnel to the Quality Assurance Coordinator for review. The Quality Assurance Coordinator will then submit these data to the Project Manager for use after all aspects of the data have been approved, initialed, and dated by the Quality Assurance Coordinator. Equations, calculations, data transfers, consistent units and significant figures will all be subject to this quality assurance review.

SECTION 14 - CORRECTIVE ACTION

Corrective action procedures that might be implemented from audit results or upon detection of data unacceptability will be developed on a case-by-case basis. Generally, the following actions may be taken:

1. The reason for the unacceptable data point(s) will be determined as follows:
   a. Precision
      i. The analyst
      ii. Nature of the sample
      iii. Glassware contamination
   b. Accuracy
      i. The analyst
      ii. Glassware contamination
      iii. Contaminated reagents
      iv. Instrument problems
      v. Sample interference with spiked material
2. The corrective actions to be taken may include:
   - Reanalyzing samples if holding times have not been exceeded.
   - Altering field or handling procedures.
   - Resampling.
   - Using a different batch of sample containers.
   - Recommending an audit of laboratory procedures.
   - Accepting data with know levels of uncertainty.
   - Discarding data.

Problems encountered during the study affecting quality assurance will be reported on a Corrective Action Form. The Project Manager and the OBG Labs QA Coordinator will be responsible for initiating the corrective actions in the field and laboratory, respectively, in a timely manner. The Project Manager will report to the Quality Assurance Coordinator on the corrective actions taken, the outcome of these actions, and their effect on data produced. Corrective actions will be discussed in the quality assurance report to management described in Section 14.

SECTION 15 - QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Project Manager, in conjunction with the Quality Assurance Coordinator, will submit, in the investigation reports, summaries of all applicable quality assurance activities. These summaries will contain at least the following types of information.

- The status and coverage of various laboratory and field quality assurance project activities.
- Data quality controls including assessment of: accuracy, precision, completeness, representativeness, and comparability.
- Significant quality assurance problems discovered, corrective actions taken, progress and improvements, plans, and recommendations for further implementation or updating of the investigative QAPP.
- Any significant irregularities noted in the field notebook during the sampling procedure.
- Results of performance and system audits, if conducted.
- A discussion of the QA/QC data as it relates to the data quality objectives of the investigation and the interpretation of the results of the field investigation.

TABLE B -1 SAMPLE CONTAINER REQUIREMENTS

PRESERVATION AND HOLDING TIMES

Sample Fraction	Sample Matrix	Sample Preservation	Holding Time	Container
Volatile Organics	Soil	Cool, 4°C	10 Days	(2) 120 ml wide-mouth vials w/ teflon liners
Metals	Soil	Cool, 4°C	6 months	(1) 8oz wide-mouth bottle w/teflon liner
Volatile Organics	Water	Cool, 4°C	10 Days	(2) 1 liter amber glass w/teflon lined enclosure
Trip Blank	Water	Cool, 4°C	14 Days	40 ml glass vials w/teflon liners
Rinsate Blanks	Water	Cool, 4°C (HNO_3 to pH <2 for metals)	14 Days	metals: 1000 ml plastic bottles w/teflon liners; VOA: 40 ml glasss vials.

Sources: Test Methods for Evaluating Solid Waste, U.S. EPA, SW-846, November, 1986, 3rd edition.

TABLE 8 - 2

ENARCO-O MACHINE PRODUCTS SITE

WELL NO.	TOTAL DEPTH (FEET)
MW-1	________
MW-2	________
MW-3	________
MW-4	________

TABLE B - 3

CONDUCTIVITY TEMPERATURE CORRECTIONS
FOR 1,413 UMHOS/CM CONDUCTIVITY STANDARD

TEMPERATURE, °C	UMHOS/CM
4	914.0
5	932.7
6	951.7
7	971.1
8	991.0
9	1,011.9
10	1,031.8
11	1,052.9
12	1,074.3
13	1,096.3
14	1,118.7
15	1,141.5
16	1,167.5
17	1,193.6
18	1,219.9
19	1,246.4
20	1,273.0
21	1,299.7
22	1,326.6
23	1,353.6
24	1,380.8
25	1,408.1
26	1,436.5
27	1,463.2
28	1,490.9
29	1,518.7
30	1,546.7

TABLE B - 4
ANALYTICAL METHOD DETECTION LIMITS
ENARC-O MACHINE PRODUCTS SITE

1. Halogenated Volatile Organics	Soil Gas (mg/sample)	Practical Quantitation Limits* Low Water** (ug/l)	Low Soil/ Sed*** (ug/kg)
Acetone	****	****	<100
Benzyl Chloride	0.01	****	****
Bromodichloromethane	****	****	<5
Bromoethane	****	****	<10
Bromoform	0.01	<5	<5
2-Butanone	****	****	<100
Carbon Disulfide	****	****	<5
Carbon Tetrachloride	0.01	<5	<5
Chlorobenzene	0.01	<5	<5
Chlorobromomethane	0.01	****	****
Chloroethane	****	<10	<10
Chloroform	0.01	<5	<5
2-Chloroethyl vinyl ether	****	****	<10
Chloromethane	****	<10	<10
Dibromochloromethane	****	<5	<5
1,2-Dichlorobenzene	0.01	<5	****
1,3-Dichlorobenzene	****	****	****
1,4-Dichlorobenzene	0.01	<5	****
Dichlordifluoromethane	****	<5	****
1,1-Dichloroethane	0.01	<5	<5
1,2-Dichloroethane	****	<5	<5
1,1-Dichlorethylene	****	<5	<5
trans-1,2-Dichloroethylene	0.01	<5	<5
1,2-Dichloropropane	****	<5	<5
hexachloroethane	0.01	****	****
2-hexanone	****	****	<50
4-methyl-2-pentanone	****	****	<50
methylene chloride	****	<5	<5
cis-1,3-dichloropropene	****	****	****
trans-1,3-Dichloropropylene	0.01	<5	<5
1,1,2,2-Tetrachloroethane	0.01	<5	<5
Tetrachloroethylene	****	<5	<5
1,1,1-Trichloroethane	0.01	<5	<5
1,1,2-Trichloroethane	****	<5	<5
Trichloroethylene	****	<5	<5
Tetrachlorofluoromethane	****	<5	****
Vinyl Chloride	****	<10	<10

TABLE B - 4 (CON'T)

2. Aromatic Volatile Organics	Soil Gas (mg/sample)	Low Water** (ug/l)	Low Soil/ Sed*** (ug/kg)
Benzene	.001 to .01	<5	<5
p-Tert-Butyltoluene	.001 to .01	****	****
Chlorobenzene	****	<5	****
Cumene	.001 to .01	****	****
1,2-Dichlorobenzene	****	<5	****
1,3-Dichlorobenzene	****	<5	****
1,4-Dichlorobenzene	****	<5	****
Ethyl Benzene	.001 to .01	<5	<5
alpha-methylstyrene	.001 to .01	****	****
Naphthalene	.001 to .01	****	****
Styrene	.001 to .01	<5	<5
Vinyltoluene	.001 to .01	****	****
Vinyl Acetate	****	<50	<50
Toluene	****	<5	<5
Xylene(s)	.001 to .01	<5	<5

3. Metals	Soil Gas (mg/sample)	Low Water (ppm)	Low Soil/Sed (ppm)
Lead (EPA 7421)	.01	<0.05	<5

* Medium Soil CRDL for volatiles are 100 times the individual Low Soil CRDL.

Detection limits listed for soil are based on wet weiht. The detection limits calculated by the laboratory on a dry weight basis will be higher.

Sources: Test Methods for Evaluating Solid Waste, U.S. EPA, SW-846, November, 1986, 3rd edition.

Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, March, 1983.

Federal Register, Vol. 49, Appendix A to Part 136-Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, October, 1984.

NIOSH Manual of Analytical Methods, U.S. DHHS, February, 1984.

TABLE 8 - 5

FREQUENCY OF QUALITY CONTROL SAMPLES

ENARC-O MACHINE PRODUCTS SITE

ATRIX	ESTIMATED No. SAMPLES	SAMPLE FRACTION/APPLICATION REFERENCE No.	TRAVEL BLANKS	RINSATE BLANKS	DUPLICATES	MS/MSD
oil	2	Lead 7421	1/ship	1	1	1
Soil	20	Organics - 8010/8020	1/ship	2	2	1
ater	5	Organics - 601/602	1/ship	1	1	1

Note: Locations specified in Work Plan, the actual number of samples obtained are dependent on the field conditions.

TABLE B - 6

CONTROL LIMITS

LEAD

EPA METHOD: 7421

AUDIT	FREQUENCY	CONTROL LIMIT
Calibration Verification	Calibrated daily and each time instrument is set up; verify at a frequency of 10% or every 2 hr. whichever is greatest.	Within 10% of the true value for all except tin and mercury (20% of true value)
Calibration Blank	During calibration at a frequency of 10% during and at end of run.	No more than CRDL.
Preparation Blank	1 per batch of samples digested or 1 in 20 whichever is greater.	No more than CRDL.
Spiked Sample Analysis	1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20 whichever is greater	Within 50% of known value.
Duplicate	Same as spiked sample analysis.	50% relative percent difference for values.
Sample Analysis Lab Control Sample	Once a month for each of the procedures (applied) to sample analysis.	Within 35% of recovey.

TABLE 8 - 6 (cont)

CONTROL LIMITS

VOLATILES

EPA METHOD: 8010/8020

AUDIT	FREQUENCY	CONTROL LIMIT
Calibration Verification	Calibrated daily (morning) with a single point calibration.	Within 10% of the true value.
Organic free Blank	Daily	No compounds present.
Reference Standard	Daily	Within 30% of true value.
MS/MSD Blank	10%	50% of known value.
Surrogates	Each Sample	30% if known value.

TABLE B - 6 (cont)

CONTROL LIMITS

VOLATILES

EPA METHOD: 8010/8020

AUDIT	FREQUENCY	CONTROL LIMIT
Calibration Verification	Calibrated daily (morning) with a single point calibration.	Within 10% of the true value.
Organic free Blank	Daily	No compounds present.
Reference Standard	Daily	Within 30% of true value.
MS/MSD Blank	10%	50% of known value.
Surrogates	Each Sample	30% if known value.

TABLE B - 6 (cont)

CONTROL LIMITS

VOLATILES

EPA METHOD: 601/602

AUDIT	FREQUENCY	CONTROL LIMIT
Calibration Verification	Calibrated daily (morning) with a single point calibration.	Within 20% of the true value.
Organic free Blank	Daily	No compounds present above DL.
Reference Spike	One per day	Within 25% of true value.
MS/MSD Blank	5%	50% of known value. 25% of the RPD.
Surrogates	Each Sample	30% if known value.

DL = Detection Limit
RPD = Relative Percent Difference

TABLE B - 7
O'BRIEN & GERE'S SYSTEM AUDIT CHECKLIST FOR OBG LABORATORIES

I. Chain-of-Custody
- Log-In Procedures Evaluated
- Sample Custodian is Assigned and Oversee Sample Transfer
- Sample Routing and Pickup is Documented and Accounted for
- Seperate Area for Sample Storage and Maintained in Locked Storage

II. Sample Preparation
- Correct Sample Preparation Procedures are Followed
- Areas Designed for Sample Preparation (Organic and Inorganic)
- Holding Times Maintained

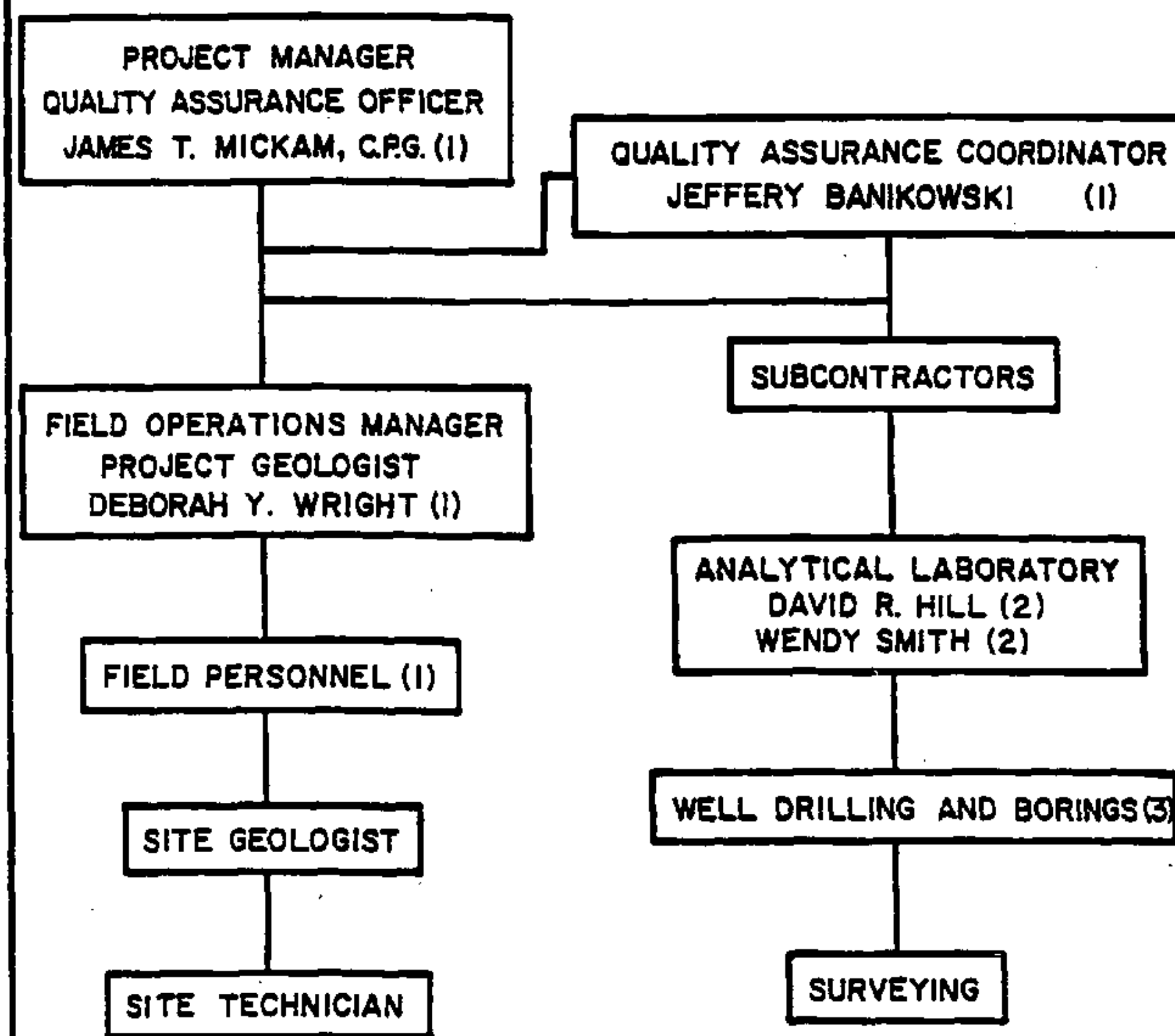
III. QA/QC Procedures
- Procedures are Being Followed According to Methods Specified
- Data Validation and Reduction Processes Reviewed by Group Leaders
- Proper Documentation of QA Procedures
- Internal QC Maintained
- Data Transfers and Reporting Checked by Group Leaders
- Awareness of Personnel of QA Requirements

IV. Equipment Maintenance
- Maintenance Logs are Up-to-Date
- Instrumentation is in Repair
- Reasonable Spare Parts are on Hand

V. Miscellaneous
- Overall Housekeeping in Order
- Certification Up-to-Date

FIGURE B-1

PROJECT ORGANIZATION CHART



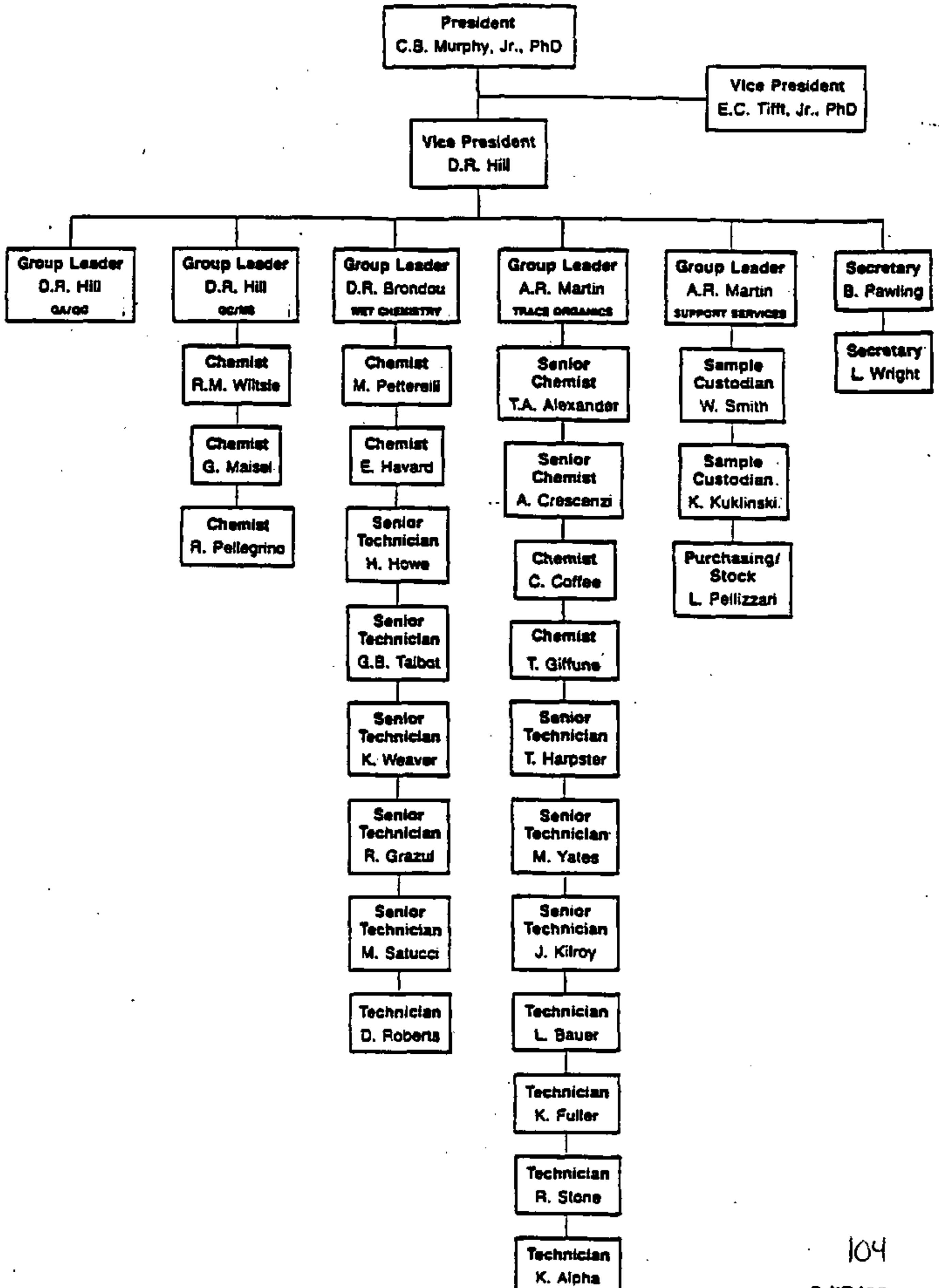
(1) OBRIEN & GERE ENGINEERS, INC.

(2) OBG LABORATORIES, INC.

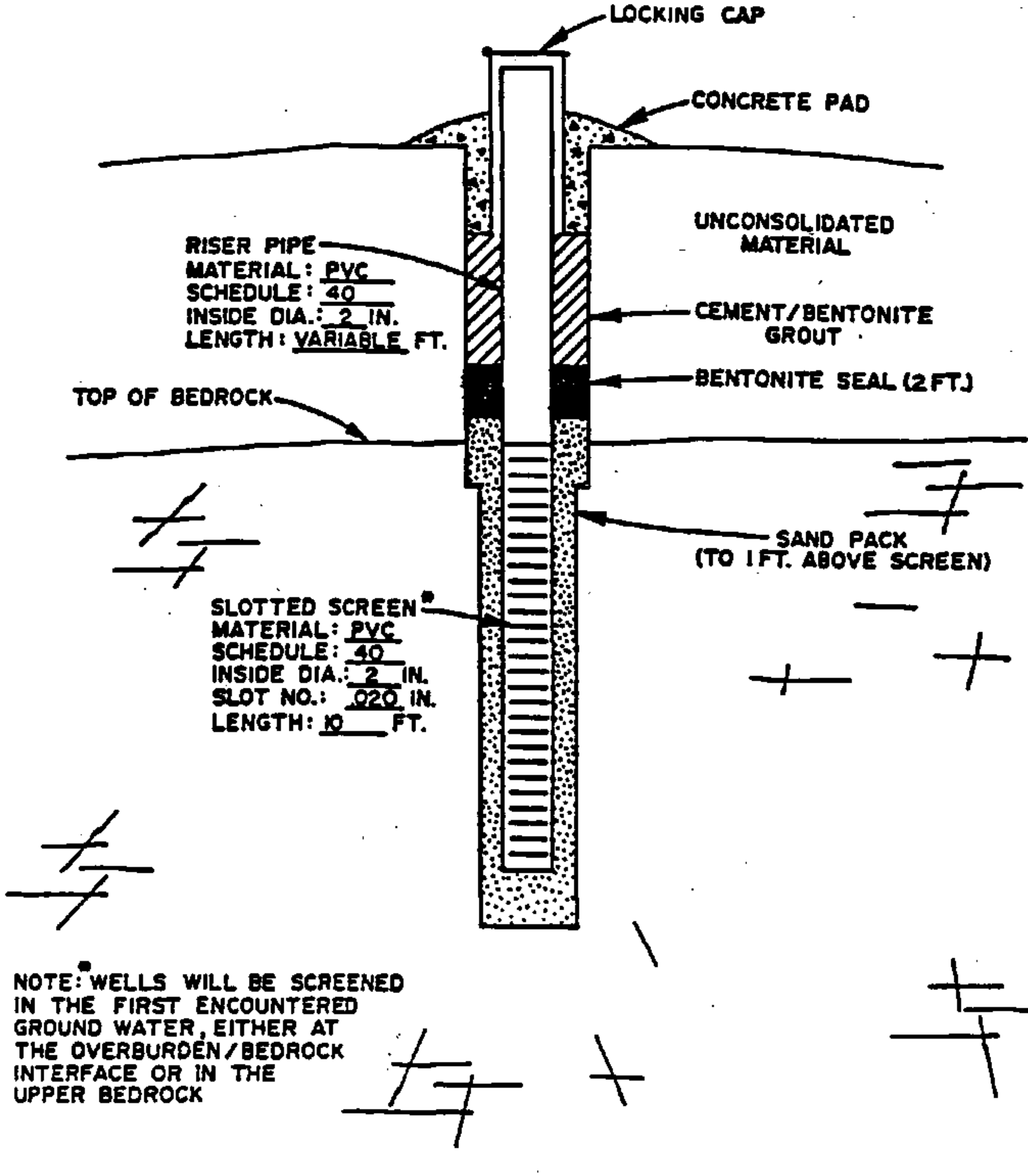
(3) PARRATT-WOLFF, INC.

LABORATORY ORGANIZATION CHART

FIGURE B-



3/17/89



*NOTE: WELLS WILL BE SCREENED IN THE FIRST ENCOUNTERED GROUND WATER, EITHER AT THE OVERBURDEN/BEDROCK INTERFACE OR IN THE UPPER BEDROCK

TYPICAL BEDROCK MONITORING WELL

(NOT TO SCALE)

053397

FIGURE B-4

LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

SURVEY	SAMPLERS: (Signature)

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE: Water – Comp.	SAMPLE TYPE: Water – Grab.	SAMPLE TYPE: Air	SEQ. NO.	NO. OF CONTAINERS	ANALYSIS REQUIRED

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) — Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment:		

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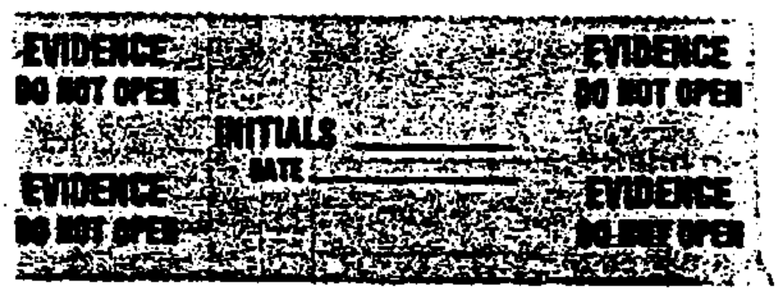
FIGURE B-5

CHAIN-OF-CUSTODY

EVIDENCE TAPE



JAMES T. MICKAM, C.P.G.
VICE PRESIDENT

BACKGROUND

Mr. Mickam joined O'Brien & Gere Engineers, Inc. in 1982, was promoted to Senior Project Hydrogeologist in 1984 and Managing Hydrogeologist in 1985. In 1988 he was promoted to Vice President.

Fields of special competence include the development, implementation and management of hydrogeologic investigations to evaluate ground water contamination occurrence and migration, and the design of municipal and industrial ground water supply wells. Hydrogeologic environmental experience includes both unconsolidated porous media and fractured bedrock flow systems.

EDUCATION

Michigan State University, 1978, BS Geology

PROFESSIONAL CERTIFICATIONS

Certified Professional Geological Scientist #6824
American Institute of Professional Geologists

PROFESSIONAL AFFILIATIONS

Association of Ground Water Scientists

EXPERIENCE

HAZARDOUS WASTE MANAGEMENT:

Extensive experience in the development of investigation protocols for hazardous waste site hydrogeologic investigations, including test boring methods, monitoring well designs and installation methods, and equipment decontamination procedures in a variety of both hard rock and unconsolidated hydrogeologic systems. Currently responsible for supervising and consulting on a wide variety of hydrogeologic studies at hazardous waste sites. Representative projects include:

Baltimore, MD - Developed and supervised hydrogeologic investigations to evaluate the potential impacts from agricultural chemical waste disposal to a major coastal plain aquifer. Study involved field activities including geophysical surveys, test drilling and insitu hydraulic conductivity testing. Computer modeling techniques were used during data reduction to evaluate feasibility of desirable remedial measures.

Performed hydrogeologic investigation and provided consulting services and expert testimony for a major Ohio law firm representing an industrial client in a federal ground water contamination litigation. Study methods employed included geophysical surveys, air photo interpretation, structural geologic mapping, borehole geophysical logging and computer modeling.

Aiken, SC - Assisted client in developing and implementing a hydrogeologic investigation and hazardous waste characterization plan to develop engineering design criteria for surface impoundment closure plans.

Muskegon County, MI - Conducted hydrogeologic investigation for a large chemical concern to assess potential impacts on a proposed hazardous waste incinerator.

Houghton, Michigan and Wexford County, Michigan Department of Natural Resources - Conducted hydrogeologic investigations to identify ground water contamination sources and developed management strategies to rate ground water contamination sites with regard to their relative severity.

Kalamazoo County, MI - Industrial chrome plating company, conducted hydrogeologic investigation to define the extent of hexavalent chrome contamination in the ground water system.

Washington County, NY - Supervised field investigation for a hydrogeologic study to assess the impact of a PCB disposal site on the ground water system.

Boston, MA - Conducted hydrogeologic investigation for a major oil company to assess extent and impact of a 50,000 gallon petroleum product loss. Designed, supervised construction and monitored a successful spill recovery system.

Muskegon County, MI - Performed hydrogeologic investigation to develop design criteria for a fly ash disposal facility and developed a ground water monitoring system around the completed facility.

Kalkaska County, MI - Conducted electrical earth resistivity surveys for the Northern Michigan Regional Planning Commission to identify areas of potential ground water contamination resulting from abandoned brine pits.

Oswego County, NY - Conducted a hydrogeologic investigation and monitoring program for a major oil company to determine the extent and migration of a gasoline spill in the local aquifer. Evaluated the original recovery system and developed a program to enhance the recovery operation and thereby minimize the potential for contamination of a nearby public supply well.

Ponce, Puerto Rico - Assisted client in developing and implementing hydrogeologic investigation to evaluate the impact of a high specific gravity non-aqueous hydrocarbon fluid. Study elements included ground water monitor well installations, ground water sampling, aquifer performance testing, hydrogeologic mapping and computer modeling.

Marquette, MI - Completed remedial investigation for industrial client at a federal superfund site. Responsibilities included assisting with regulatory negotiations on work plan, coordination of subcontracts, and supervision of hydrogeologic investigation.

WATER RESOURCES:

Experience includes studies to evaluate ground water resource development potential and final designs of municipal and industrial ground water supply wells. Representative projects include:

Conklin, NY - Completed regional hydrogeologic study to evaluate and select potential sites for .5 mgd municipal ground water supply well field. Developed and performed subsequent field investigations, completed well designs and tested completed supply wells for long term safe yield.

McDowell County, NC - Conducted gravity survey along the Linville Fault to evaluate thicknesses of valley fill material and potential ground water resources for a pharmaceutical company.

Tully, NY - Designed and supervised construction of two large diameter deep brine solution mining wells. Included the preparation of contract drawings, bed specifications and contractor cost monitoring.

Pevely, MO - Siting, design and specification review of municipal supply well to be completed in fractured bedrock system for proposed .75 mgd supply.

Cortland, NY - Efficiency and long term yield evaluation of 4 mgd municipal supply well.

Dorado Beach, Puerto Rico - .5 mgd ground water drinking water supply development for proposed housing development.

Ingham County, MI - Conducted electrical earth resistivity surveys, supervised test well installation and prepared hydrogeologic reports to assess and rate potential ground water recharge areas for the Tri-County Regional Planning Commission's ground water availability project.

WASTEWATER, MUNICIPAL:

Experience includes evaluating site suitability to receive treated wastewater via spray irrigation or subsurface drains and designing system hydraulic loading capacity. Representative projects include:

Muskegan County, MI - Completed numerous hydrogeologic investigations for the County of Muskegan to evaluate wastewater spray irrigation systems. Studies include regional ground water mapping and flow analysis, aquifer performance testing and developing regional hydrologic budgets.

Pontiac, MI - Developed and supervised hydrogeologic investigation to evaluate the suitability of a proposed housing development site to support a community septic system. Responsibilities include discharge permit negotiations, construction oversight and system operations monitoring.

Ludington County, MI - Site evaluation to assess area suitability to receive treated wastewater from overland flow loading system.

PUBLICATIONS

Detection of Fractures and Solution Channels in Karst Terranes Using Natural Gamma Ray and Hole Caliper Borehole Logs, Mickam, James T.; Levy, Banjamin S.; Lee George W., Jr.; Surface and Borehole Geophysical Methods in Ground Water Investigations; San Antonio, Texas; February 1984.

JEFFREY E. BANIKOWSKI
SENIOR PROJECT SCIENTIST

BACKGROUND

Mr. Banikowski joined O'Brien & Gere in 1988 following fifteen years of service with the Onondaga County Department of Health. He was promoted to Senior Project Scientist in 1989. Fields of special competence include environmental toxicology, risk assessments and public health evaluations, geologic and hydrogeologic research/investigation, statistics, indoor air monitoring, the implementation of hazardous waste sampling programs and radon mitigation and assessment.

EDUCATION

State University of New York at Fredonia, 1972, BS/Geology
Syracuse University, 1984, MS/Geology

CERTIFICATION

Certified as a Senior Public Health Sanitarian by the State of New York, Certificate #1526.

EXPERIENCE

GROUND WATER SAMPLING PROGRAMS:

Developed ground water evaluation program for Onondaga County, NY in conjunction with Syracuse University and the Central New York Environmental Management Council.

Initiated program to sample over two hundred private drinking water supplies situated in the vicinity of active and inactive landfills.

Performed ambient air monitoring for ammonia and hydrogen sulfide at the Allied-Signal waste beds in Camillus, NY in response to odor complaints. Determined health risk to area residents.

Established ground water and surface water sampling program on behalf of residents living near a former chemical recycling center in Pompey, NY. As a result, the Environmental Protection Agency established an emergency water supply for several residents and placed the center on the National Priorities List of hazardous waste sites.

Implemented a sampling program involving 45 private water supplies located around the Clay Landfill, Clay, NY following allegations of PCB laden material entering the waste stream. Presented findings to the Onondaga County Legislature. Consequently, a public water supply line was installed for the affected residential units.

EMERGENCY RESPONSE:

Liverpool High School, Liverpool, NY - Assisted in the closure and reopening of the High School following a herbicide spraying incident wherein 22 people required medical attention.

Amtrak, Minoa, NY - Coordinated with Chemtrek and local fire department to resolve problems associated with a tank car leaking fuming nitric acid.

Skaneateles Lake, Skaneateles, NY - Assisted NYS Department of Environmental Conservation in evaluating remedial alternatives after a truck overturned and released emulsified asphalt into Skaneateles Lake which provides water to the City of Syracuse.

Stanton Founderies, Solvay, NY - Evaluated health risk posed to workers following an acid spill inside a production facility.

Syroco Corporation, Van Buren, NY - Assessed source and impact of fumes creating noxious odors inside plant facility following its evacuation.

Prepared emergency response protocol to PCB ballast failures for use by local fire departments.

Developed procedure for removal of underground transformer located in a downtown building in the City of Syracuse.

Developed Division of Environmental Health, Onondaga County Department of Health Emergency Response Plan.

AIR MONITORING:

Designed and implemented a Radon Pilot Screening Program on behalf of the Onondaga County Department of Health. This program won recognition from the NY State and National Association of Counties as an innovative and model program for local health departments. Findings from the program were presented to the County Executive, New York State Department of Health, County Legislature, news media, Home Builders Association, and numerous civic groups by request.

North Area Garage Facility, North Syracuse, NY - Developed sampling program for airborne pollutants and made recommendations for ventilation and structural changes to the subject building which housed approximately 40 vehicles.

Administered a residential formaldehyde program on behalf of New York State in order to assess the short and long term retention of this chemical material in air following the installation of urea-formaldehyde foam insulation.

Fairmount Gardens Senior Citizen Center, Camillus, NY - Developed indoor air sampling program for formaldehyde and other aldehydes. Made recommendations for changes in the ventilation system and removal of source materials.

North Syracuse High School, North Syracuse, NY - Performed indoor air sampling related to the replacement of a hot-tar roof. Also, reviewed asbestos documentation to determine compliance with existing regulations and provided recommendations for additional work to the Superintendent of Schools.

HAZARDOUS WASTE INVESTIGATIONS:

Rockwell Plant Site, Syracuse, NY - Conducted oversight of Phase I and Phase II investigations conducted by a private consulting firm on behalf of the Onondaga County Department of Health and the NYS Department of Environmental Conservation.

Stauffer Chemical Corporation, Skaneateles Falls, NY - Reviewed interim clean-up measures and assisted the NYS Department of Health in assessing the health implications associated with an on-site landfill.

Maestri Waste Site, Lakeland, NY - Prepared bid specifications for the installation of monitoring wells, provided field oversight for all work activities, obtained ground water samples and soil samples; presented findings to Town Officials and members of the County Legislature.

Inventoried hazardous waste sites located in Onondaga County in conjunction with City-County Planning Agency.

Administered environmental lead program on behalf of Onondaga County for a period of two years.

Brookhurst, Casper, WY - Participated in soil-gas vapor survey.

Van Buren Landfill, Van Buren, NY - Developed criteria for a Phase II investigation prior to closure.

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PLANS:

Blosenski Landfill, West Caln Township, PA - Prepared QA/QC Plan for pre-design activities associated with RI/FS.

Waldick Aerospace Devices, Wall Township, NJ - Prepared QA/QC Plan for the pre-design phase of the RI.

Fort Drum, Fort Drum, NY - Administered preparation of QA/QC Plan for RI/FS.

HEALTH AND SAFETY PLANS:

Keene Landfill, Parkersburg, WV - Prepared site Health and Safety Plan for drum disposal characterization and removal work.

Metaltec/Aerosystems, Sussex County, NJ - Prepared site Health and Safety Plan for workers engaged in the excavation and heat treatment of approximately 10,000 cubic yards of soil.

Fort Drum, Fort Drum, NY - Prepared Health and Safety Plan for RI/FS work activities.

Schilling Atlas Missile Sites 3,4,5,6,7, and 8, KS and MO - Wrote Health and Safety Plans for work associated with the evaluation of potential on-site chemical contamination.

Forbes Atlas Missile Sites 5 and 9, KS - Prepared Health and Safety Plans for the investigation of potential on-site chemical contamination.

Richards-Gebaur Air Force Base, Belton, MO - Developed Health and Safety Plans for an RI/FS related to five areas of potential chemical contamination.

PUBLICATIONS

Hand, Bryce M. and Banikowski, Jeffrey E., 1988, **Radon in Onondaga County, New York: Paleohydrogeology and redistribution of uranium in Paleozoic sedimentary rocks**, Journal of Geology, v. 16, p. 775-778.

Hand, Bryce M., and Banikowski, Jeffrey E., 1988, **Geologic factors affecting indoor radon in Onondaga County**, NY, Northeastern Geology Abstracts:Radon in the Northeast: Perspectives and Geologic Research, v. 10, no. 3, p. 176.

Hand, Bryce M., and Banikowski, Jeffrey E., 1988, **Radon in Onondaga County, New York: Cenozoic Redistribution of Uranium in Paleozoic Sediments**, EOS, Transactions of the American Geophysical Union, v. 69, no. 16, p. 359-360.

DEBORAH Y. WRIGHT
SENIOR PROJECT HYDROGEOLOGIST

BACKGROUND

Ms. Wright joined O'Brien & Gere Engineers, Inc. in 1982 after two years of field and laboratory experience with other drilling, testing and consulting firms in Central New York. She was promoted to Senior Project Hydrogeologist in 1988.

Fields of special competence include soil and water well drilling methods; soil testing; ground water investigations; aquifer evaluations; geophysical surveys and aerial photograph interpretation.

EDUCATION

State University of New York at Oneonta, 1980, BS/Geology

SPECIALIZED TRAINING

Princeton University - Princeton Associates, Ground Water Pollution and Hydrology, January 1984.
Syracuse University - Advanced Hydrogeology, Spring 1984.
Cornell University - Remote Sensing for Assessing Landfills, June 1985.

PROFESSIONAL AFFILIATIONS

National Water Well Association
Association for Women Geoscientists

EXPERIENCE

HAZARDOUS WASTE MANAGEMENT:

Experience includes site investigations, remedial program design and implementation, including hydrogeologic studies, soil sampling, monitoring well installations, performance of in situ permeability tests, geophysical surveys, ground water and surface water sampling and aerial photograph interpretations. Confidentiality agreements preclude specific client identification. Representative projects include:

Frederick, Howard and Carrol County, MD - Responsible for development, coordination, supervision and completion of site investigations and hydrogeologic assessments of organic substances at industrial facilities. Hydrogeologic environments included unconsolidated deposits, fractured bedrock and karst terrain. Activities included the review of hydrogeologic literature and historic aerial photographs, geologic mapping, geophysical surveys, completion of soil borings and monitoring wells; soil and ground water sampling; geologic evaluations; ground water assessment including direction, velocity, quality; aquifer performance testing, soil gas surveys; and negotiations with regulatory agencies.

Spartanburg County, SC - Developed a work plan and completed a two-phase site investigation at a bulk storage facility owned by a major oil corporation. The investigation included review of historic aerial photographs; installation of monitoring wells; ground water sampling; assessment of ground water flow direction and rate and ground water quality. Based on findings of investigation developed a work plan for ground water recovery and treatment. The site location adjacent to a residential area required that extensive communication with concerned residents as well as negotiations with the South Carolina Department of Health and Environmental Control during completion of the work.

Jefferson County, AL - Completed hydrogeologic investigations at two gas stations and one bulk storage facility owned by a major oil corporation. These investigations were requested by the Alabama Department of Environmental Management (ADEM) as a result of product losses. Included in these investigations was development of work plans for ADEM approval; installation and sampling of monitoring wells; and evaluations of ground water flow direction and rate and ground water quality.

Onondaga County, NY - Developed a work plan and coordinated and supervised completion of a site investigation at a small manufacturing facility. This investigation included a detailed background information review; installation and sampling of ground water, monitoring wells; characterization of the hydrogeology of the area; and negotiations with NYSDEC.

Chautauqua and Steuben Counties, NY - Developed work plans, supervised coordination and completion of RI/FS investigations on property owned by three major manufacturers. The investigations included review of hydrogeologic literature and historic aerial photographs; geophysical surveys; monitoring well installations; soil and ground water sampling; evaluation of the direction and rate of ground water flow; assessment of ground water quality; geologic characterization; and negotiations with NYSDEC.

Washington County, NY - Conducted gamma ray logging of bore holes to delineate subsurface materials and performed laboratory analyses of soils for grain size, permeability, compaction and moisture content. Supervised drilling and monitoring well installations, contributed to geologic and hydrogeologic evaluation of landfill sites, conducted in situ hydraulic conductivity tests on selected monitoring wells.

Indiana - Performed in situ hydraulic conductivity tests, seep and outcrop surveys and contributed to hydrogeologic evaluation of industrial waste disposal area.

Tonawanda and Waterloo, NY - Designed and conducted a NYSDEC Phase II site investigation to determine the types of substance contained at an industrial landfill. This investigation included soil, surface water and ground water sampling; monitoring well installations; geophysical surveys and performance of in situ permeability tests. Developed an NYSDEC RI/FS work plan based on the Phase II investigation results including negotiations with NYSDEC.

Town of Holbrook, MA - Monitored site investigations conducted by EPA subcontractors at a superfund site. This project included review of protocols and site investigations results and procedures.

Waterloo, NY - Developed and conducted a NYSDEC Phase II investigation at an industrial landfill to determine its content. This investigation included geophysical surveys; ground water, surface water and soil sampling; performance of in situ permeability test; and historic aerial photograph interpretation.

Saugerties, NY - Designed and conducted an investigation at an industrial facility to determine the source of ground water contamination by industrial solvents. This program included aerial photograph fracture trace analysis; geophysical surveys; bedrock mapping and indepth analysis of contaminant concentration trends in bedrock and overburden wells.

Baltimore, MD - Conducted a detailed site investigation at a large industrial facility to characterize the flow and the quality of the ground water. This project included well installations, aquifer analysis and the analysis of the influence of tidal fluctuations on the local ground water system.

Newark, NJ - Designed and conducted a detailed sampling program in connection with an ECRA closure of an industrial facility. This program included monitor well installations; soil, ground water and surface water sampling; and performance of in situ permeability tests.

Oswego County, NY - Conducted a hydrogeologic investigation and monitoring program for a major oil company to determine the extent and migration of a gasoline spill in the local aquifer. Evaluated the original recovery system and developed a program to enhance the recovery operation and thereby minimize the potential for contamination of a nearby public supply well.

Boston, MA - Conducted hydrogeologic investigation for a major oil company to assess extent and impact of a 50,000 gallon petroleum product loss. Designed, supervised construction and monitored a successful spill recovery system.

Onondaga County, NY - Conducted hydrogeologic investigation for a major oil company to assess the impact of a gasoline product release on the ground water system. Designed and supervised the installation and operation of a subsurface product recovery system.

ENVIRONMENTAL ASSESSMENT:

Experience includes sampling and analysis of air, water and soil for various environmental concerns. Representative projects include:

Central NY - Performed residential air quality sampling and laboratory analysis to determine the presence of formaldehyde caused by foam insulation.

Maryland - Conducted investigations at two corn fields to determine the presence of residual pesticides in the soil and ground water. This program included soil sampling; monitor well installations; domestic well survey and sampling and ground water sampling.

SOLID WASTE:

Experience includes installation of ground water monitoring wells, soil and ground water sampling, background data review and historic aerial photograph interpretations. Representative projects include:

Seneca County, NY - Developed and completed site investigations associated with the development and construction of a municipal landfill facility. This project included extensive negotiations with NYSDEC; installation of monitoring wells; ground water sampling; geophysical surveys; assessment of the ground water flow direction and rate; establishment of a ground water quality baseline; and full characterization of the hydrogeology of the site and surrounding area.

Broome County, NY - Supervised installation of ground water monitoring wells and collected ground water samples for analysis in connection with the characterization of a closed municipal landfill.

Central NY - Participated in the preliminary environmental assessment of several areas for the selection of a site for a proposed steam generation waste incineration facility.

WATER RESOURCES:

Experience includes drilling supervision, soils analysis, aquifer testing, well design and well installations. Representative projects include:

Tully, NY - Supervised the drilling and installation of two 1,400' industrial supply wells.

Cortland, NY - Conducted an aquifer performance and well efficiency test on an existing public supply well.

Conklin, NY - Participated in a hydrogeologic study in connection with the location of a public supply well.

PUBLICATIONS

Investigation and Remediation of a Mineral Spirit Product Loss in a Shallow Unconfined Aquifer. John C. Tomik, Cornelius B. Murphy, Jr., and Deborah Y. Wright; Association of Ground Water Scientists and Engineers Eastern Regional Ground Water Conference; July 1985.

DONALD T. BUSSEY
HYDROGEOLOGIST

BACKGROUND

Mr. Bussey joined O'Brien & Gere in 1986 following one year of field experience with monitoring, drilling and geophysical firms located in upstate New York.

Fields of special competence include soil and rock water well design and drilling methods; design of petroleum product monitoring and recovery systems; geophysical techniques including seismic refraction and geophysical well logging; and computer mapping applications.

EDUCATION

Syracuse University, 1988, MS/Geology (expected)
Syracuse University, 1982, BA/Geology

PROFESSIONAL AFFILIATIONS

American Association of Petroleum Geologists

EXPERIENCE

HAZARDOUS WASTE MANAGEMENT:

Experience includes drilling supervision, soil analysis, well design and installation, aquifer testing, in situ permeability testing, ground water sampling, geophysical data acquisition and interpretation, and computer modeling and mapping. Representative projects include:

ARCO, Rome, NY - Site monitoring and petroleum product recovery. Site monitoring at three other sites in upstate New York.

Atlantic Refining Company, Endwell, NY - Site monitoring, recovery well design and installation, aquifer testing. Monitoring well design and installation, ground water sampling and site monitoring at five other sites in upstate New York.

Getty, Inc., Valley Cottage, NY - Site monitoring, recovery well design, air stripper tower installation. Site monitoring at one other site in upstate New York.

Crown Central Petroleum Corporation, Spartanburg, SC - Transfer pipeline soil investigation, monitor well design and installation. Monitoring well design and installation at two sites in Birmingham, Alabama and one site in Baltimore, Maryland.

Sun Oil, Booneville, NY - Aquifer testing, product recovery.

Van Dyne Oil Company, Sayre, PA - Site monitoring.

New York State Department of Environmental Conservation:

Lake Peekskill, NY - Site monitoring.
Vestal, NY - Monitoring well design and installation.
Appalachin, NY - Recovery well design and installation, air stripper tower installation.
Berkshire, NY - Site monitoring and ground water sampling.

SCM Corp., Cortlandville, NY - Natural gamma ray logging, collection of ground water samples, computer modeling and mapping.

U.S. Fish & Wildlife Service, Crab Orchard National Wildlife Preserve, Marion IL - Designed and installed monitoring wells, conducted and analyzed in situ permeability tests.

IBM Corporation, Owego, NY - Ground water sampling, data acquisition, site monitoring, computer mapping of geotechnical data and ground water elevation data.

IBM Corporation, Erie, PA - Monitoring well design and installation, soil and ground water sampling.

Prestolite Corporation, Syracuse, NY - Monitoring well design and installation, soil and ground water sampling.

TRW, Casey, IL - Soil borings and sampling.

General Motors Corporation, Syracuse, NY - Soil borings and sampling at two sites (Meadowbrook and Ley Creek).

Jarl Extrusions, Penfield, NY - Soil sampling.

Gunlocke Co., Wayland, NY - Electromagnetic and resistivity geophysical surveys, monitoring well design and installation, gamma ray logging, ground water sampling and computer mapping.

Brookhurst Development, Casper, WY - Ground water sampling.

OIL AND GAS RESOURCE EVALUATION:

Syracuse University, Syracuse, NY - Research Assistant in project designed to digitize and computer process geophysical well logs. Teaching Assistant in Stratigraphy, Numerical Methods in Geology, and Computer Applications in Petroleum Geology. Masters Thesis in the analysis and evaluation of computer processed geophysical well logs applied on a regional basis. Organized and updated New York State Tops and Production file.

Urban-Snow Gas Development Co. - Well-site geologist on three deep gas wells drilled in Cato, NY.

Applied Information Resources, Inc. - Acquired and analyzed seismic refraction data and constructed and helped build gas production data base for New York State.

PUBLICATIONS

Bussey, D.T., 1985, **Natural Gas Reservoirs in Northern New York State.** Appalachian Basin Industrial Associates program, v.8, p. 231-248.

Brower, J.C. and Bussey, D.T., 1985, **A Comparison of Five Quantitative Techniques for Biostratigraphy**. in Quantitative Stratigraphy, p. 279-306. Paris, UNESCO.

Bussey, D.T., in preparation, **A Computer Assisted Evaluation of Natural Gas Reservoirs in North-Central New York State.** Masters Thesis, Department of Geology, Syracuse University, Syracuse, NY.

Laboratory Quality
Management Plan

Analytical Services

TABLE OF CONTENTS

I. O'BRIEN AND GERE LABORATORY

Introduction

For several years the O'Brien and Gere laboratory has been involved in the physico-chemical and microbiological analyses of environmental contaminants for federal, state, municipal and industrial clients. The laboratory has analyzed over 10,000 samples for over 100,000 parameters on an annual basis. The organic and inorganic pollutants occur in several matrices, i.e., potable water, industrial and domestic wastewater, hazardous waste, sludges, sediment, biological tissue, solid, air, etc. The ability to accurately characterize the chemical pollutants in these matrices is paramount.

In this document concepts are presented to outline the laboratory program purpose, policies, organization and operations established to support physico-chemical analyses conducted under USEPA compliance. Implementation of this program will better insure the validity of the data acquisition, and, therefore, will provide a more reliable foundation on which to base decisions. The principles and procedures used are the result of considerations of the general operations and trends in the field of analytical chemistry, analytical instrumentation, statistical quality control techniques, and previous experiences in the laboratory programs conducted under USEPA, local and state government compliance.

Laboratory Policy

The management of O'Brien & Gere's Laboratory is firmly committed to the Quality Assurance/Quality Control (QA/QC) program depicted in this manual. The program has been implemented and is maintained to assure any data reported by the laboratory are of known and documented quality commensurate with their intended use. The technical personnel who contribute to all or any portion of the laboratory analyses follow the procedures delineated in this manual.

The QA/QC manual is an integral part of a generalized representation of our Good Laboratory Practice program. It is primarily intended to set control guidelines and direction for all the physico-chemical and microbiological measurements performed by the laboratory. The contents of this manual will be re-evaluated yearly by the QA/QC group leader, and if necessary, revisions will be made, and/or the QA/QC program expanded.

A supplementary laboratory manual dealing with specific technical areas has been written and is available to all laboratory personnel. The laboratory manual is reviewed and approved by the QA/QC, Trace Organics and Wet Chemistry group leaders and management prior to distribution to the laboratory staff.

Quality Control Program Objectives

The primary objective of the O'Brien & Gere Laboratory QA/QC program is to assure the precision and accuracy of all data generated by the laboratory personnel. That is, the data is of known and documented quality.

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The QA/QC guidelines are implemented in support of the laboratory surveillance programs and analyses efforts. They reflect the best cost effective effort, and are used to assess, ensure and document that all data collected, stored, reported or used by the laboratory are scientifically valid, defensible and of known precision and accuracy.

The major effort of the QA/QC program will be to develop a workable day-to-day "QA/QC model", and thus provide the detailed control charts and control limits to measure the laboratory daily performance. The QA/QC activities shall be carried out in accordance with EPA, state and local government mandates. The implementation, coordination and supervision of these procedures will provide the customer with the quality assurance (QA) activities associated with good laboratory practices.

Personnel and Organization

Any organization consists of a number of people whose skills and delegated responsibilities assure the quality of the ultimate product, i.e. analytical services. QA/QC procedures commence when the sample is first collected, and continues until the final product is in the client's hand. An organizational chart of the laboratory technical staff is included in Figure 1 to serve as a frame of reference for all QA/QC procedures.

The Laboratory Manager is responsible for the overall administration of the analytical operations at O'Brien & Gere. The section group leaders handle the day to day scheduling and operation, and report to the manager. Together with the group leaders they review

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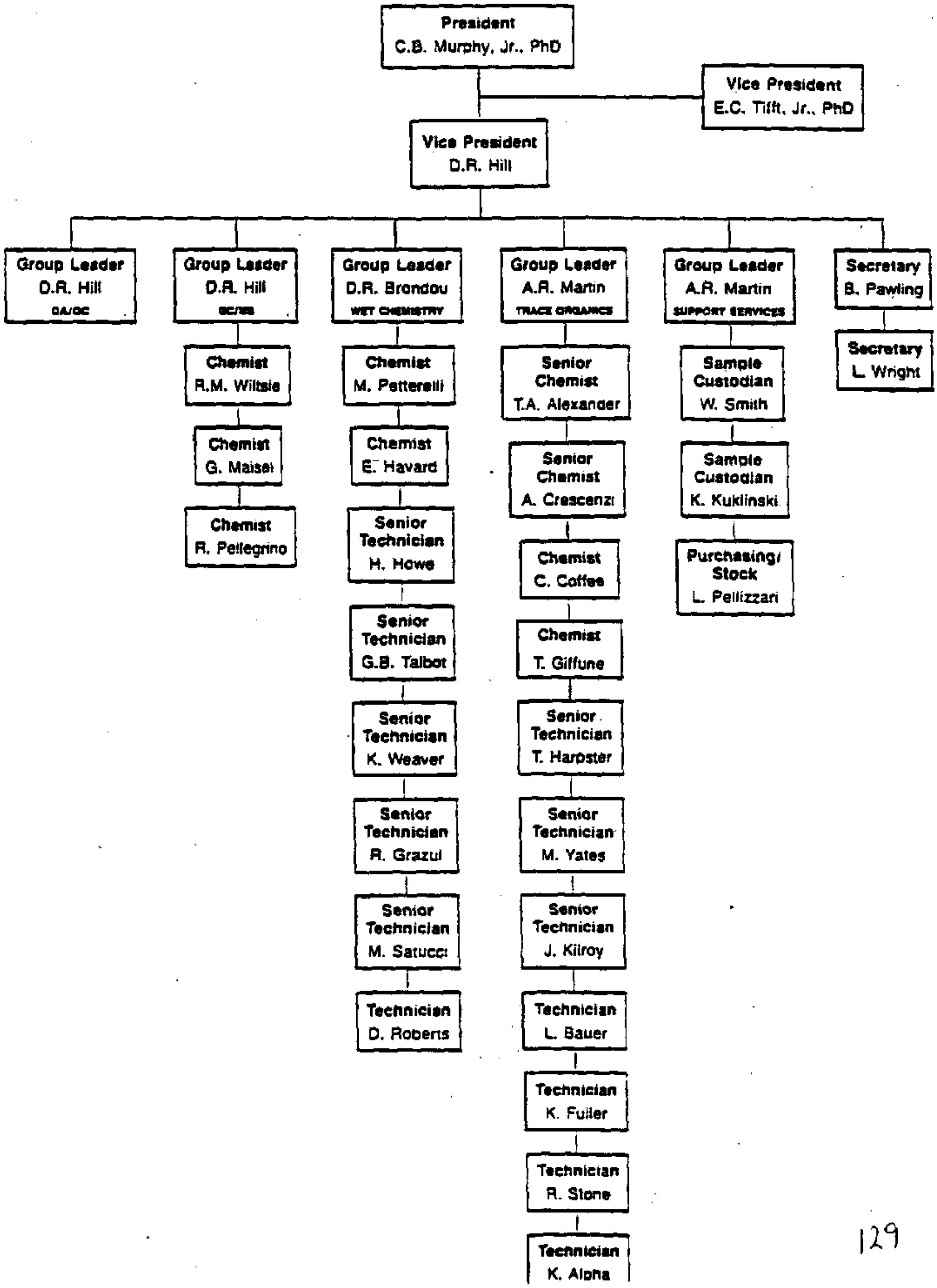
LABORATORY ORGANIZATION CHART



and approve all policies concerning their specific areas of responsibility.

The QA/QC group leader is responsible for the implementation, monitoring and supervision of the QA/QC program. He assures that the program is conducted in strict adherence to procedures and requirements outlined in this manual. He reports to the Laboratory Manager, and interacts daily with other group leaders and laboratory staff. His duties include:

1. Develops and implements new QA/QC programs, including statistical techniques and procedures.
2. Conducts regular inspections and audits of analytical procedures.
3. Daily monitors accuracy and precision and implements correction measures if "out of control".
4. Maintains copies of all procedures routinely used in the laboratory measurements.
5. Informs management of the status of the QA/QC program by annual status reports.
6. Coordinates and conducts investigations of any customer complaints regarding quality.
7. Reschedule any analysis based on poor accuracy or precision data.

The section group leaders are responsible for the day to day operation and technical questions concerning analytical protocol and together with the QA/QC group leader:

1. Maintain and increase the technical skills of the laboratory technical personnel to achieve optimum quality results.

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2. Approve analytical methods, sampling procedures, special QA/QC procedures, and any subsequent revisions in analytical procedures used in their respective areas.
3. Approve completed work.

Technical Training

All personnel involved in any function affecting data quality (sample collection, analysis, data reduction, and quality assurance) have sufficient technical training (in their appointed positions) to contribute to the reporting of complete and high quality data. The training is achieved through: a) On-the-job training, b) Short-term courses (one week or less), and c) Long-term courses (one semester or longer).

Short and long term courses are available through universities, colleges, and technical schools in statistics, analytical chemistry, and other disciplines. In addition, short-term courses are provided by commercial training organizations, manufacturers of equipment and others.

The trainee and/or analyst performance is evaluated by providing unknown samples for analysis. An unknown, as defined here, is a sample whose concentration is known to the QA/QC group leader or other group leaders but is unknown to the trainee or analyst. Proficiency is judged in terms of accuracy.

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II. GENERAL FACILITIES AND EQUIPMENT

The laboratory is located in the corporate headquarters of O'Brien & Gere in Syracuse. The laboratory maintains a staff of sixteen chemists, biologists and technicians. As many as ten temporary and part-time personnel have been used to meet peak demands. The staff maintains a constant awareness of state-of-the art techniques in environmental analysis through its review of literature. The laboratory has 3700 square feet to utilize for the preparation and analysis of samples and 1200 square feet for receiving and storage of reagents.

The laboratory's involvement in a variety of programs has provided the necessary experience in microbiological, inorganic contaminants and trace organic identification and quantification. Particular expertise has been developed in the area of hazardous waste identification and trace organics analysis including priority pollutants and PCB's. A brief description of available instrumentation, computer services, sample storage and receiving follows.

Laboratory Instrumentation

The following analytical instrumentation is located in the Syracuse office and has been used on a number of major analytical programs:

(a) Hewlett Packard 5993B Gas Chromatograph/Mass Spectrometer Data System - for the low level identification of organic priority pollutants and other compounds. The unit is equipped with a dual disc, 32K computer and 9-track magnetic tape.

(b) Hewlett Packard 5880A - Gas Chromatograph equipped with dual electron capture detectors. The fully automated system has capabilities for both packed and capillary column work. The system can

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operate unattended around the clock to provide rapid turnaround of results.

(c) Tracor Model MT220 gas chromatograph equipped with electron capture and dual flame ionization. The unit is interfaced to a Hewlett Packard Model 3380 S integrator.

(d) Two Tracor Model 550 gas chromatographs, both equipped with Hall electrolytic conductivity detectors, linearized electron capture detectors, and photoionization detectors interfaced to Hewlett Packard Model 3390 integrators.

(e) Due to the highly specialized procedures for cleaning glassware used in the low level analysis of halogenated organics and other substances, a sonic cleaner is utilized. Additionally, a complete glassware supply including Soxhlet extractors, separatory funnels, flasks and chromatographic columns is maintained.

(f) Two Technicon AutoAnalyzers, single and dual channel, for the automated determination of nutrients and other inorganic parameters.

(g) Perkin-Elmer Model 290B Atomic Absorption Spectrophotometer for the determination of metals by flame techniques.

(h) Varian Model 575 Atomic Absorption Spectrophotometer for the low-level detection of metals by conventional flame and graphite furnace (flameless) techniques.

(i) Beckman Model 915 Total Organic Carbon Analyzer, for the determination of organic, inorganic or total carbon.

(j) Dohrman Model DX-20 Total Organic Halide Analyzer, and Model MCTS 20/30 Elemental Analyzer for the determination of chlorine and sulfur in environmental samples.

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(k) Bausch & Lomb Model 340 colorimeter, used for those colorimetric procedures not performed on the AutoAnalyzers.

(l) DuPont Model 760 Luminescence Biometer for the determination of adenosine triphosphate (ATP).

(m) Orion Model 4 Specific Ion Meter.

(n) Mettler Model HE10 Electronic Semi-Micro Balance.

(o) Hiack Particle Counter for the determination of particle sizes in water ranging from 0.5m to 300m.

(p) A walk-in refrigerator for storage of samples prior to analysis.

The laboratory also maintains a wide range of the usual supporting equipment such as pH meters, analytical balances, ovens and incubators, refrigerators and hood space.

Computer Services

The hardware which serves as the foundation of the firm's computer facilities has been responsible for the ability of the O'Brien & Gere laboratory to store and retrieve all data for individual clients.

The quantity of data has led to the development and utilization of a computer-based data management system. Samples are logged in, analyses are scheduled and output is received, all via time-shared or batch computer programs. One of the benefits of this system is that turnaround time has been reduced to a practical minimum. Data can be reported in a variety of formats. The standard computer output includes sample identification and various test results. A variety of statistical and modeling programs are available for the evaluation and interpretation of data.

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III. GENERAL CONSIDERATIONS

Maintenance

A preventative maintenance schedule on all instruments, balances, and equipment requiring maintenance is followed. All maintenance, whether performed by the laboratory or other professional sources, is documented in appropriate log books. Entries are made each time maintenance is performed and include the reason for maintenance, what was performed, by whom, and the dates and initials of the analyst in charge during the maintenance.

Calibration

Thermometers needed for critical temperature determination and control are calibrated against an NBS thermometer on site once a year. Analytical balances are professionally calibrated and cleaned once a year and checked with Class S weights daily by analysts who routinely use the balances. Calibration data are entered into a specific calibration notebook, which is kept with the equipment being calibrated. When the balances are professionally calibrated, a document stating the specific balance (model and serial number), its location, and the data calibrated is provided by the company or individual providing such service.

Reagent Quality

The quality of reagents and instrument readings are maintained by the following procedures:

(a) Reagents for quantitative purposes are ACS analytical quality grade or better.

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(b) Each sample is collected in a new container to minimize contamination. This rule does not apply to bacteriological samples for which sterilized glass bottles are used, or trace organic samples for which solvent rinsed glass bottles are used.

(c) Distilled deionized water with a conductivity not more than 1.5 micromho/cm is used in the preparation of all reagents and for final rinses. The conductivity is measured daily and recorded in the quality control log. The pH is also checked daily and the values recorded.

(d) All volumetric glassware is National Bureau of Standards Class A grade or better.

(e) All glassware is cleaned and rinsed with distilled water and visually inspected before use. Any volumetric glassware found to be etched or cracked is discarded.

(f) The operating temperatures of all ovens, incubators, water baths and refrigerators are recorded daily in the quality control log.

(g) All reagents are discarded after a set interval which has been established and recorded in the Laboratory Handbook.

(h) The date a prepared reagent is made is entered into the Reagent Log and initialed by the preparer. Therefore, the results which have been affected by a contaminated or otherwise improper reagent can be easily determined. These results are either recalculated or discarded and the analysis may be repeated if possible. Reagent containers are also dated when new solutions are prepared and are initialed. These procedures are followed for all (even daily) preparations.

(i) The pH meter is checked with three buffers (4.0, 7.0 and 10.0) and the results are recorded in the quality control log.

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Safety

A safety manual is issued to all laboratory personnel and describes safety policies, procedures and guidelines. Although laboratory workers are trained to be cautious in handling toxic or dangerous materials, they have confidence in the safety features built into their working area, thus enhancing the reliability of their performance.

Audits and Inspections

The Quality Assurance program is audited weekly for overall adherence to the guidelines and procedures outlined in this manual. The QA/QC group leader is responsible for scheduling and ensuring that each audit occurs.

Monthly meetings are scheduled between the QA/QC group leader and manager of Analytical Services to thoroughly discuss the program. Any corrective action required is monitored and ensured by the QA/QC group leader.

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IV SAMPLE COLLECTION AND TRACKING

Valid representative samples of environmental matrices are collected through well defined sampling protocols. The sampling may be performed by the laboratory sampling team, or the customer who then assumes responsibility for properly obtaining, handling, preserving and shipping the sample.

Sample Collection and Handling

A well defined sampling protocol must ensure that:

a. sampling team members are competent and qualified
b. proper sampling methods are used
c. equipment is accurately calibrated
d. all samples are properly handled to prevent contamination
e. samples analyzed are actually the samples collected under reported conditions.

For these reasons, samples are kept in secure places from time of collection until they are analyzed. It is the joint responsibility of the group leader and sampling team leader to ensure that approved methods are used, and it is the responsibility of each sampling technician to assure that the equipment is accurately calibrated.

Chain of Custody

The laboratory sampling protocol generally follows a chain of custody procedure. The procedure creates an accurate, written, legally defensible document that can be used to trace possession of sample from its collection through analysis and final disposal.

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The basic elements in the chain-of-custody phase of our QA/QC program are:

1. Sample collection and handling
2. Sample analysis
3. Preparation and filing of test report

These measures are documented by the chain of custody form (Figure 2) signed by all handlers of the sample(s). As defined here, a sample is "in custody" if it is:

a. in actual physical possession, or
b. in view after being in physical possession, or
c. in a locked repository, or
d. in a secure, restricted area.

Analysis, Preparation and Filing of Test Report

A critical concern of QA/QC program is the maintenance of sample and data base integrity and the timely preparation of data reports. The data management program allows for the identification of samples and the maintenance of the discrete character of the data generated by each respective sample. This system is a unique advantage over manual methods and has permitted the laboratory to successfully tabulate data involving high numbers of samples and multiple analyses. The system may be divided into the following phases:

1. sample identification -- as each sample enters the laboratory, it is assigned a unique access number found on a sample identification ticket. This identifier permits the discrete organization of all information and data relating to that sample, whether for analytical

FIGURE 2

CHAIN OF CUSTODY RECORD

SURVEY	SAMPLERS: (Signature)

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE: Water – Comp.	SAMPLE TYPE: Water – Grab	SAMPLE TYPE: Air	SEQ. NO.	NO. OF CONTAINERS	ANALYSIS REQUIRED

Relinquished by: (Signature)		Received by: (Signature)	Date/Time
Relinquished by: (Signature)		Received by: (Signature)	Date/Time
Relinquished by: (Signature)		Received by: (Signature)	Date/Time
Relinquished by: (Signature)		Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment:			

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identification purposes, reference in paper-copy records and correspondence, or computer storage and recall.

2. <u>data organization</u> -- in a preliminary planning phase of any analytical investigation involving the laboratory, a computer codification format can be established which can serve as the basis for storage and retrieval of data. This format is characterized by the categorization of samples, with any type of identification permissible for the classification. The categories may be based on any similarities (or dissimilarities) in the total volume of samples.

The storage and retrieval of quality control sample data is also managed with the laboratory's computer-based data management system. Samples are tagged and data is input, stored and retrieved as with any routine project samples. This has been made possible by the use of a unique quality control project number by which such data may be identified.

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V. METHODS AND PROCEDURES

The laboratory analyzes a variety of matrices for a number of different environmental constituents of concern. Therefore, several documents are referenced which include the procedures employed. The following list itemizes the most widely used documents:

1. Standard Methods for the Examination of Water and Wastewater.
2. Methods for Chemical Analysis of Water and Wastewater.
3. ASTM Annual Book of Standards.
4. Code of Federal Regulations.
5. NIOSH Manual of Analytical Methods.
6. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

When analyzing samples by the above standardized methods, the accuracy or precision of the data generated by the laboratory is determined through analysis of replicates, spiked samples, synthetic reference standard samples, and/or field or laboratory blanks along with each set of samples. Any interferences are identified and documented.

In general, the methods accuracy is determining by spiking the sample matrix with the analyte at a minimum of three concentration levels. The range of the spiking levels is selected to bracket the concentration of interest. Percent recoveries of the spikes are calculated and are compared with synthetic standards. The methods precision is determined by analyzing a minimum of three replicates at each spiking level. The precision is evaluated by calculating the standard derivation.

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The data generated is, whenever possible, input into the laboratory base data management system. Analyst's work sheets are filed for one year as a temporary record. When approved and signed, data reports and pertinent information are reported to the customer.

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VI. INTRALABORATORY QA/QC PROGRAM

A quality control program is a systematic attempt to assure the precision and accuracy of analyses by detecting and preventing recurrency of errors, or measuring the degree of error inherent in the proven methods used. By identifying the sources of errors confidence in the precision and accuracy of analytical results can be established and improvements in the analytical methods made. To ensure the precision and accuracy of a result our quality control program requires the measurement and analysis of spiked samples, duplicate samples, synthetic standards and blanks.

Duplicate samples are used to provide assurance that the procedure is under control and to determine the statistical limit of uncertainty (i.e., precisions). Synthetic standards and spiked samples are used to determine the quantification of the laboratory accuracy.

In general, our quality control program incorporates the concepts of: a) calibration to attain accuracy, b) replication to establish precision limits, and c) correlation of quantitatively related tests (synthetic standards and spikes) to confirm accuracy.

The overall effectiveness of the program is dependent upon the evaluation of: a) equipment and instruments, b) current state of the art, c) precision of the analytical method itself, d) expected ranges of analytical results, e) control charts to determine trends as well as gross errors, f) data sheets and laboratory procedures adopted for control of sample integrity, g) quality control results on a daily as well as on varying time frames.

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Definitions of Basic Terms

Before we discuss the standard operating practice for the QA/QC program some definitions are in order. These are:

1. Reagent Blank - The reagent (or method) blank is an aliquot of pure, organic free water (or organic reagents) used in the analysis of samples. It is generated by passing the clean matrices through the entire analytical procedure (including all glassware and other materials that come into contact with the sample). These blanks are analyzed along with the samples to verify that: a) qualitatively, no false positives occur, and b) quantitatively, concentrations are accurate and do not reflect contamination.

2. Field Blanks - These are water blanks sent from the laboratory to the sampling site and are returned to be analyzed in the same manner as the samples. If the samples are to be analyzed for purgeable organics, the analysis of field blanks provide a check on possible contamination of the samples by permeation of volatiles through the septum seal. If positive interferences occur the analytical results are rejected unless sufficient data can be obtained from these blanks to allow correction of results.

3. Duplicates - Duplicates are the result of splitting a field sample into equal amounts and are treated throughout as two unique samples. The results of duplicate (or replicate) analyses provide information on the overall precision of the analytical methodology. Quantitative results are obtained by calculating the relative percent difference (RPD) for each analyte in the sample matrix.

4. Spike - Spikes are the result of the addition of a known amount of analyte to a sample or a blank. The analytical results yield

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a quantitative measure of accuracy (spiked blanks) or percent recovery (spiked samples). The measured accuracy reflects the best result which can be expected, whereas the percent recovery reflects matrix effects upon the analytical method accuracy.

Because several different environmental matrices are analyzed (e.g., potable water, effluent and influent waters, process wastes, sludges, etc.), two spiking levels are necessary when analyzing different samples. Relatively clean samples are spiked at detection limit and 10 times the detection limit for each component. Highly polluted samples are spiked at 100 times the detection limit for each component. Ideally, the spike should be 50 - 100% of the original concentration of each analyte in the sample matrix. If the added spike is less than 10% of the sample result, the data are questionable and statistically unacceptable.

5. Surrogate Spike - These are the result of the addition of known amounts of standards to every sample prior to the analysis. The standards are chemically similar to the compounds in the fraction being analyzed. In addition, some standards added have compounds which are not likely to be found in environmental samples. The analyses of surrogate spikes provide quality control on every sample by constantly monitoring unusual matrix effects, gross sample processing errors, etc. These spikes are not used as internal standards for quantitation.

6. Reference Standard (reference audits) - These are the analysis of independently prepared standard solutions or synthetic standards. Two types of standards are used, i.e., a) internal reference standard solutions (synthetic standards prepared in-house), and b) external

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reference standard solutions obtained from outside sources (i.e., primarily EPA).

The external audits samples are used for monitoring the complete analytical method. These samples are introduced at the onset of the procedure (typically extractions) and carried through the entire analysis.

The internal standard audits are used to verify the "accuracy" of quantitative instrument calibration. All standard solutions are prepared by the QA/QC group leader and are submitted blind for analyses. The analyst analyzes the solutions as discrete samples and a percent recovery or percent error is calculated. Errors greater than 5% are carefully investigated and differences resolved through proper action.

Guidelines for Evaluating the QA/QC Program

This section defines the QA/QC program for the analysis of environmental pollutants, i.e., the analysis of trace organics by gas chromatographic (GC) and GC/MS techniques, and analysis of inorganic pollutants by wet techniques and atomic absorption (AA), etc. The QC program for the analysis of trace organics by GC and GC/MS is different due to the unique nature of the analytical problems addressed by the GC/MS methodology. Therefore, the QC requirements for these two techniques will be addressed separately. A description of the QC program follows.

1. Gas Chromatography

In general, when GC methodologies are used the specific analyte or class of analyte is known. As a result a more specific, less generalized QC program can be defined. For example, accuracy data can be collected prior to analysis of actual samples, and often previous QC data for a particular analyses is available.

The QC program outlined below depicts the procedures used to determine the quality of the data generated in the trace organics analyses. The steps monitored include extractions, concentration, qualitative and quantitative analyses and confirmation.

a) Method Verification

The methods are validated before they are used in routine analysis of samples. Method validation includes analysis of reagent blanks, blanks spiked with compound(s) of interest, analytical standards and standard mixtures. The results from these analysis approximate the best data to be expected from the method.

The extraction and concentration steps are validated by spiking a minimum of 2 blank samples with the same matrix as the sample of interest. The concentration of the analyte used for the spiking is 10 times the detection limit. The accuracy (or percent recovery) of the method is calculated by:

$$\text{ACCURACY} = \frac{\text{(spiked sample result)}}{\text{spike added}} \times 100$$

and is recorded on transcription sheets and is assigned a unique QC number. The data is then logged and stored in the computer.

b) Instrument Calibration and Performance

To insure good analytical data the analytical instruments are calibrated prior to sample analysis by analyzing three standards of analyte which span the suspected concentration range of the analyte in the sample. The performance of the instruments are checked by analyzing a standard mixture. If the retention time or

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area counts vary more than 10% from previous calibration the standard mix is reanalyzed. If the deviation is still more than 10%, a new standard mix is analyzed. If the new standard mix still yields greater than 10% deviation, instrument malfunction is suspected and proper action is taken to resolve the problem.

Routine Analysis

The quality of the analytical data generated during routine analyses is monitored by the following:

1) Contamination from reagents and glassware is identified by analyzing a reagent blank. One reagent blank is prepared for every 20 or fewer samples analyzed (or when a new lot of reagent is used in the analysis).

2) The analytical method accuracy is determined by spiking a known amount of analyte into a sample and blank. The percent recoveries are then calculated. The amount of analyte recovered from the blank indicates the best result which can be expected from the method. The amount of analyte recovered from a sample reflects matrix effects upon the accuracy of the method. Two spikes are prepared for every 20 or fewer samples analyzed.

3) The analytical method precision is determined by analyzing equal amounts of a split sample. Ideally, the analytical results will be identical; however, differences occur due to variations in the procedure. A quantitative measure of these differences is assessed by calculating the relative percent differences (RPD) for each analyte in the matrix and the results compared.

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In general, one duplicate is analyzed for every 20 or fewer samples, and the performance of the analytical instrument verified. Whenever possible identification is confirmed by a second procedure.

GC and GC/MS Characterization of Trace Organics

The requirments for the characterization of trace organics analyses include: 1) the identification and quantitation of unknown pollutants, 2) the specific detection of selected groups of pollutants (i.e., Priority Pollutants by GC/MS), and 3) other analyses requiring GC/MS for identification, verification and/or quantitation. A summary of the required audits is given in Table I. The performance and calibration of the GC and GC/MS systems are monitored and maintained on a regular basis by the procedures and methods discussed below.

TABLE I. SUMMARY OF SAMPLE ANALYSIS AUDITS REQUIRED FOR THE CHARACTERIZATION AND QUANTITATION OF TRACE ORGANICS

AUDIT	AUDIT
Spike	Mass Spectrometer:
Reagent Blank	mass calibration
Duplicate Sample Analysis	response calibration
Standard Mix	standards
Reference Standard	Computer Match
Standards and Calibration Curve	Reference Spectra Comparison
GC Retention Times	Completeness and Accuracy
GC Peak measurement calculation	

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1. Calibration of GC/MS System

At the beginning of each day the GC/MS system is calibrated and tuned by examining the mass spectrum of decafluorotriphenylphosphine (DFTPP) or 4-bromofluorobenzene (BFB). The details are discussed below.

a. Base/Neutrals (and Acids or Pesticide) Fractions

The analysis of 50 nanograms of DFTPP is carried out daily by direct injection into the GC inlet. The resulting mass spectrum is then examined. The requirement is that the mass spectrum of 50 nanograms DFTPP must meet the specification of the key ions and ion abundance criteria listed in Table II.

b. Volatile (Purgeable) Fraction

The analysis of 20 nanograms of BFB is carried out by direct injection into the GC/MS. The requirement is that the mass spectrum of 20 nanograms BFB must meet the prescribed specifications of the key ions and ion abundance criteria listed in Table II.

2. GC Column Performance Check

The GC columns performance are checked at the beginning of each day that samples are analyzed. For base/neutrals and acid fractions the columns performance are monitored by injecting 100 nanograms (ng) of benzidine and pentachlorophenol, respectively. For purgeables the column is checked by injecting 20 ng of BFB. Performance acceptance is based on calculations of tailing factors (see Table III).

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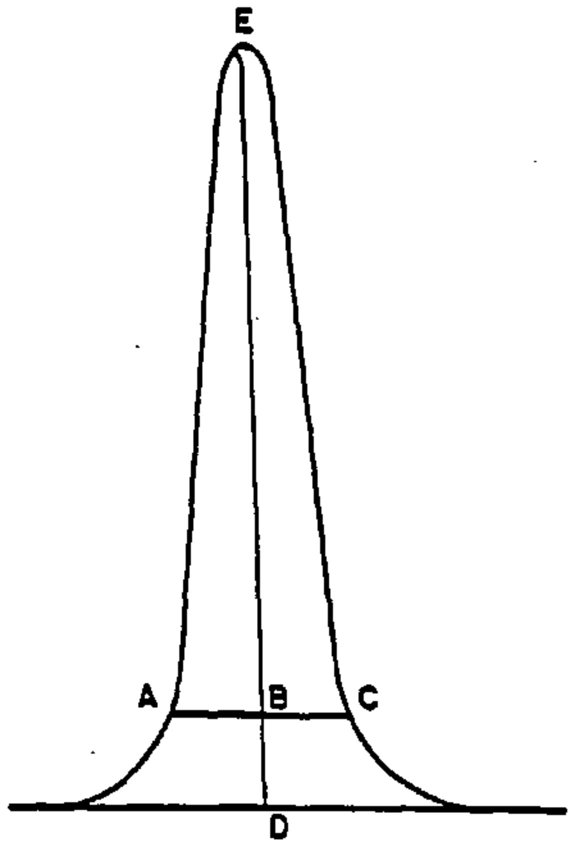
TABLE II. KEY IONS AND ION ABUNDANCE CRITERIA FOR DFTPP AND BFB

DFTPP		BFB	
MASS	ION ABUNDANCE CRITERIA	MASS	ION ABUNDANCE CRITERIA
51	30-60% of mass 198	50	20-40% of mass 95
68	less than 2% of mass 69	75	50-70% of mass 95
70	less than 2% of mass 69	95	base peak, 100% relative abundance
127	40-60% of mass 198	96	5-9% of mass 95
197	less than 1% of mass 198	173	less than 1% of mass 95
198	base peak, 100% relative abundance	174	70-90% of mass 95
199	5-9% of mass 198	175	5-9% of mass 95
275	10-30% of mass 198	176	70-90% of mass 95
365	greater than 1% of mass 198	177	5-9% of mass 95
441	less than mass 443		
442	greater than 40% of mass 198		
443	17-23% of mass 442		

TABLE III EXAMPLE CALCULATION OF TAILING FACTOR



TAILING FACTOR = (BC/AB)

Example calculation:
Peak Height = DE = 100 mm
10% Peak Height = BD = 10 mm
Peak Width at 10% Peak Height = AC = 23 mm
AB = 11 mm
BC = 12 mm
Therefore: Tailing Factor = (12/11) = 1.1

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Wet Chemistry and Bacteriology

The quality of the analytical data generated from inorganic and microbiological analyses of environmental contaminants are monitored as follows:

1. Wet Chemical Instrumental Methods

The atomic absorption (AA) spectrophotometer and AutoAnalyzer are calibrated using appropriate calibrating standards and blanks. The calibrations are checked by analyzing synthetic standards at five different concentration levels. The results are used to generate standard curves by least squares fit of the data via computer programs. The deviation of the standards from the least squares fit (standard curves) and the standard deviation of the fit are printed on the daily printout and the data stored accordingly in appropriate computer data bases. If deviation from accepted values occur analyses of sample and instrumental calibrations are repeated. Standard curves are generated regularly.

For colorimetric analyses that do not use the standard curve program, one or more standards are analyzed with each group of samples. The results are compared to generally accepted criteria, i.e., percent recovery (or percent error) and relative percent error.

Spectrophotometric instruments are checked by comparing the gain settings or percent transmittance for known (synthetic) standards to previous values. This monitoring method shows any decrease in sensitivity or other systematic effects in performance.

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The conductivity meter is checked each time a group of samples is analyzed. The conductance of a standard solution is entered in the quality control log. In addition, the cell constant is checked annually by measuring the electrical conductivity of potassium chloride reference solution. The results are also entered in the quality control log book.

2. Bacteriology Techniques

Quality control extends to all aspects of the bacteriological laboratory. The date of preparation of media and the various solutions used in analysis are recorded in the quality control log together with any information which may be important to its preparation such as pH, lot or control number, manufacturer and concentration. In addition, random samples of prepared media are incubated under the same conditions as unknown samples to insure the maintenance of sterility during preparation and use.

The efficiency of autoclave sterility is monitored by the monthly use of Kilit ampules (BBL), a suspension of Bacillus stearothermophilus spores. The sterility of rinse water is checked periodically by the filtration and incubation of a reagent blank (sterile rinse water).

As part of the overall quality control program, the bacteriological quality of the distilled deionized water supply of the laboratory is monitored weekly. Samples for the standard plate count are taken from the water system prior to entry to the deionization cartridge (following

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distillation), after deionization and from the storage tank. The results are recorded in the quality control log. Additionally, the Suitability Test as described in Standard Methods is performed on a yearly basis by an outside laboratory qualified to undertake this testing. Bacteriological samples are included in the duplicate analyses program described in the chemical section.

Humidity checks are performed monthly on Standard Plate Count petri dishes to determine percent moisture loss upon incubation.

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VII. INTERLABORATORY QUALITY CONTROL

To indicate how well our laboratory is performing by comparison with other laboratories performing similar work, O'Brien & Gere Laboratory participates in a variety of proficiency and roundrobin tests. Successful performance in the proficiency analyses of samples results in the laboratory certification.

Certification

The U.S. Environmental Protection Agency certifies state laboratories to conduct their own intrastate program of certification for the proficiency of private laboratories in potable water analysis. The EPA only certifies private laboratories directly in those states which have not assumed primacy. In New York State, the certifying agency is the NYS Department of Health. The firm's laboratory was one of the first participants in the New York State program and has been certified for chemical, atomic absorption, bacteriological and gas chromatographic analysis of potable water since 1974. Laboratory certification has been extended to the State of Massachusetts and interm states in the State of New Jersey for potable water and wastewater testing requirements.

In addition, the laboratory participates in the round robin analyses of reference samples supplied by the EPA and in the analysis of commercially available reference samples.

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VIII. DEFINITIONS OF STATISTICAL TERMS

The following statistical term definitions are used to identify statistical reports and evaluations:

a. Accuracy and Precision - Accuracy is a measure of the nearness of an analytical result, or a set of results, to the true value. It is usually expressed in terms of error, bias, or percent recovery (PR).

Normally the term "accuracy" is used synonymously with "percent recovery". It describes either the recovery of a synthetic standard of known value, or the recovery of known amount of analyte (spike) added to a sample of known value. The percent recovery (PR) or "accuracy" can be calculated by using:

1. standards: PR = (observed value/true value) x 100

2. spikes: $PR = \frac{(\text{conc. spike + sample}) - \text{sample}}{\text{conc. spike}} \times 100$

Precision refers to the agreement or reproducibility of a set of replicate results among themselves without assumption of any prior information as to the true result. It is usually expressed in terms of the deviation, variance, or range. Good precision often is an indication of good accuracy, however, one can obtain good precision with poor accuracy if systematic (determinate) errors are present in the method or instrument used. Systematic errors are either positive or negative in sign. Other analytical errors are indeterminate (random) errors. These are inherent in the analytical methods due to uncertainties in measurements.

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b. Average - The average or arithmetic mean ($\bar{X}$) of a set of n values (Xi) is calculated by summing the individual values and dividing by n:

$$\bar{X} = \left[\sum_{i=1}^{n} X_i\right]/n$$

c. Range - The range (R_i) is the difference between the highest and lowest value in a group. For n sets of duplicate values (X_2, X_1) the range (R_i) of the duplicates and the average range ($\bar{R}$) of the n sets are calculated by:

$$R_i = \left| X_2 - X_1 \right|$$

and

$$\bar{R} = \left[\sum_{i=1}^{n} R_i\right]/n$$

d. Standard Deviation and Variation - The standard deviation (S) of a sample of n results is the most widely used measure to described the dispersion of a data set. It is calculated by using the equation

$$S = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}}$$

where $\bar{X}$ is the average of the n results and X_i is the value of result i. Normally, $\bar{X} \pm S$ will include 68% and $\bar{X} \pm 2S$ about 95% of the data in a normal distribution curve.

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The variance is equal to S^2. The relative standard deviation (RSD) or coefficient of variation (CV) is the standard deviation divided by the mean and multiplied by 100, i.e.,

$$CV = 100S/\bar{X}$$

It is interesting to note that the precision is increased (value of S reduced) by increasing the number of duplicate analysis. The greater the number of replicate analysis, the greater the statistical confidence that the true mean lies within certain limits about the experimental mean.

e. Standard Calibration Curves - standard calibration curves are widely used in the analysis of inorganic pollutants. These curves are generated from the results of analyses of three or more standard solutions of known concentration and a blank. Typically, they are plots of the instrument response versus concentration. A plot is defined as linear, i.e., obeys the linear equation Y=a + bX, if the correlation coefficient (R) calculated from the linear regression analysis is 0.996 or greater.

The intercept (a), slope (b) and correlation coefficients (R_c) can be calculated from:

$$a = \frac{\Sigma X^2 \Sigma Y^2 - \Sigma X \Sigma Y}{n\Sigma X^2 - (\Sigma X)^2}$$

$$b = \frac{n\Sigma XY - \Sigma X \Sigma Y}{n\Sigma X^2 - (\Sigma X)^2}$$

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$$R_c = \frac{\Sigma(X_i - \overline{X})^2 (Y_i - \overline{Y})^2}{\sqrt{\Sigma(X_i - \overline{X})^2 \, \Sigma(Y_i - \overline{Y})^2}}$$

We fit the analytical data to a linear regression analysis by using a computer program.

f. Absolute and Relative Errors - An absolute error is the difference between the experimental result and the true value. The relative error is the absolute error divided by the true value and multiplied by 100 to yield the percent relative error (PRE). When the true value is not known, the PRE is a measure of the difference (range) of a replicate analysis divided by the mean of the replicate value and multiplying by 100. That is, for duplicates

$$PRE = \frac{100\,|X_2 - X_1|}{(X_2 + X_1)/2} = \frac{100\,|X_2 - X_1|}{\overline{X}_j}$$

g. Skewness and Kurtosis - Skewness and kurtosis are the numbers used to understand the shape of a given curve. Our groups are data bases of spikes, duplicates, and knowns. The data points in these groups should fall within a normal curve. Aberrations from the normal curve are detected in values of skewness and kurtosis.

Skewness defines the symmetry of a curve. A symmetrical curve must have a skewness of zero. Positive or negative values denote lack of symmetry. Kurtosis defines the peakedness of a curve. A normal distribution curve will have a kurtotic value of 3. Peaked curves will have values greater than three, and broad flat curves will have values 161 less than 3. These values are monitored by the QA/QC group leader. When aberrant values are noted, the interpretation is usually related to very high or low QC values entering data bases or the persistence of patterns of consistently high or low QC values. It is the QA/QC coordinator's responsibility to research the causes of excessive values and patterns and, where possible, rectify the analytical conditions leading to them.

References

1) "Handbood for Anayltical Quality Control in Water and Wastewater Laboratories," March, 1979 (EPA-600/4-79-019)

2) "Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples," January, 1979 (EPA-600/1-79-008)

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IX. STATISTICAL QUALITY CONTROL AND THE "DAILY QC MODEL"

Random (indeterminate) and systematic (determinate) errors are inherent in all analytical methods due to uncertainties in measurements. The measurement of physico-chemical and microbiological properties of pollutants in various environmental matrices involve uncertainties which cannot be entirely eliminated. The errors in these measurements, however, can be reduced to tolerable limits by examining and controlling the significant variables.

Additional errors, often unrecognized, are introduced by interfering chemical reactions and other undesirable physico-chemical effects. In many instances absolute values cannot be attained directly.

Although uncertainties cannot be reduced to zero, they can be minimized by using available statistical methods. Estimates of the accuracy (probable "true value") and precision (range of measurement error) can be made for the various analytical methodologies by analyzing blanks, duplicates, spikes and synthetic standards. After sufficient QC data are collected various statistical methods are used to evaluate the quality of data by calculating control and warning limits. A discussion of the statistical methods used follows.

Control Charts

Control charts provide the necessary tool for detecting quality variations in the various analytical methodologies used for the quantitation of environmental pollutants. They are a continuous graphic indication of the state of an analytical procedure with respect to quality, and assist in deciding when and how to take corrective action. The QC charts are generated for each pollutant from the statistical

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evaluation of QC data. A minimum of 15 duplicates and spiked samples and/or synthetic standard analyses are required to generate a control chart.

The control limits (CL) on QC charts are paramount criteria for assessing the significance of variations in the analytical results. For instance, when the plotted QC indicators (i.e., percent recoveries, relative percent error, etc.) fall within these limits, the analytical methodologies used are under "control". If, however, a QC indicator value falls outside the CL's, there is an indication that some assignable cause is present which has thrown the system "out of control". Thus, control limits can be considered warning or action limits. They enable us to detect deviations in analytical procedures, and therefore, take corrective action before producing erroneous results (or results which exceed the absolute maximum tolerable limits).

Common practice set warning limits (WL) at ± 2 standard (S) deviations (95% confidence level of the normal distribution curve) and control limits (CL) at ±3S limits (99.7% confidence level of the normal distribution curve) on each side of the mean. The CL and WL are calculated from the QC data of duplicates analyses by using the equations and statistical factors listed in Table IV. These CL's and WL's include approximately the entire data set under "in control" conditions, and are equivalent to the commonly used ± 3S and ± 2S limits, respectively. The qualitative relationship between upper and lower control limits, upper and lower warning limits, and the mean is shown in Figure 3.

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TABLE IV STATISTICAL FACTORS AND EQUATIONS FOR CALCULATING QC (X BAR AND R) CHART LINES[1]

Observations in Subgroup (n)	Factor			
	A_2	d_2	D_3	D_4
2	1.88	1.13	0	3.27
3	1.02	1.69	0	2.58
4	0.73	2.06	0	2.28
5	0.58	2.33	0	2.12
6	0.48	2.53	0	2.00
7	0.42	2.70	0.08	1.92
8	0.37	2.85	0.14	1.86

Upper control limit for $\bar{X} = UCL_{\bar{X}} = \langle\bar{X}\rangle + A_2\bar{R}$

Lower control limit for $\bar{X} = LCL_{\bar{X}} = \langle\bar{X}\rangle - A_2\bar{R}$

Upper warning limit for $\bar{X} = UWL_{\bar{X}} = \langle\bar{X}\rangle + (2/3)\ A_2\bar{R}$

Lower warning limit for $\bar{X} = LWL_{\bar{X}} = \langle\bar{X}\rangle - (2/3)\ A_2\bar{R}$

Upper control limit for $R = UCL_R = D_4\bar{R}$

Lower control limit for $R = LCL_R = D_3\bar{R}$

Upper Warning Limit for $R = UWL_R = \bar{R} + (2/3)(D_4\ \bar{R} - \bar{R})$

$= \bar{R}\ (2\ D_4 + 1)/3$

[1]Taken from (1) "Handbook for Analytical Quality Control in Water and Wastewater Laboratories", March, 1979 (EPA-600/4-79-019); and (2) C. Samson, P. Hart and C. Rubin, "Fundamentals of Statistical Quality Control", Addison-Wesley (Massachusetts, 1970), p. 40.

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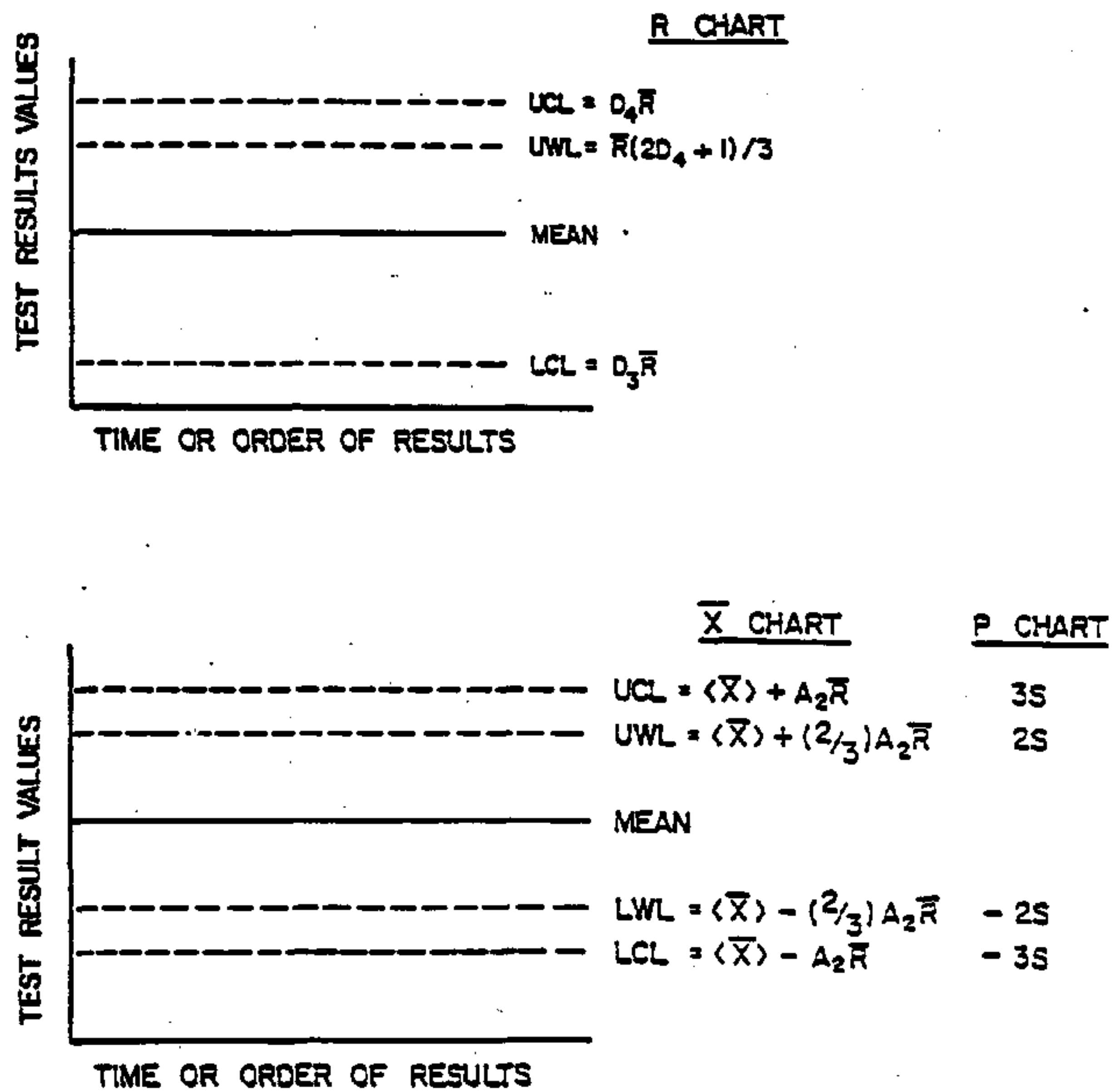
FIGURE 3

ESSENTIALS OF CONTROL CHARTS



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Statistical Calculations

The statistical techniques used in generating the data for $\bar{X}$ and R QC charts involves complex mathematics. The short cut methods for calculating the $\bar{X}$ and R limits are based on the equations listed in Table IV. The statistical factors A_2, D_3, D_4, etc. have been calculated by statisticians such that the CL limits involve a maximum risk of making an error only 0.1% to 0.3%. Thus, when the QC charts indicate that the analytical system is "out of control" 997 times out of 1,000 it is likely that something has actually gone wrong and corrective actions are needed. The factors are calculated to yield 3S limits. Examples of QC data and the statistical techniques used to calculate precision and accuracy QC charts follow.

Precision QC Charts ($\bar{X}$ and R Charts)

These charts are developed by using a minimum of 15 to 25 QC data results on duplicate analyses. Once these data have been collected over an extended period of time the warning and controlling limits on the QC charts are calculated by using the equations and statistical coefficients listed in Table IV. The procedure used follows:

(1) For each duplicate sample analysis calculate the range ($R_i = | X_2 - X_1 |$) and the average ($\bar{X}j = (X_2 + X_1)/2$) of the concentration of the duplicate set.

(2) Calculate the relative percent range (R^1_j) defined as

$$R^1_j = PRE/100 = R_i/\bar{X}_j$$

where PRE is the relative error defined in Section VIII.

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(3) Calculate the mean ($\bar{R}^1$) relative range by summing the R^1_j values and divide by the total number (n) of duplicate sets, e.g.,

$$\bar{R}' = \left[\sum_{j=1}^{n} R_j\right] / n$$

(4) Calculate the grand average $\langle\bar{X}\rangle$, i.e., the average of the average of n sets of duplicate averages $\bar{X}_j$ by using:

$$\langle\bar{X}\rangle = \left[\sum_{j=1}^{n} \bar{X}_j\right] / n$$

(5) Calculate the warning and control limits for R and $\bar{X}$ (see Table IV) by using:

For R:

$$UCL = D_4\ \bar{R}^1 = 3.27\ \bar{R}^1$$

$$LCL = D_3\ \bar{R}^1 = 0$$

$$UWL = \bar{R}^1\ (2D_4 + 1)/3 = 2.51\ \bar{R}^1$$

For $\bar{X}$:

$$UCL = \langle\bar{X}\rangle + A_2\bar{R} = \langle\bar{X}\rangle + 1.88\ \bar{R}$$

$$LCL = \langle\bar{X}\rangle - A_2\bar{R} = \langle\bar{X}\rangle - 1.88\ \bar{R}$$

$$UWL = \langle\bar{X}\rangle + (2/3)\ A_2\bar{R} = \langle\bar{X}\rangle + 1.25\ \bar{R}$$

$$LWL = \langle\bar{X}\rangle - (2/3)\ A_2\bar{R} = \langle\bar{X}\rangle - 1.25\ \bar{R}$$

where for duplicates $D_3 = 0$, $D_4 = 3.27$, and $A_2 = 1.88$ (Table IV); UCL and LCL are the upper and lower control limits, respectively; and UWL and LWL are the upper and lower warning limits. The WL's and CL's correspond, respectively, to the 95% (2S) and 99.7% (3S) confidence limits of a normal distribution curve.

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(6) Graph the $\bar{R}^1$, UCL, LCL and UWL on the QC charts with appropriate scales which allow additions of new results (Figure 3) and the individual (R^1_j) QC data results.

(7) Graph the $<\bar{X}>$, UCL, LCL, UWL, and LWL on the QC charts with appropriate scales which allow additions of new results and individual ($\bar{X}_j$) QC data.

(8) If QC values are "out of control", i.e., lie outside the control limits, take appropriate corrective action.

Accuracy QC Charts (P Charts)

The P charts are the same as the $\bar{X}$ and R charts since their function is to enable us to detect changes in the laboratory daily performance of analyses and take corrective action. The P QC charts utilize the sigma (i.e., standard deviation, S) as a quantitative measure of the degree of variations in the analytical methodologies.

The accuracy of the laboratory analytical methodologies is monitored via the analysis of various spiked samples and/or audits of synthetic standards. Spiked samples are also analyzed vis a vis field samples and the percent recovery calculated. Once a minimum of 15 QC recovery data have been collected over a period of time the warning and controlling limits are calculated and P charts developed. The procedure used follows:

(1) For each spiked sample analyzed calculate the percent recovery (PR) using the equations given in Section VIII.

(2) Calculate the mean percent recovery ($\bar{PR}$) by summing the total number of PR's and divide by n (see Section VIII).

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(3) Calculate the standard deviation (S) from the percent recoveries (see Section VIII).

(4) Calculate the warning (WL) and control (CL) limits by using:

$$CL = mean \pm 3S$$

$$WL = mean \pm 2S$$

where CL and WL denote, respectively, the upper and lower control limits, and the upper and lower warning limits; S the standard deviation; and mean the average percent recovery ($\overline{PR}$) for n spiked samples or synthetic standards. The WL and CL on the accuracy charts (similar to the precision charts) correspond, respectively, to the 95% and 99.7% confidence limits of a normal distribution curve.

(5) Graph the mean, WL, CL and the individual (PR) QC data results on the accuracy chart using appropriate scales.

(6) If QC values lie outside the control limits, the analytical method is "out of control" and appropriate corrective actions are taken.

The "Daily QC Model"

The "Daily QC Model" comprises two unique activities of our QA/QC program, i.e., the data management and monitoring specific statistical programs of data management systems on a daily basis. The salient features of the programs are discussed below.

1. Data Management

Integral to the laboratory's QA/QC program is the management of data generated from specified quality control procedures. These procedures are designed to monitor all laboratory analyses and ultimately, to ensure the highest possible quality of results. As

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previously mentioned, the duplicate, the spiked recovery, the synthetic known and the blank(s) are the analytical tools used to monitor the precision and accuracy of analytical methods. Recall:

(a) duplicate analyses monitor analytical method precision,

(b) spiked samples and synthetic knowns monitor analytical accuracy, and

(c) analyses of blanks account for possible sources of contamination.

The data produced from these tests is maintained via a quality control data management system which has the dual function of relating QA/QC data to analytical performance on a daily as well as varying time frames.

The key to the management of QA/QC data in the laboratory is the Firm's Honeywell X560 computer. Quality control computer programs allow for the calculations, storage, segregation, interpretation, monitoring and retrieval of each bit of QA/QC information. A discrete system of sample identification is used which allows the computer to perform these functions automatically. Each QA/QC sample is assigned a specific code identifying it as a blank, duplicate, spike or synthetic known sample. The code identifiers place each QC value in an appropriate data base which provides a permanent record of each and every quality control sample. These data base are then used as the starting point of various statistical analyses of QC data which aid in understanding the developed analytical information.

Specific statistical programs are available for the various types of QA/QC samples, and generate precision (X bar and R) and accuracy (P bar) quality control charts. These charts provide the graphic representation of the QA/QC information and are used to monitor the accuracy and precision of the various analytical methodologies daily.

2. Monitoring Statistical Programs of Data Management Systems

The QA/QC programs are made available to the QA/QC group leader and the analyst to allow daily response to analysis. The programs offer instant presentation of statistical values which are checked vis a vis the most recent mean, standard deviations and control limits calculated from each data base in the computer. As a result the QA/QC group leader and the analyst will know immediately whether or not the analytical method performance is in control (lie within acceptable ranges) and a decision can be made to accept, reject or repeat the analysis.

In addition, a program exists for the QA/QC group leader which presents all quality control information in a daily printout (see Figures 4 and 5). On this printout, information concerning QC samples is organized for review by the QA/QC group leader. The sample number, the test parameter, the QC sample type, the date of analysis, percent recoveries, relative errors and all values necessary for the calculation of QC data are collected on this printout (Figure 4). In addition to the QC values, commensurate warning and control limits are given. The QA/QC group leader is able to examine these data for acceptability. A quick scan can tell him the status of unfinished samples and values of QC data entering data bases. It is at this point where errors are detected, researched, and corrected whenever possible. We feel that the use of this monitoring program minimizes elapsed time between analysis and data review, therefore, greatly

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TABLE V. SUMMARY OF VARIOUS QA/QC ITEMS ON DAILY COMPUTER PRINTOUT

ITEM	INFORMATION
CONTROL CHARTS	X Bar and R Charts (precision)
	P Charts (accuracy)
TABLES	Blanks
	Duplicates (Percent Relative Error)
	Spikes (Percent Recovery)
	Synthetic Standards (Percent Error)
WARNING PROGRAM	Outliers on all QC Data Base
	Mean and Standard Deviation
	Upper and Lower Warning and Control Limits
STATISTICS	Average, Mean and Standard Deviation
	Upper and Lower Warning and Control Limits
	Skewness and Kurtosis
	Percent Relative Error
	Percent Recovery
	Percent Error

improves the sensitivity of our QC program to our analyses. The earlier errors are detected and corrected, the less time is required to deliver valid results to a client.

A summary of the various QC activities and statistical calculations found in the daily printout is given in Table V. If QC values are found to lie outside the control limits, corrective actions are taken to bring the analytical method "under control". The various corrective actions are delineated in Table VI.

3. Other QA/QC Functions

A further ramification of the QA/QC computer management system is the historical evaluations afforded through data storage. Data may be retrieved over long varying time frames providing solid estimates of performance limits for any given analytical parameter. By the same token knowledge of performance limits and the factors that establish them should allow for the improvement of analyses as these factors are identified and removed. Such review is used in the evaluation of new techniques, instruments, and analysts when comparisons are made to the established quality control data bases.

To assist in evaluation and historical review a statistical package is available for measuring the variability of any given data over varying time frames. The Peursonian coefficient of skewness is utilized to quantify variability of percent recoveries, duplicate ratios, and percent of unknown values.

Automatic storage of data, generation of control charts, and data examination through statistics are the tools used to manage the quality control data. The goal of the data management system is a sensitive quality control program which will allow accurate decision making processes and continuous quality of analytical results.

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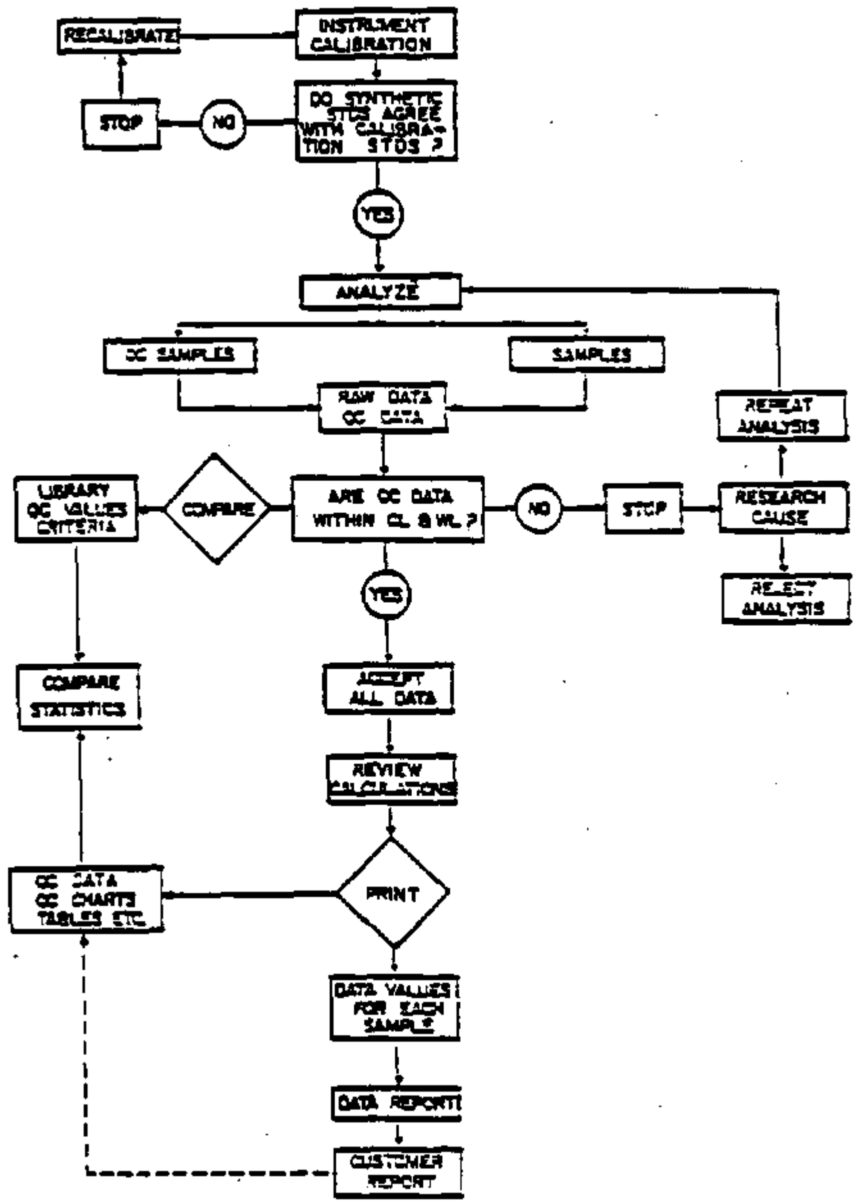
TABLE VI
DECISION MAKING PROCESS FOR QA/AC
PROTOCOL AND ANALYSIS OF SAMPLES



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X. FOR THE CLIENT

The overall importance of our quality control program to the client lies in the fact that we are able to guarantee a certain level of confidence in our analyses. This confidence is expressed through our statistics. As mentioned earlier, we have established our acceptability limits to be plus or minus three times the standard deviation of the mean of the quality control values in each data base. Assuming that the values in the data bases describe a normal distribution, it is known that 99% of the values will fall within the range described by 3 standard deviations of the mean of the distribution. There exists a probability of .99 that any data point will be (plus or minus) 3 times the standard deviation of the mean. This may be described as the 99% confidence interval. We may state, therefore, with 99% certainty, that our quality control data will fall within acceptable limits. As we use quality control data to determine the validity of analyses of client samples, the same confidence interval may be ascribed to such data. The client must be aware, however, that the limits of acceptability are based upon the actual quality control data itself. That data derived from quality control analyses directly reflects the variability of the test. The limits, therefore, will vary as the test varies. Accordingly, the confidence interval of 99% will depict a different range in concentration for each test. The use of the confidence interval provides us with a method of checking the quality of our data and providing the client with some guarantee of validity.

The other facet of our operation which must be described is the ability to adapt our quality control options to the client's specific needs. Quality control parameters, blanks, spiked samples, duplicates,

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and the analysis of knowns may increase or decrease in frequency according to the client's wishes. If, for example, there is a concern over contamination, a client may wish to increase the number of blanks from one per ten client samples to two per set. The same applies to spikes, duplicates, and knowns.

If requested, graphs of all quality control data and lists of the statistical information can be made available. The graphs include sample numbers, mean, warning limits and control limits for acceptability (see Figures 6 and 7). The graphs may be formulated to include any desired number of data points for each of the quality control parameters. Statistical lists for data groups include the mean, standard deviation, median, coefficient of skewness and measures of kurtosis. These values can also be modified to comprise varying groups of data points. The variation is related to the time frame the client may wish to relate the data to provide the best description of the validity of analyses on his samples.

FIGURE B-4

OBG
LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

SURVEY	SAMPLERS: (Signature)

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE: Water – Comp.	SAMPLE TYPE: Water – Grab	SAMPLE TYPE: Air	SEQ. NO.	NO. OF CONTAINERS	ANALYSIS REQUIRED

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time

Method of Shipment:

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Road / Syracuse, New York 13221 / (315) 457-1494

APPENDIX

KEY FOR DAILY QUALITY CONTROL REPORT

PROJECT NO: denotes client and parameters tested.

SAMPLE: denotes O'Brien & Gere sample ticket number.

MATE: client sample that was spiked or duplicated.

TYPE: Quality control sample type as:

1 - blank sample

3 - denotes duplicate

50 - chemistry spike

51 - trace organics spike

40 - EPA known concentration

QC VALUE: value obtained for QC sample as blank value, duplicate ratio, percent recoveries for spiked and known samples.

L, WARNING: lower warning limit as (-2) times the standard deviation of the mean of the last 25 samples.

U, WARNING: upper warning limit as (+2) times the standard deviation of the mean of the last 25 samples.

SIZE: number of values in data base.

COMMENTS: as written.

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TABLE VII

SPIKED RECOVERIES DATA BASE

FOR GENERATING CONTROL CHARTS & STATISTICS

HG DATABASE SIZE IS 25 NUMBER OF SAMPLES ARE 54

FIELD	SAMPLE	VALUE
1	64261	109.000
2	64456	100.000
3	64362	110.000
4	64378	100.000
5	64322	100.000
6	66507	124.000
7	81628	107.000
8	19683	67.000
9	82504	112.000
10	83870	95.000
11	81075	93.000
12	90033	104.440
13	91773	124.000
14	94287	122.000
15	95283	80.000
16	92510	98.000
17	97001	82.000
18	97055	106.000
19	97253	120.000
20	97906	96.000
21	98469	98.000
22	98743	118.000
23	99151	105.000
24	2409	129.000
25	2410	103.000
26	28598	84.711
27	28833	100.000
28	38710	86.364
29	39461	73.333
30	39629	96.000
31	39633	90.625
32	21292	99.160
33	21310	125.000
34	21741	69.841
35	22011	96.061
36	98263	95.522
37	22504	131.657
38	22611	97.222
39	14622	82.759
40	26661	104.637
41	38006	80.202
42	30037	108.333
43	30035	103.448
44	35971	89.756
45	39979	95.455
46	5590	123.529
47	7507	80.851
48	7517	71.897
49	17107	109.091
50	17514	88.462
51	17521	94.667
52	17431	111.755
[illegible]	[illegible]	[illegible]

BENZ DATABASE SIZE IS 25 NUMBER OF SAMPLES ARE 45

FIELD	SAMPLE	VALUE
1	29830	109.677
2	23250	87.000
3	44382	99.000
4	5593	97.500
5	43077	100.000
6	5718	120.000
7	5716	100.000
8	9646	94.500
9	9651	105.000
10	9665	92.000
11	17041	104.065
12	17262	89.000
13	17326	93.500
14	17410	83.333
15	17411	90.244
16	17505	105.000
17	17506	105.000
18	17638	105.000
19	17767	100.000
20	17774	102.000
21	17857	77.419
22	17875	87.948
23	17930	99.500
24	18104	102.000
25	18107	105.000
26	18125	88.599
27	18170	105.000
28	18234	80.645
29	18236	84.691
30	18203	93.000
31	18366	105.000
32	18464	105.000
33	18472	105.000
34	50627	91.667
35	50648	100.000
36	50789	91.667
37	50824	108.333
38	50669	100.000
39	50867	100.000
40	50942	100.000
41	50943	105.000
42	51035	105.000
43	51049	100.000
44	51051	105.000
45	51077	91.667

FIELD	SAMPLE	RATIO
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	[illegible]	[illegible]
8	[illegible]	[illegible]
9	[illegible]	[illegible]
10	[illegible]	[illegible]
11	[illegible]	120.000
12	[illegible]	[illegible]
13	[illegible]	[illegible]
14	[illegible]	[illegible]
15	[illegible]	114.000
16	[illegible]	[illegible]
17	[illegible]	[illegible]
18	[illegible]	[illegible]
19	[illegible]	[illegible]
20	[illegible]	[illegible]
21	[illegible]	[illegible]
22	[illegible]	[illegible]
23	[illegible]	[illegible]
24	[illegible]	[illegible]
25	[illegible]	[illegible]
26	[illegible]	[illegible]
27	[illegible]	[illegible]
28	[illegible]	[illegible]
29	[illegible]	[illegible]
30	[illegible]	[illegible]
31	[illegible]	[illegible]
32	[illegible]	[illegible]
33	[illegible]	[illegible]
34	[illegible]	[illegible]
35	[illegible]	[illegible]
36	[illegible]	[illegible]
37	[illegible]	[illegible]
38	[illegible]	[illegible]
39	[illegible]	[illegible]
40	[illegible]	[illegible]
41	[illegible]	[illegible]
42	[illegible]	[illegible]
43	[illegible]	[illegible]
44	[illegible]	[illegible]
45	[illegible]	[illegible]
46	[illegible]	[illegible]
47	[illegible]	[illegible]
48	[illegible]	[illegible]
49	[illegible]	[illegible]
50	[illegible]	[illegible]
51	[illegible]	[illegible]
52	[illegible]	[illegible]

FIELD	SAMPLE	RATIO
53	[illegible]	105.000
54	20620	101.[illegible]
55	21639	99.0[illegible]
56	86918	101.000
57	89[illegible]24	105.000
58	89075	101.000
59	89162	98.000
60	80716	105.000
61	89415	105.000
62	89401	101.000
63	89100	105.000
64	89672	99.000
65	94495	126.000
66	94674	131.000
67	41561	110.000
68	41567	126.000
69	88029	125.000
70	85016	101.000
71	95155	126.000
72	91963	120.000
73	94926	111.000
74	95412	111.000
75	95560	113.000
76	95406	125.000
77	95600	110.000
78	95629	116.000
79	95728	110.000
80	95830	96.000
81	95871	100.000
82	95956	116.000
83	[illegible]	103.000
84	[illegible]	109.000
85	96231	[illegible]
86	96197	[illegible]
87	[illegible]	[illegible]
88	[illegible]	[illegible]
89	[illegible]	[illegible]
90	[illegible]	[illegible]
91	[illegible]	[illegible]
92	[illegible]	[illegible]
93	[illegible]	[illegible]
94	[illegible]	[illegible]
95	[illegible]	[illegible]
96	[illegible]	[illegible]
97	[illegible]	[illegible]
98	[illegible]	[illegible]
99	[illegible]	[illegible]
100	[illegible]	[illegible]
101	[illegible]	[illegible]
102	[illegible]	[illegible]
103	[illegible]	[illegible]
104	[illegible]	[illegible]

FIELD	SAMPLE	RATIO
105	98817	10[illegible].000
106	78860	124.000
107	51[illegible]91	112.000
108	99950	132.000
109	2412	7[illegible].000
110	4384	115.000
111	98000	113.000
112	2405	86.000
113	2413	84.000
114	2409	136.000
115	99319	114.000
116	20104	95.230
117	20277	80.000
118	20369	97.541
119	20407	115.789
120	20633	99.578
121	20647	102.915
122	30633	97.873
123	33064	99.259
124	36005	95.099
125	37105	105.556
126	39268	115.195
127	39530	101.125
128	39670	100.000
129	39959	10[illegible].352
130	21155	101.226
131	21515	9[illegible].652
132	21641	91.290
133	21857	10[illegible].185
134	88134	106.972
135	88250	101.504
136	88599	90.411
137	88164	10[illegible].552
138	88506	101.761
139	88762	10[illegible].071
140	89291	104.225
141	22129	106.465
142	22630	108.567
143	11011	100.000
144	11[illegible]11	10[illegible].000
145	46051	[illegible]
146	[illegible]	[illegible]
147	[illegible]	[illegible]
148	[illegible]	[illegible]
149	[illegible]	[illegible]
150	[illegible]	[illegible]
151	[illegible]	[illegible]
152	[illegible]	[illegible]
153	[illegible]	[illegible]
154	[illegible]	[illegible]
155	[illegible]	[illegible]
156	[illegible]	[illegible]
157	[illegible]	[illegible]

FIELD	SAMPLE	RATIO
158	40650	[illegible]
159	40517	113.500
160	40034	107.143
161	40635	105.[illegible]
162	40654	112.500
163	40855	101.[illegible]
164	40057	102.263
165	40031	94.737
166	40830	105.747
167	40029	102.703
168	40638	105.263
169	23519	103.158
170	30773	98.592
171	37917	77.500
172	37969	100.013
173	40203	98.522
174	31090	102.703
175	67036	95.238
176	31033	90.493
177	45435	101.266
178	38004	96.774
179	2591	98.925
180	9505	101.167
181	9587	92.398
182	17061	101.641
183	17373	103.704
184	17541	102.092
185	17509	80.000
186	95676	110.000
187	99653	111.000
188	56601	106.900
189	56606	114.286
190	51103	100.000

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FIGURE 4

DAILY QUALITY CONTROL REPORT

(SEE KEY)

*** QC REPORT FOR 3/15/83 TO 3/22/83

PROJECT NO.	SAMPLE	RATE	TYPE	DATE	QC VALUE	L. WARNING	U. WARNING	SIZE	COMMENTS
1042- 97-510	18465	0	1	3/15/83					
1042- 97-510	50585	0	1	3/16/83					
1042- 97-510	50714	0	1	3/15/83					
1042- 97-510	50783	0	1	3/15/83					
1042- 97-510	50787	0	1	3/15/83					
1042- 97-510	50790	0	1	3/16/83					
1042- 97-510	50793	0	1	3/16/83					NO SCHEDULED ANALYSES
1042- 97-510	50795	0	1	3/16/83					
1042- 97-510	50820	0	1	3/16/83					NO SCHEDULED ANALYSES
1042- 97-510	50840	0	1	3/16/83					NO SCHEDULED ANALYSES
1042- 97-510	50850	0	1	3/16/83					
1042- 97-510	50851	0	1	3/17/83					
1042- 97-510	50853	0	1	3/17/83					
1042- 97-510	50866	0	1	3/18/83					
1042- 97-510	50868	0	1	3/18/83					
1042- 97-510	50883	0	1	3/21/83					NO SCHEDULED ANALYSES
1042- 97-510	50890	0	1	3/21/83					
1042- 97-510	50891	0	1	3/21/83					
1042- 97-510	50892	0	1	3/21/83					
1042- 97-510	50897	0	1	3/21/83					NO SCHEDULED ANALYSES
1042- 97-510	50899	0	1	3/21/83					
1042- 97-510	50900	0	1	3/21/83					
1042- 97-510	50906	0	1	3/22/83					
BENZ	<1.				1.000			481	
CHCL3	<1.000				1.000			191	
FREON113	<1.000				1.000			593	
CL3CCH3	<1.000				1.000			608	
CCL4	<1.000				1.000			73	
BRCL2CH	<1.000				1.000			191	
CL3C2H	<1.000				1.000			609	
CLBR2CH	<1.000				1.000			191	
CHBR3	<10.000				10.000			190	
CL4C2	<1.000				1.000			603	
CH2CL2	<1.000				1.000			604	
TOLUENE	<1.000				1.000			482	
M-XYLENE	<1.000				1.000			473	
CLORODBZ	<1.000				1.000			171	
CL4C2H2	<1.000				1.000			66	
DCETANIL	<1.000				1.000			592	

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DCETANI2	<1.000				1.000	342	
DCLENI1	<1.000				1.000	342	
ETHBENZ	<1.000				1.000	98	
DCLENI2	<1.000				1.000	342	
C2H5CL	<1.000				1.000	316	
CH2CHCL	<1.000				1.000	315	
XYLENES	<1.000				1.000	195	
CH3CL	<1.000				1.000	66	
CH3BR	<1.000				1.000	66	
DCPANI2	<1.000				1.000	66	
DCPENT13	<1.000				1.000	66	
CL3C2112	<1.000				1.000	66	
DCPENC13	<1.000				1.000	66	
CLETHER	<10.000				10.000	66	
1042- 97-510	50907	0	1	3/22/83			
BENZ	2.				2.000	482	
CHCL3	<1.000				1.000	192	
FREON113	<1.000				1.000	594	
CL3CCH3	<1.000				1.000	609	
CCL4	<1.000				1.000	74	
BRCL2CH	<1.000				1.000	192	
CL3C2H	<1.000				1.000	610	
CLBR2CH	<1.000				1.000	193	
CHBR3	<10.000				10.000	191	
CL4C2	<1.000				1.000	604	
CH2CL2	<1.000				1.000	605	
TOLUENE	<1.000				1.000	483	
M-XYLENE	<1.000				1.000	474	
CLOHOMZ	<1.000				1.000	172	
CL4C2H2	<1.000				1.000	67	
DCETANI1	<1.000				1.000	343	
DCETANI2	<1.000				1.000	343	
DCLENI1	<1.000				1.000	343	
ETHBENZ	<1.000				1.000	99	
DCLENI2	<1.000				1.000	343	
C2H5CL	<1.000				1.000	317	
CH2CHCL	<1.000				1.000	316	
XYLENES	<1.000				1.000	196	
CH3CL	<1.000				1.000	67	
CH3BR	<1.000				1.000	67	
DCPANI2	<1.000				1.000	67	
DCPENT13	<1.000				1.000	67	
CL3C2112	<1.000				1.000	67	
DCPENC13	<1.000				1.000	67	
CLETHER	<10.000				10.000	67	
1042- 97-510	50913	0	1	3/22/83			NO SCHEDULED ANALYSES
1042- 97-510	50700	468	3	3/16/83			
CHCL3	<100.000						< FLAG - SKIPPED
FREON113	<10.000						< FLAG - SKIPPED
CCL4	<100.000						< FLAG - SKIPPED
BRCL2CH	<100.000						< FLAG - SKIPPED
CLBR2CH	<10.000						< FLAG - SKIPPED
CHBR3	<100.000						< FLAG - SKIPPED
CL4C2	<10.000						< FLAG - SKIPPED
CLOHOMZ	<1.000						< FLAG - SKIPPED
CL4C2H2	<10.000						< FLAG - SKIPPED
CH3CL	<10.000						< FLAG - SKIPPED
CH3BR	<10.000						< FLAG - SKIPPED
DCPANI2	<10.000						< FLAG - SKIPPED
DCPENT13	<10.000						< FLAG - SKIPPED
CL3C2112	<10.000						< FLAG - SKIPPED

187

DCPENC13	<10,000				< FLAG - SKIPPED
CLETHER	<100,000				< FLAG - SKIPPED
1042- 97-510	50741	50686	3	3/16/83	
BOD5	<10.0				< FLAG - SKIPPED
1042- 97-510	50791	50605	3	3/16/83	
1042- 97-510	50817	50812	3	3/16/83	NO SCHEDULED ANALYSES
1042- 97-510	50818	50660	3	3/16/83	
1042- 97-510	50821	50660	3	3/16/83	
NO2N	<.01				< FLAG - SKIPPED
1042- 97-510	50823	493	3	3/16/83	
BENZ	<10.				< FLAG - SKIPPED
CHCL3	<100,000				< FLAG - SKIPPED
FREON113	<100,000				< FLAG - SKIPPED
CCL4	<1000,000				< FLAG - SKIPPED
BRCL2CH	<1000,000				< FLAG - SKIPPED
CLBR2CH	<100,000				< FLAG - SKIPPED
CHBR3	<1000,000				< FLAG - SKIPPED
CLORDBZ	<10,000				< FLAG - SKIPPED
CL4C2H2	<100,000				< FLAG - SKIPPED
ETHBENZ	<10,000				< FLAG - SKIPPED
C2H5CL	<100,000				< FLAG - SKIPPED
CH2CHCL	<100,000				< FLAG - SKIPPED
CH3CL	<100,000				< FLAG - SKIPPED
CH3BR	<100,000				< FLAG - SKIPPED
DCPAN12	<100,000				< FLAG - SKIPPED
DCPENT13	<100,000				< FLAG - SKIPPED
CL3C2112	<100,000				< FLAG - SKIPPED
DCPENC13	<100,000				< FLAG - SKIPPED
CLETHER	<1000,000				< FLAG - SKIPPED
1042- 97-510	50825	212	3	3/16/83	
1042- 97-510	50827	212	3	3/16/83	
NO2N	<.01				< FLAG - SKIPPED
1042- 97-510	50849	511	3	3/16/83	
BENZ	<100.				< FLAG - SKIPPED
CHCL3	<1000,000				< FLAG - SKIPPED
FREON113	<1000,000				< FLAG - SKIPPED
CCL4	<1000,000				< FLAG - SKIPPED
BRCL2CH	<1000,000				< FLAG - SKIPPED
CLBR2CH	<1000,000				< FLAG - SKIPPED
CHBR3	<10000,000				< FLAG - SKIPPED
CL4C2H2	<1000,000				< FLAG - SKIPPED
DCETAN11	<1000,000				< FLAG - SKIPPED
DCETAN12	<1000,000				< FLAG - SKIPPED
ETHBENZ	<100,000				< FLAG - SKIPPED
C2H5CL	<1000,000				< FLAG - SKIPPED
CH2CHCL	<1000,000				< FLAG - SKIPPED
CH3CL	<1000,000				< FLAG - SKIPPED
CH3BR	<1000,000				< FLAG - SKIPPED
DCPAN12	<1000,000				< FLAG - SKIPPED
DCPENT13	<1000,000				< FLAG - SKIPPED
CL3C2112	<1000,000				< FLAG - SKIPPED
DCPENC13	<1000,000				< FLAG - SKIPPED
CLETHER	<10000,000				< FLAG - SKIPPED
1042- 97-510	50852	3892	3	3/17/83	
BENZ	<1.				< FLAG - SKIPPED

CHCL3	<1.000				< FLAG - SKIPPED
FREON113	<1.000				< FLAG - SKIPPED
CCL4	<1.000				< FLAG - SKIPPED
BRCL2CH	<1.000				< FLAG - SKIPPED
CLBR2CH	<1.000				< FLAG - SKIPPED
CHBR3	<10.000				< FLAG - SKIPPED
CL4C2	<1.000				< FLAG - SKIPPED
TOLUENE	<1.000				< FLAG - SKIPPED
M-XYLENE	<1.000				< FLAG - SKIPPED
CLOROBZ	<1.000				< FLAG - SKIPPED
CL4C2H2	<1.000				< FLAG - SKIPPED
ETHBENZ	<1.000				< FLAG - SKIPPED
XYLENES	<1.000				< FLAG - SKIPPED
CH3BR	<1.000				< FLAG - SKIPPED
DCPAN12	<1.000				< FLAG - SKIPPED
DCPENT13	<1.000				< FLAG - SKIPPED
CL3C2112	<1.000				< FLAG - SKIPPED
DCPENC13	<1.000				< FLAG - SKIPPED
CLETHER	<10.000				< FLAG - SKIPPED
1042- 97-510	50854	3858	3	3/18/83	
CHCL3	<1.000				< FLAG - SKIPPED
CCL4	<1.000				< FLAG - SKIPPED
BRCL2CH	<1.000				< FLAG - SKIPPED
CLBR2CH	<1.000				< FLAG - SKIPPED
CHBR3	<10.000				< FLAG - SKIPPED
TOLUENE	<1.000				< FLAG - SKIPPED
M-XYLENE	<1.000				< FLAG - SKIPPED
CLOROBZ	<1.000				< FLAG - SKIPPED
CL4C2H2	<1.000				< FLAG - SKIPPED
DCETAN12	<1.000				< FLAG - SKIPPED
CH3CL	<10.000				< FLAG - SKIPPED
CH3BR	<10.000				< FLAG - SKIPPED
DCPAN12	<1.000				< FLAG - SKIPPED
DCPENT13	<1.000				< FLAG - SKIPPED
CL3C2112	<1.000				< FLAG - SKIPPED
DCPENC13	<1.000				< FLAG - SKIPPED
CLETHER	<10.000				< FLAG - SKIPPED
1042- 97-510	50856	18315	3	3/16/83	
AL	<.1				< FLAG - SKIPPED
1042- 97-510	50858	215	3	3/17/83	NO SCHEDULED ANALYSES
1042- 97-510	50860	50660	3	3/17/83	
F	<.10				< FLAG - SKIPPED
1042- 97-510	50862	10330	3	3/17/83	
1042- 97-510	50865	212	3	3/21/83	
1042- 97-510	50898	3902	3	3/21/83	
BENZ	<100.				< FLAG - SKIPPED
CHCL3	<1000.000				< FLAG - SKIPPED
FREON113	<1000.000				< FLAG - SKIPPED
CCL4	<1000.000				< FLAG - SKIPPED
BRCL2CH	<1000.000				< FLAG - SKIPPED
CLBR2CH	<1000.000				< FLAG - SKIPPED
CHBR3	<10000.000				< FLAG - SKIPPED
CL4C2	<1000.000				< FLAG - SKIPPED
CH2CL2	<1000.000				< FLAG - SKIPPED
TOLUENE	<100.000				< FLAG - SKIPPED
M-XYLENE	<100.000				< FLAG - SKIPPED
CLOROBZ	<100.000				< FLAG - SKIPPED
CL4C2H2	<1000.000				< FLAG - SKIPPED

DCETANI2	<1000,000								< FLAG - SKIPPED
DCLENI1	<1000,000								< FLAG - SKIPPED
ETHBENZ	<100,000								< FLAG - SKIPPED
C2H5CL	<1000,000								< FLAG - SKIPPED
CH2CHCL	<1000,000								< FLAG - SKIPPED
XYLENES	<100,000								< FLAG - SKIPPED
CH3CL	<1000,000								< FLAG - SKIPPED
CH3BR	<1000,000								< FLAG - SKIPPED
DCPANI2	<1000,000								< FLAG - SKIPPED
DCPENT13	<1000,000								< FLAG - SKIPPED
CL3C2112	<1000,000								< FLAG - SKIPPED
DCPENC13	<1000,000								< FLAG - SKIPPED
CLETHER	<10000,000								< FLAG - SKIPPED
1042- 97-510	50901	50800	3	3/21/83					
BENZ	<1.								< FLAG - SKIPPED
CHCL3	<1,000								< FLAG - SKIPPED
CCL4	<10,000								< FLAG - SKIPPED
BRCL2CH	<10,000								< FLAG - SKIPPED
CLBR2CH	<1,000								< FLAG - SKIPPED
CHBR3	<10,000								< FLAG - SKIPPED
M-XYLENE	<1,000								< FLAG - SKIPPED
CLOROBZ	<1,000								< FLAG - SKIPPED
CL4C2H2	<1,000								< FLAG - SKIPPED
DCETANI2	<1,000								< FLAG - SKIPPED
ETHBENZ	<1,000								< FLAG - SKIPPED
DCLENI2	<1,000								< FLAG - SKIPPED
C2H5CL	<1,000								< FLAG - SKIPPED
CH2CHCL	<1,000								< FLAG - SKIPPED
XYLENES	<1,000								< FLAG - SKIPPED
CH3CL	<1,000								< FLAG - SKIPPED
CH3BR	<1,000								< FLAG - SKIPPED
DCPANI2	<1,000								< FLAG - SKIPPED
DCPENT13	<1,000								< FLAG - SKIPPED
CL3C2112	<1,000								< FLAG - SKIPPED
DCPENC13	<1,000								< FLAG - SKIPPED
CLETHER	<10,000								< FLAG - SKIPPED
1042- 97-510	50902	18543	3	3/21/83					NO SCHEDULED ANALYSES
1042- 97-510	50909	212	3	3/22/83					
NO2NO3	.45	.41			1.103	.8150	1.3219	56	
1042- 97-510	50911	212	3	3/22/83					
NO2N	<.01								< FLAG - SKIPPED
1042- 97-510	50916	213	3	3/22/83					
ZN	.33	.25			1.320 *	.9379	1.1329	49	
1042- 97-510	50918	219	3	3/22/83					
CU	.24	.24			1.000	.9394	1.1100	45	
1042- 97-510	50788	50807	40	3/18/83					
1042- 97-510	50789	50629	40	3/16/83					
1042- 97-510	50807	0	40	3/16/83					
1042- 97-510	50829	50629	40	3/16/83					
1042- 97-510	50867	50869	40	3/22/83					
BENZ	2.	2.			100.000	76.6607	115.0226	59	
BENZ,F	2.								
CL3CCH3	2.000	2.000			100.000	71.9670	102.8464	59	
CL3CCH3,F	2.000								

CL3C2H	2.000	2.000			100.000	80.0250	110.7254	39	
CL3C2H,F	2.000								
CL4C2	2.000				100.000	.0000	.0000	15	
CL4C2,F	2.000								
CH2CL2	2.000	2.000			100.000	75.9820	105.6501	31	
CH2CL2,F	2.000								
TOLUENE	2.000	2.000			100.000	77.4026	115.4676	39	
TOLUENE,F	2.000								
CLOROBZ	2.000	2.000			100.000	48.9895	128.4501	25	
CLOROBZ,F	2.000								
DCETAN11	2.000	2.000			100.000 *	70.4276	96.3720	27	
DCETAN11,F	2.000								
DCETAN12	2.000	2.000			100.000	52.9995	105.6725	33	
DCETAN12,F	2.000								
DCLEN11	2.000	2.000			100.000	69.3359	110.3640	33	
DCLEN11,F	2.000								
ETHBENZ	2.000	2.000			100.000	79.7258	107.1142	37	
ETHBENZ,F	2.000								
DCLEN12	2.000	2.000			100.000	73.1254	102.0690	31	
DCLEN12,F	2.000								
1042- 97-510	50869	0	40	3/18/83					
1042- 97-510	50645	50605	50	3/16/83					
1042- 97-510	50667	17868	50	3/15/83					
TCOLI	0.								QC FILT/UNFILT ANALYSIS NOT DONE
1042- 97-510	50739	50650	50	3/16/83					
1042- 97-510	50742	50686	50	3/16/83					
1042- 97-510	50792	50604	50	3/16/83					
1042- 97-510	50819	50660	50	3/16/83					
1042- 97-510	50822	50660	50	3/16/83					
1042- 97-510	50826	212	50	3/16/83					
1042- 97-510	50828	212	50	3/16/83					
1042- 97-510	50855	18173	50	3/16/83					
1042- 97-510	50857	214	50	3/17/83					
1042- 97-510	50859	18268	50	3/17/83					
1042- 97-510	50861	50660	50	3/17/83					
1042- 97-510	50863	18338	50	3/17/83					
1042- 97-510	50893	213	50	3/21/83					
TC	61.								QC FILT/UNFILT ANALYSIS NOT DONE
TIC	52.								QC FILT/UNFILT ANALYSIS NOT DONE
TOC	9.								QC FILT/UNFILT ANALYSIS NOT DONE
1042- 97-510	50903	240	50	3/21/83					NO SCHEDULED ANALYSIS
1042- 97-510	50904	18333	50	3/22/83					
HG	1.0	.5			78.947	63.5830	129.5509	[illegible]	

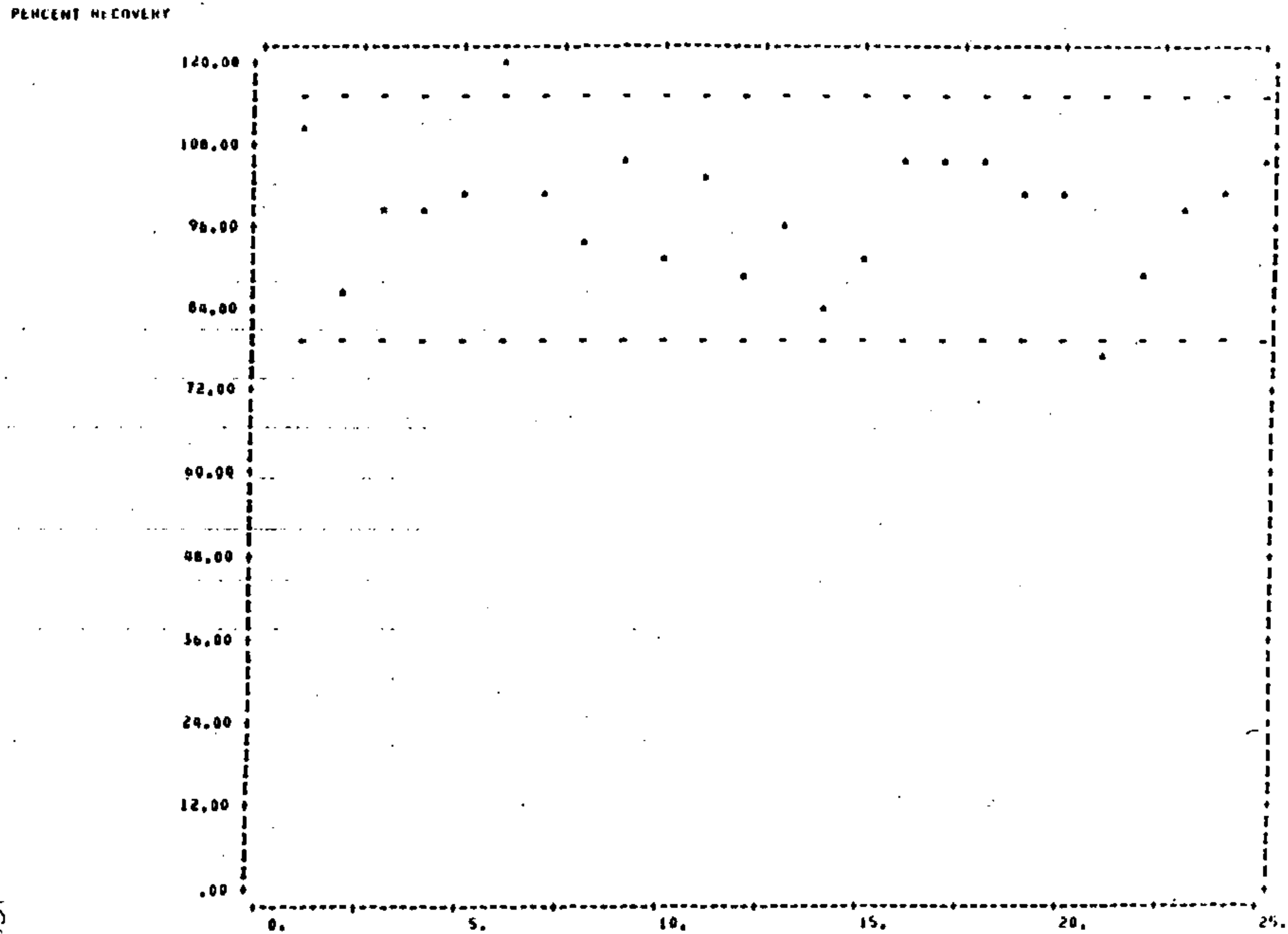
191

HG,F	2.0								
1042- 97-510	50910	212	50	3/22/83					
NO2NO3	.52	1.09			71.945	71.6096	136.7683	112	
NO2NO3,F	.41								
1042- 97-510	50912	212	50	3/22/83					
NO2N	.09	<.10			100.000	79.3854	132.8427	96	
NO2N,F	.19								
1042- 97-510	50915	218	50	3/22/83					
ZN	.62	.20			103.333	91.8367	117.0568	156	
ZN,F	1.00								
1042- 97-510	50917	267	50	3/22/83					
CU	.67	.35			99.259	92.2782	108.3764	109	
CU,F	1.00								
1042- 97-510	18466	18465	51	3/15/83					
1042- 97-510	50794	50793	51	3/16/83					NO SCHEDULED ANALYSES
1042- 97-510	50816	50815	51	3/16/83					NO SCHEDULED ANAL.SES
1042- 97-510	50888	230	51	3/21/83					NO SCHEDULED ANALYSES
1042- 97-510	50908	50907	51	3/22/83					
BENZ	36.	2.			100.000	70.5872	120.1899	143	
BENZ,F	36.								
TOLUENE	35.000	<1.000			97.222	82.1822	110.5127	148	
TOLUENE,F	36.000								
M-XYLENE	41.000	<1.000			105.128	81.6048	111.9041	135	
M-XYLENE,F	39.000								
CLOROBZ	41.000	<1.000			95.349	57.8037	128.8618	31	
CLOROBZ,F	43.000								
ETHBENZ	41.000	<1.000			100.000	.0000	.0000	7	
ETHBENZ,F	41.000								

FIGURE 5

DAILY QUALITY CONTROL GRAPH

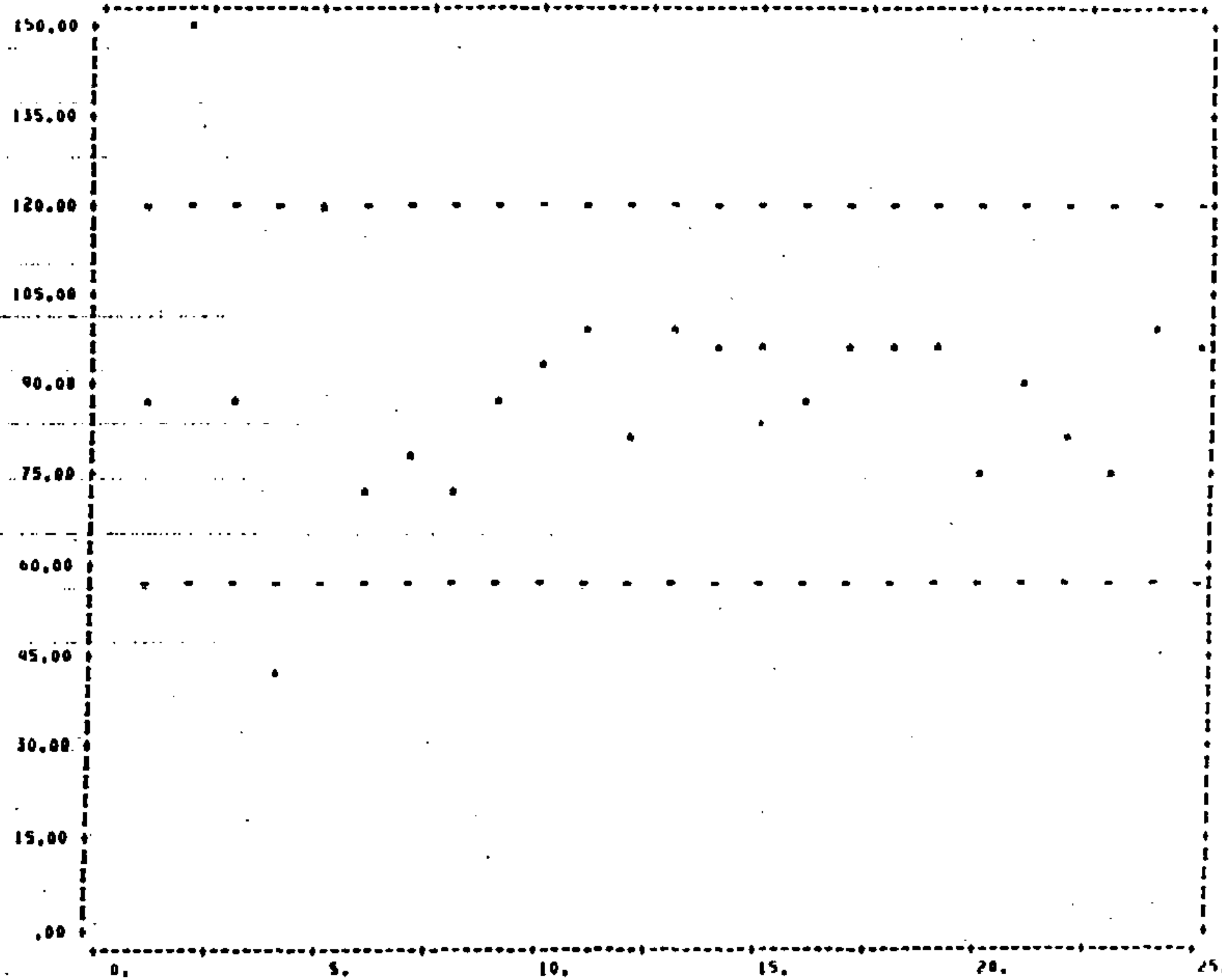
(SPIKED RECOVERIES)



BENZ SAMPLES 29810 THROUGH 50867

(*) = QC VALUES (-) =WARNING LIMITS
MEAN = 97.6021 STANDARD DEVIATION = 8.87217
MEDIAN = 100.000 SKEWNESS = -.743181 KURTOSIS = 2.95627

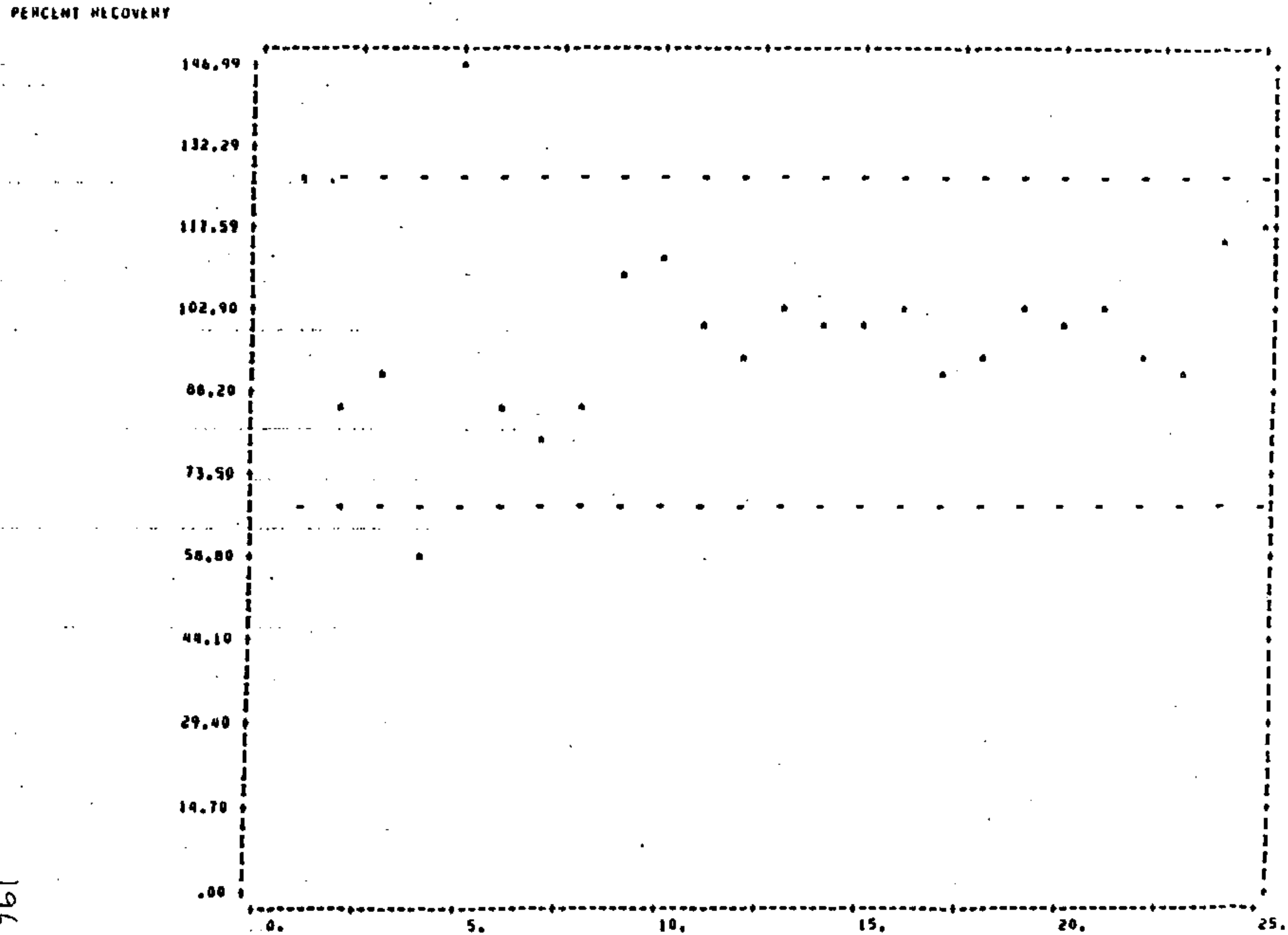
PERCENT RECOVERY



CL3CCH3 SAMPLES 39705 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS
MEAN = 86.5001 STANDARD DEVIATION = 15.9869
MEDIAN = 87.5000 SKEWNESS = .187665 KURTOSIS = 8.46347

195

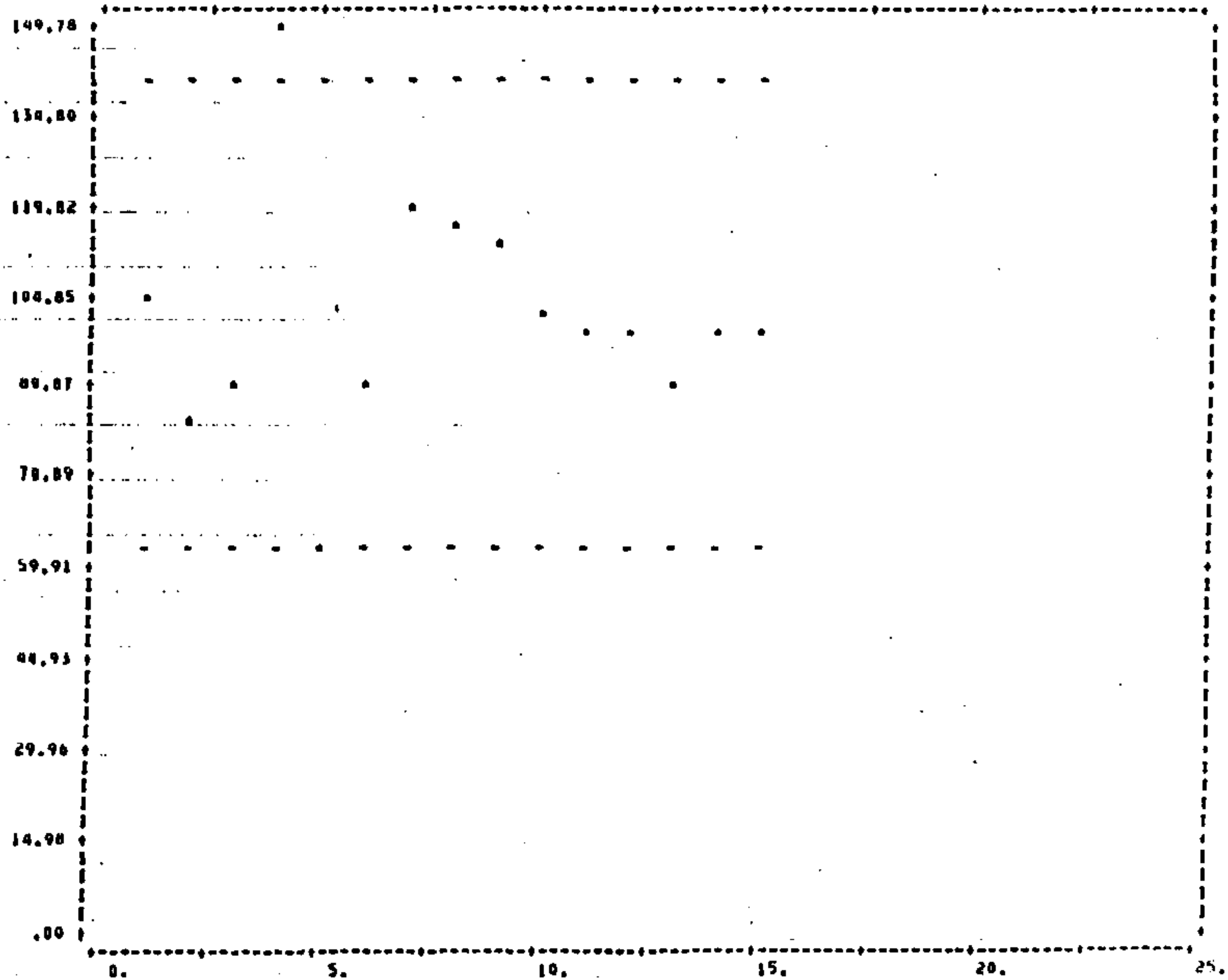


CL3C2M SAMPLES 19705 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS
MEAN = 97.7031 STANDARD DEVIATION = 14.3505
MEDIAN = 100.000 SKEWNESS = -.408136 KURTOSIS = 5.97265

196

PERCENT RECOVERY



CLAC2 SAMPLES 39705 THROUGH 50867

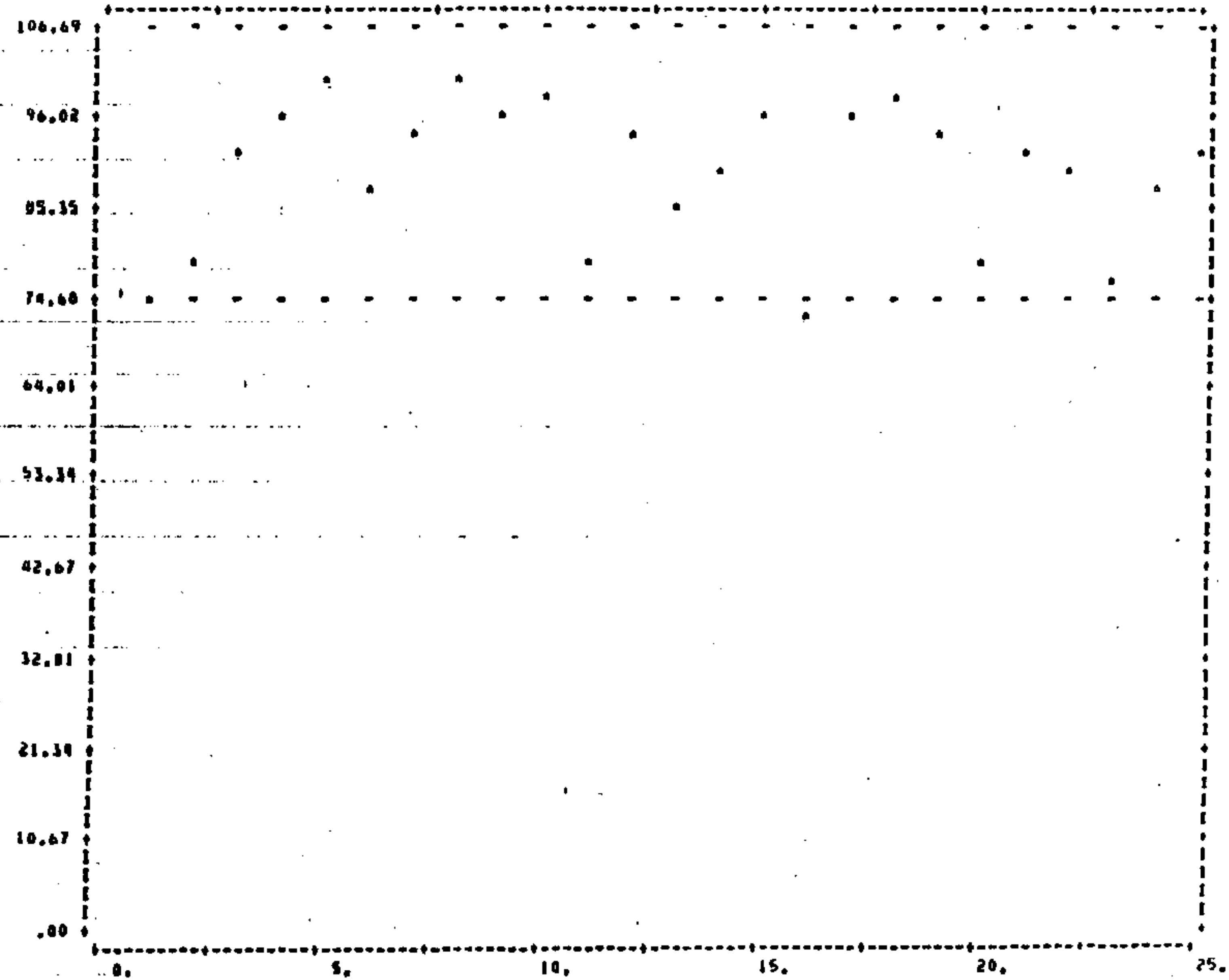
(*) - QC VALUES (-) -WARNING LIMITS

MEAN = 101.350 STANDARD DEVIATION = 19.6985

MEDIAN = 100.000 SKEWNESS = .206263 KURTOSIS = 4.25512

197

PERCENT RECOVERY



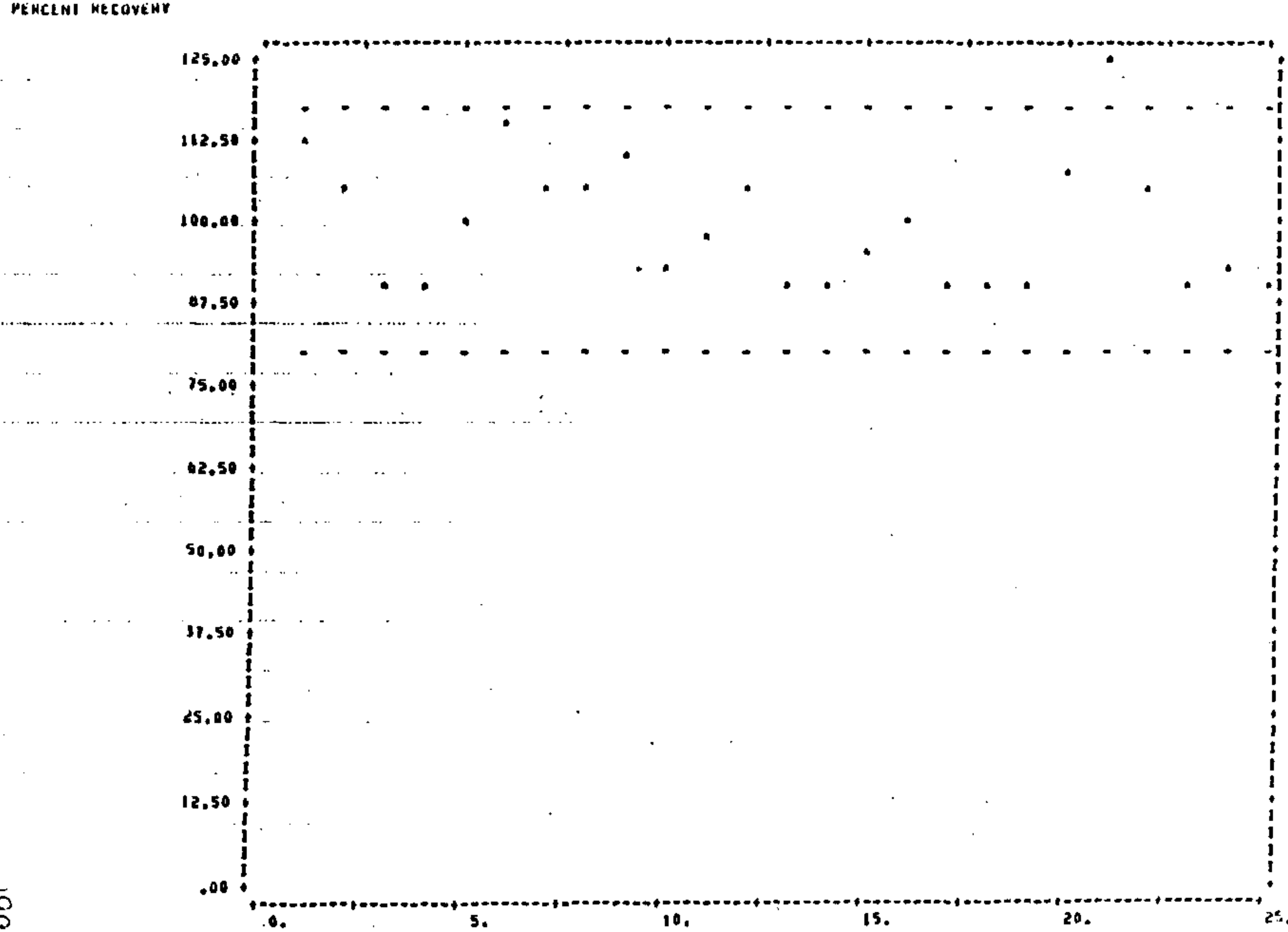
CH2CL2 SAMPLES 23250 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS

MEAN = 90.7871 STANDARD DEVIATION = 7.94928

MEDIAN = 92.5000 SKEWNESS = -.646415 KURTOSIS = 2.47973

198



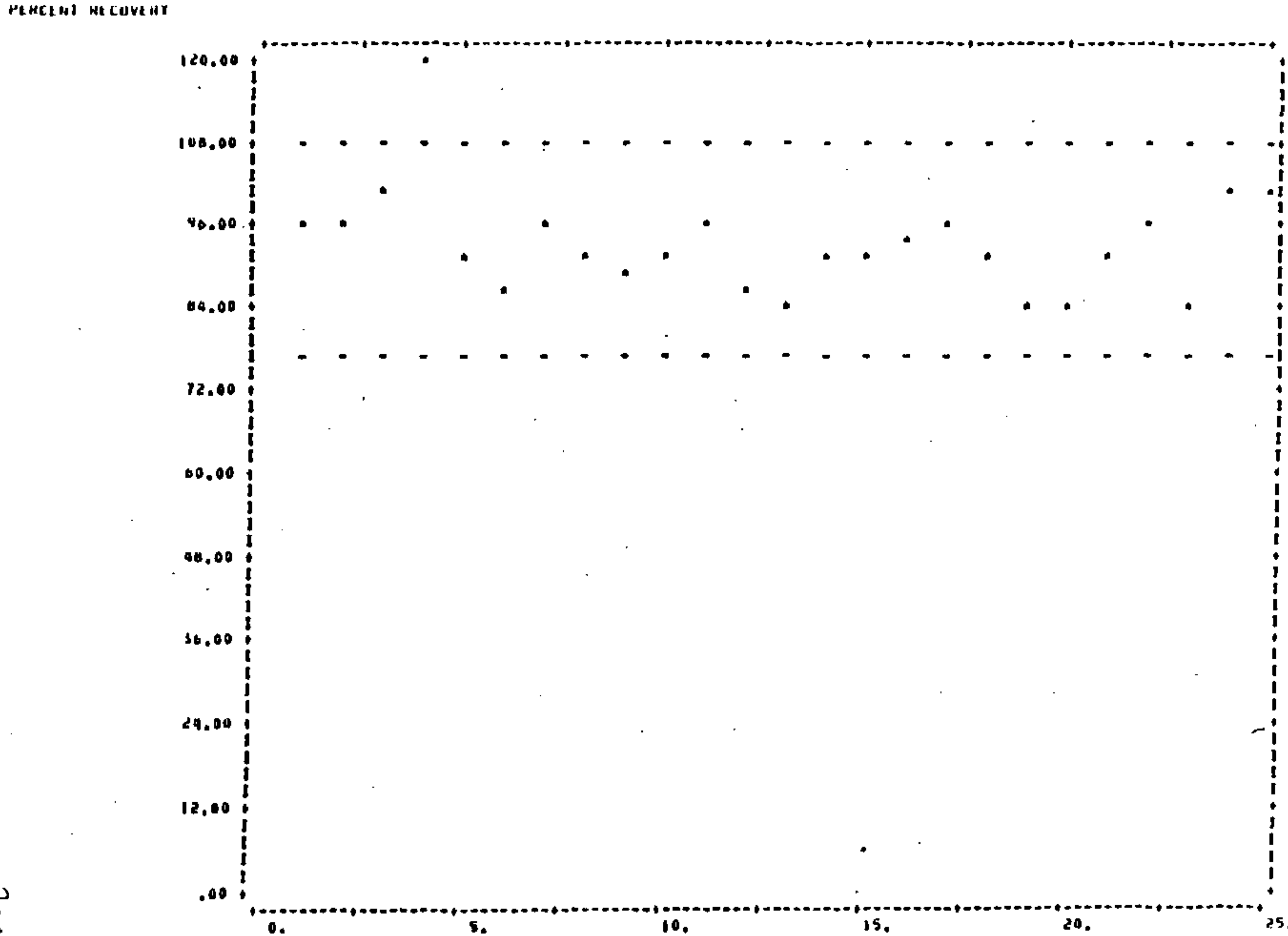
TOLUENE SAMPLES 29830 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS

MEAN = 98.1067 STANDARD DEVIATION = 9.36984

MEDIAN = 97.0350 SKEWNESS = .183119 KURTOSIS = 3.13778

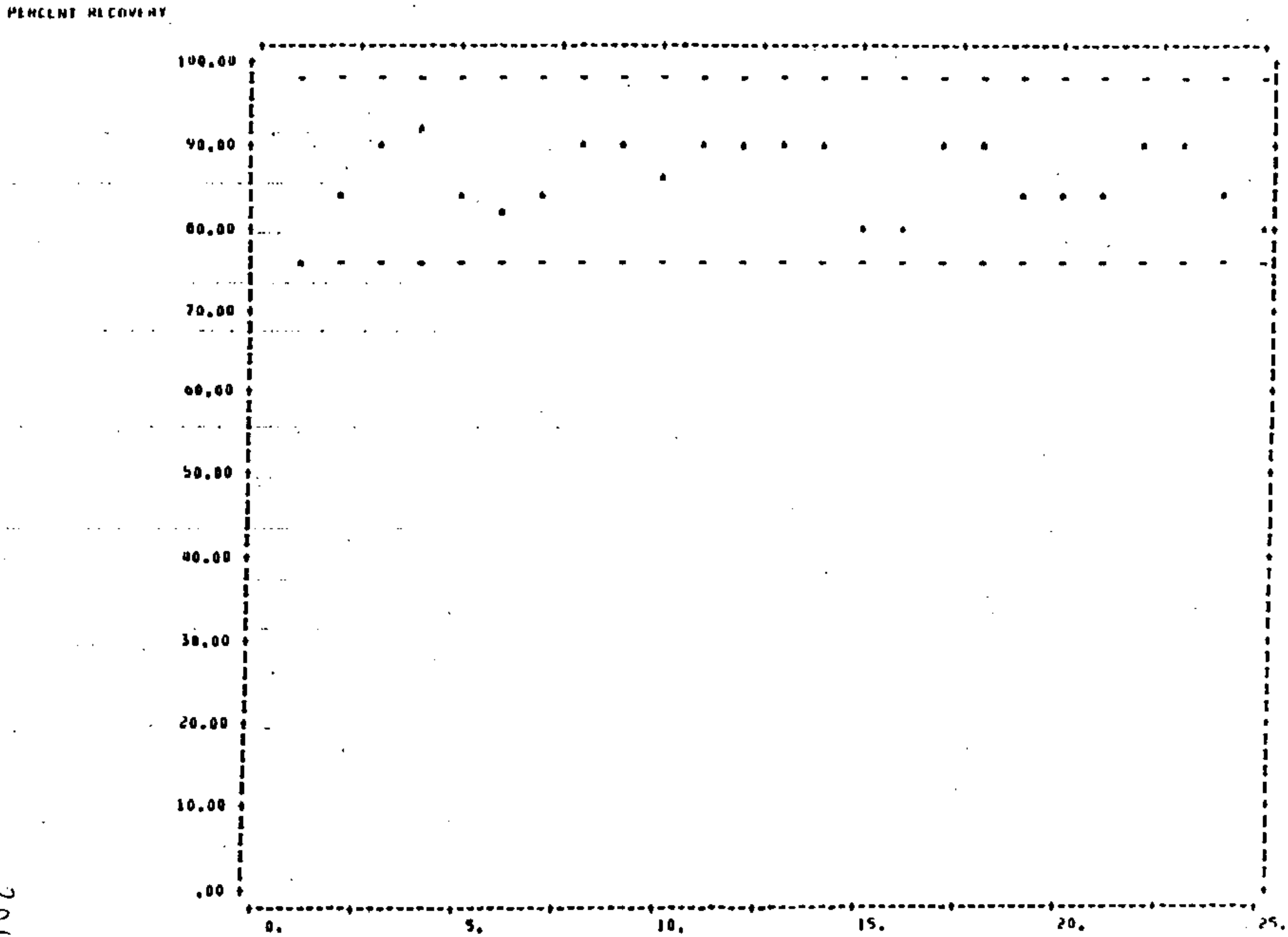
199



CLOROBZ SAMPLES 40382 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS
MEAN = 92.7198 STANDARD DEVIATION = 7.83594
MEDIAN = 91.0000 SKEWNESS = .693866 KURTOSIS = 8.25299

200

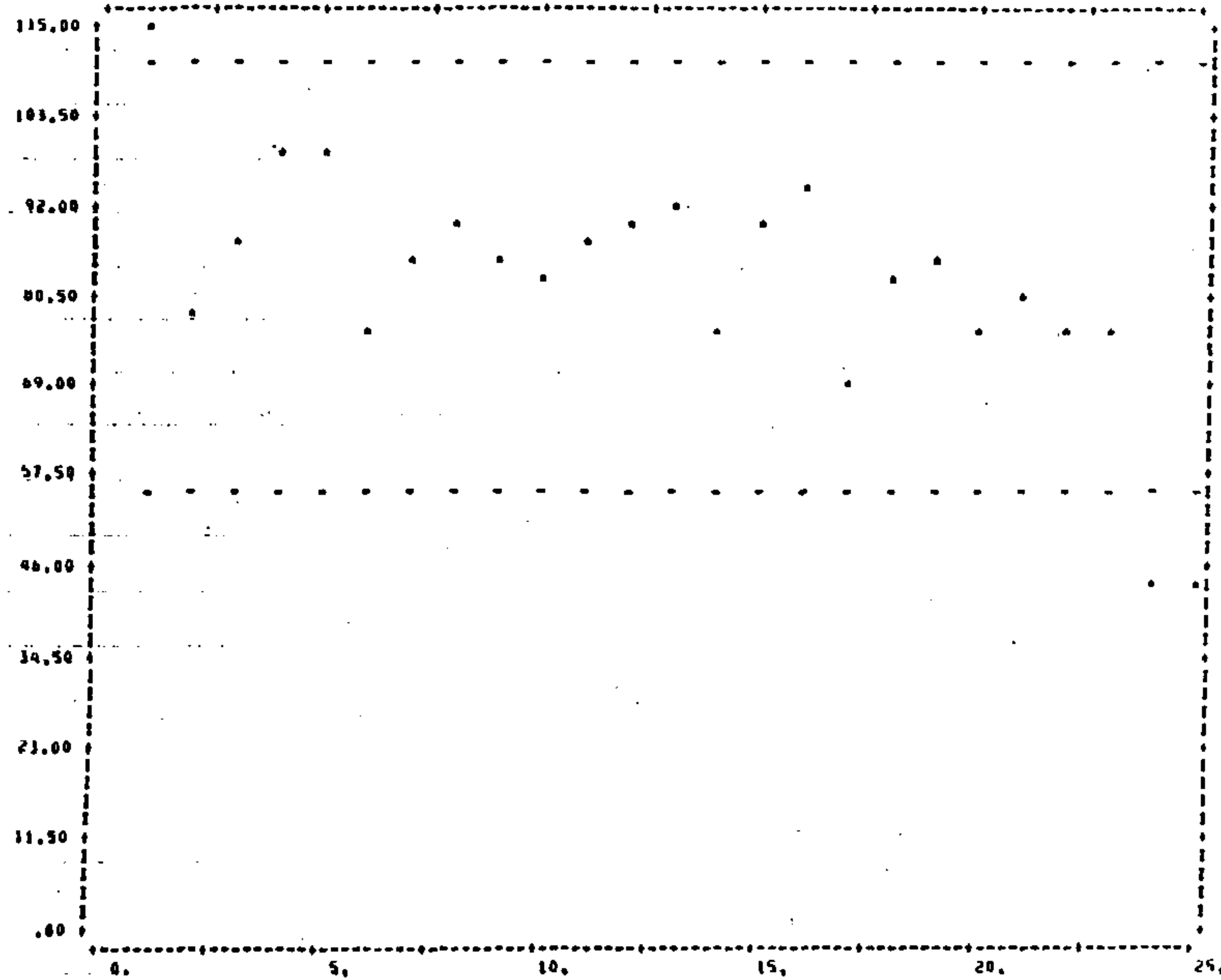


DCETANII SAMPLES 23250 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS
MEAN = 87.4441 STANDARD DEVIATION = 5.44788
MEDIAN = 89.0000 SKEWNESS = -.856704 KURTOSIS = 3.53356

201

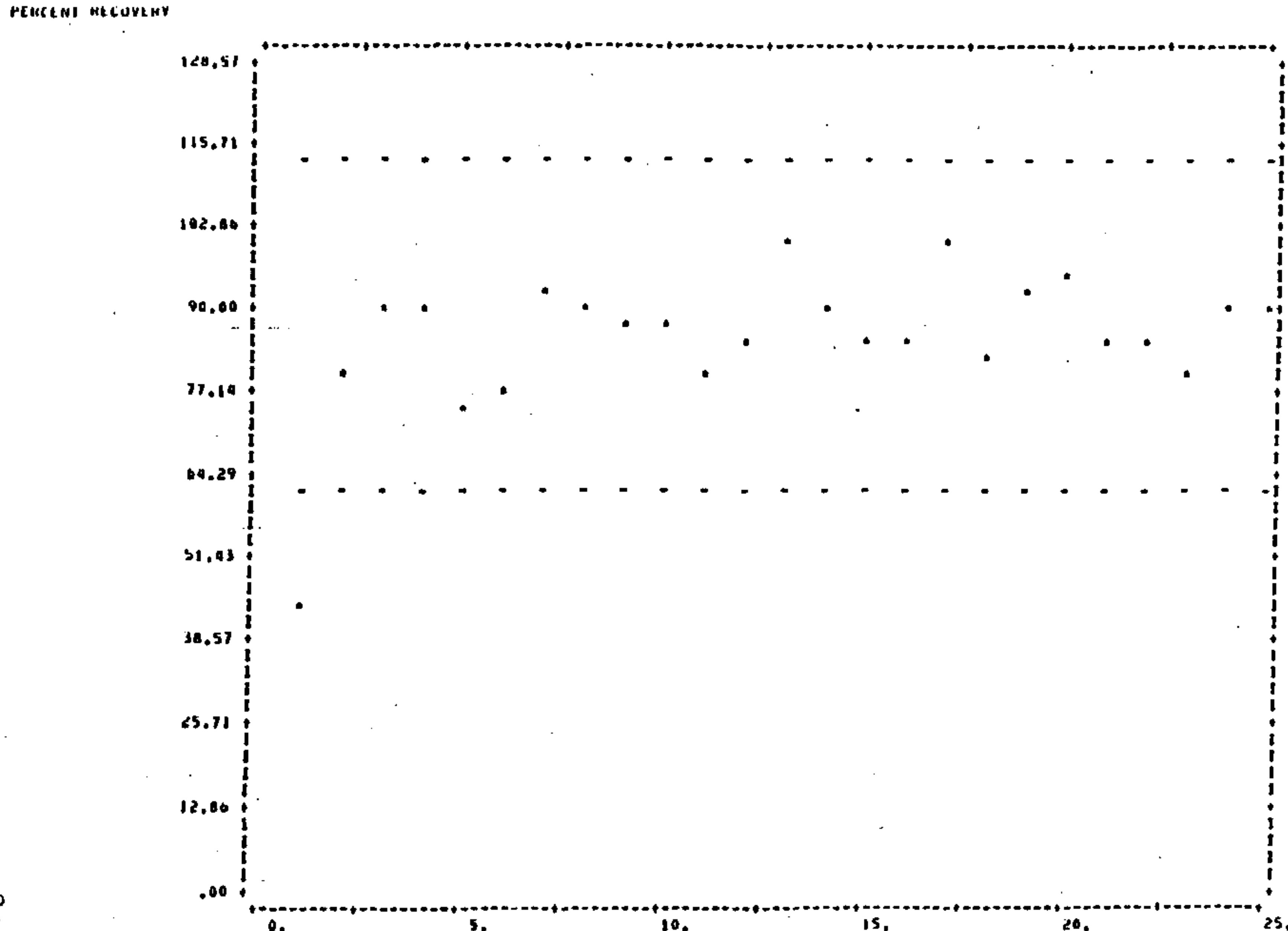
PERCENT RECOVERY



DCLTAN12 SAMPLES 40299 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS
MEAN = 82.4609 STANDARD DEVIATION = 14.1964
MEDIAN = 82.5000 SKEWNESS = -.829153E-02 KURTOSIS = 4.72746

202



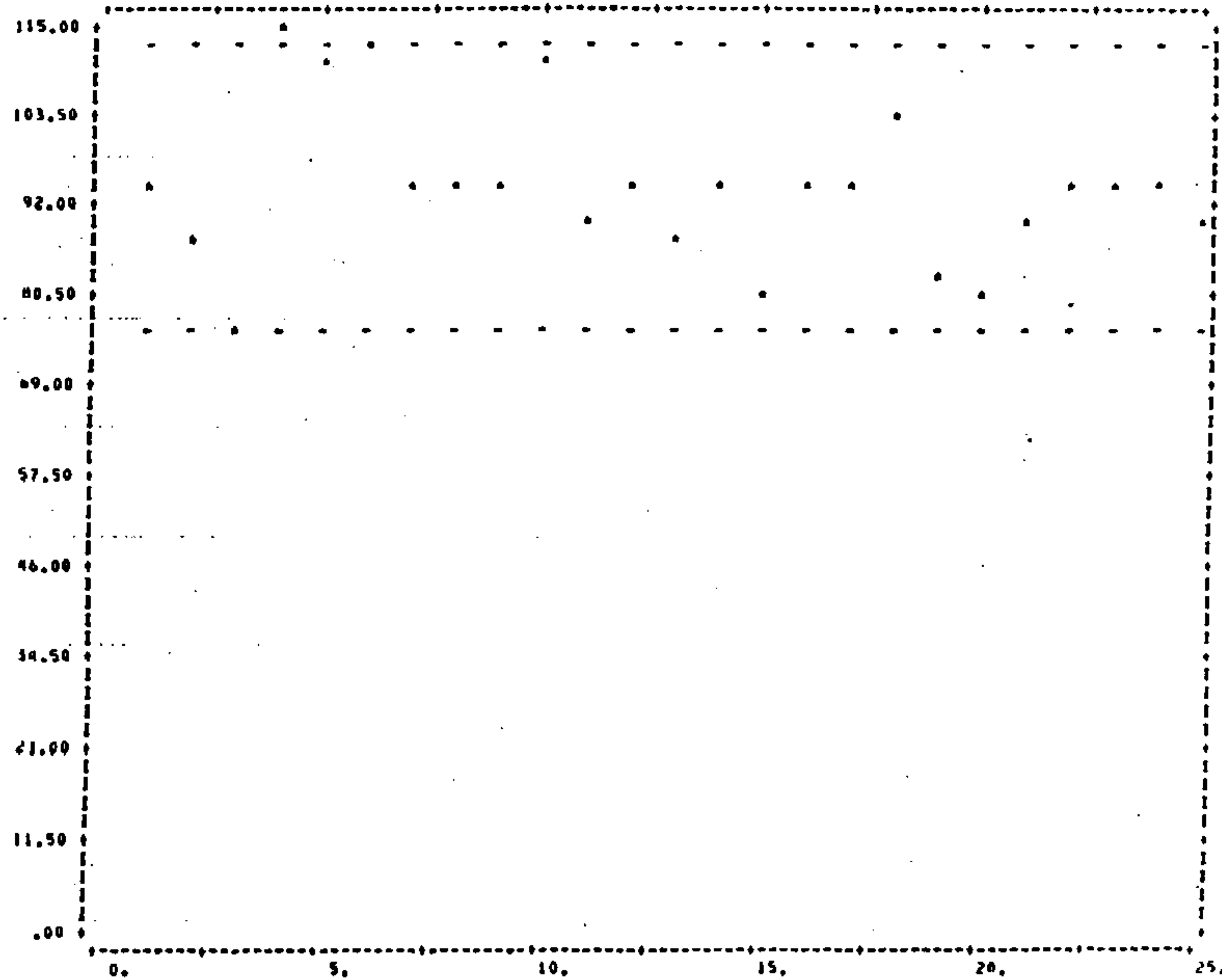
DELENII SAMPLES 23250 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS

MEAN = 87.7040 STANDARD DEVIATION = 12.5846

MEDIAN = 86.5000 SKEWNESS = -.189742 KURTOSIS = 8.48701

PERCENT RECOVERY

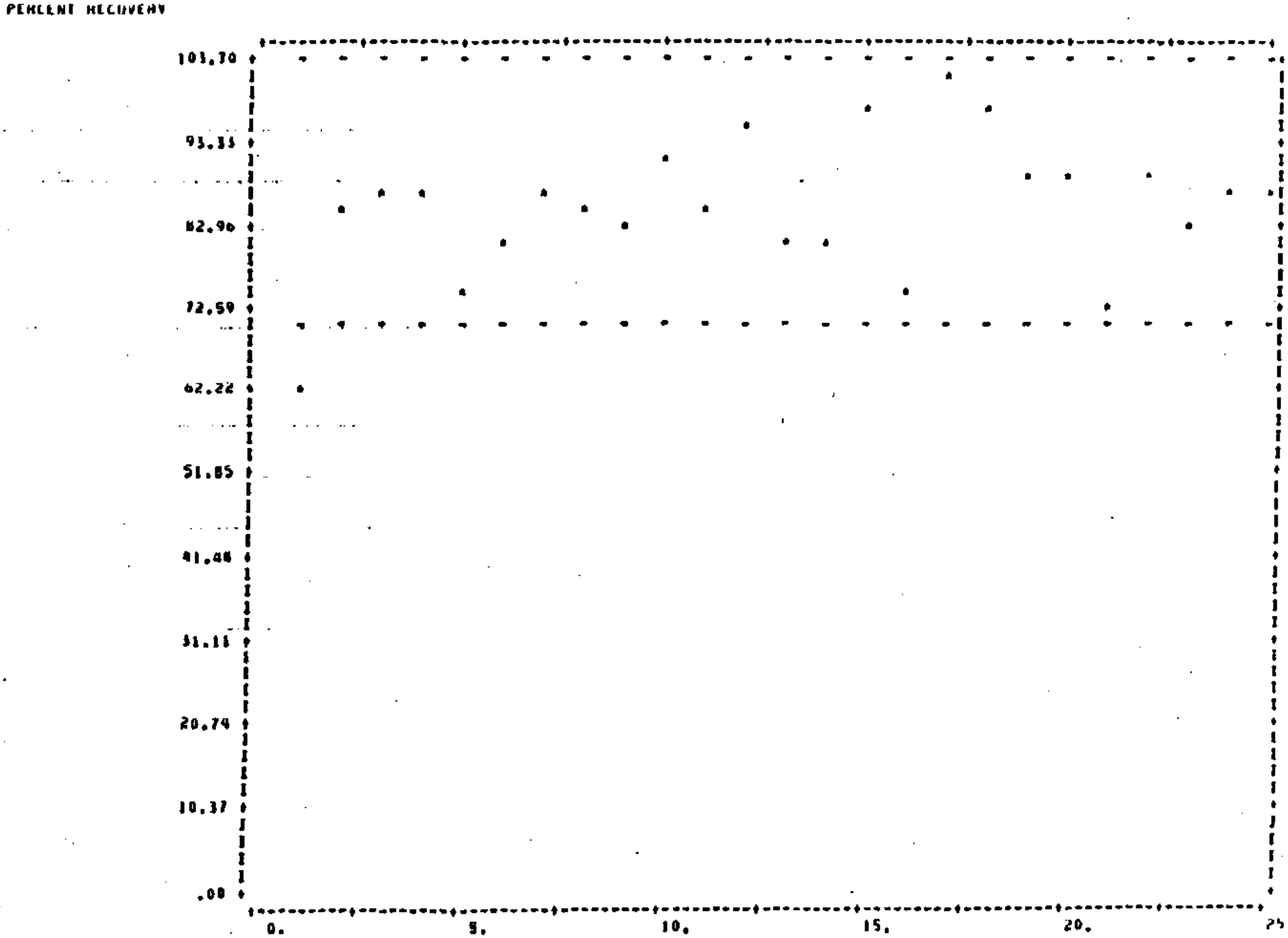


ETHBENZ SAMPLES 5593 THROUGH 50867

(*) = QC VALUES (-) =WARNING LIMITS

MEAN = 95.0119 STANDARD DEVIATION = 8.99539
MEDIAN = 95.0000 SKEWNESS = .396932E-02 KURTOSIS = 3.07061

204



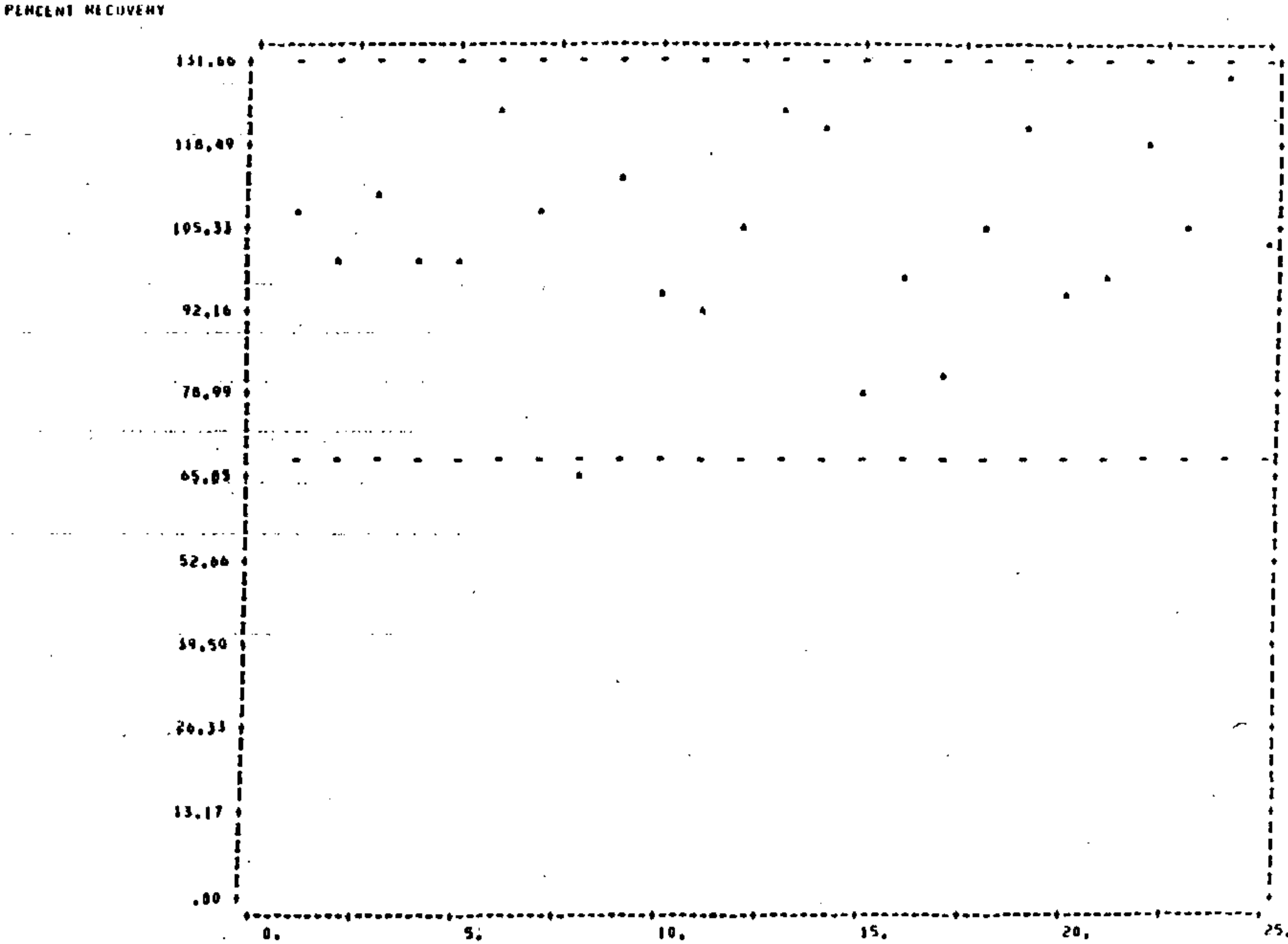
205

DCLENI2 SAMPLES 23250 THROUGH 50867

(*) - QC VALUES (-) -WARNING LIMITS

MEAN = 86.6590 STANDARD DEVIATION = 8.52285

MEDIAN = 87.0000 SKEWNESS = -.120015 KURTOSIS = 3.67436



HG SAMPLES 64261 THROUGH 50904

(*) - QC VALUES (-) -WARNING LIMITS
MEAN = 99.1502 STANDARD DEVIATION = 15.7322
MEDIAN = 98.5798 SKEWNESS = .108757 KURTOSIS = 2.46181

APPENDIX B

HEALTH AND SAFETY PLAN (HASP)

ENARC-O MACHINE PRODUCTS

DIVISION OF KADDIS MANUFACTURING CORPORATION

NORTH BLOOMFIELD, NEW YORK

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HEALTH AND SAFETY PLAN

KADDIS CORPORATION

DECEMBER 1989

O'BRIEN & GERE ENGINEERS, INC.
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SYRACUSE, NEW YORK 13221

SECTION 1 - INTRODUCTION

1.01 Background

Kaddis Corporation owns and operates a metal machining facility, Enarc-O Machine Products, Inc. (Enarc-O) located in the Town of Lima, Livingston County, New York. Figure 1 illustrates the general site location. The area surrounding Enarc-O is predominantly residential. A small auto repair shop is located south of the facility. Additionally, a small manufacturing facility was once located on the property adjacent to the eastern boundary of the Enarc-O property.

The site encompasses approximately six acres and is situated on top of a small ridge at an elevation of approximately 720 feet above mean sea level. Honeoye Creek is located about 400 feet east of the property at an elevation approximately 20 feet lower than the site.

The unconsolidated deposits in the site area are reportedly glacial drift comprised of stratified silt, clay and fine-grained sand. One to 35 feet of this material overlies the Onondaga Limestone bedrock. (Fairchild, H.L; Genesee Valley hydrography and drainage; Rochester Academy of Science, V 7; 1935.)

During 1985, sampling and analysis of several residential wells in the area surrounding the Enarc-O property was conducted by the New York State Department of Health (NYSDOH), the New York State Department of Environmental Conservation (NYSDEC) and the Livingston County Department of Health (LCDOH). These analyses revealed detectable concentrations of chlorinated solvents, including 1,1,1-trichloroethane and trichloroethylene, in the ground water at the Enarc-O site and at some of the neighboring properties.

In July 1987 the United States Environmental Protection Agency (USEPA) Region II requested that Enarc-O develop a site assessment work plan to evaluate the general hydrogeologic conditions and in particular the ground water quality on the Enarc-O site. A proposed work plan was subsequently prepared and submitted to USEPA Region II in August 1987. Comments on the August 1987 Work Plan received from USEPA dated October 22, 1987 and February 1, 1988 were then incorporated and the plan was resubmitted in March 1988. Comments pertaining to the March 1988 plan were received on June 30, 1988. These comments were addressed in a letter dated July 21, 1988. On February 2, 1989 USEPA comments were received and subsequently incorporated into this Work Plan.

1.02 Site Investigstion Purpose

The primary objective of this study is to determine if a source of chlorinated solvents detected in local ground water is located on the Enarc-O property. This will be accomplished by evaluating the on-site hydrogeologic conditions. More specifically an assessment of the subsurface geology, ground water flow patterns and ground water chemistry will be completed.

Several areas were identified by USEPA for investigation on the Enarc-O property. These areas were located during the Background Information Review and are illustrated on Figure 2 as follows:

1. Area surrounding a recently excavated and removed gasoline storage tank.
2. Area around the removed above ground solvent storage tank where the 1985 spill of 1-1-1 trichloroethane occurred.

3. Area where waste oil is retained.

4. Area around Enarc-O's loading dock, EPA reportedly has reason to believe the entire area was covered with an oily residue and was used to store drums at some point in the past.

5. Area of the parking lot where used oils were used for dust control. The southeast corner of the is area was where the excavated soils from the 1985 spill were spread out to allow volatilization to occur.

6. Area southwest of the storage building where drums are currently stored.

1.03 Site Investigation Work Tasks

The site investigation (SI) work tasks as discussed in the Work Plan dated March 1989 and the Interim Technical Memorandum (December 1989) are as follows:

Task 1: Background Information Review

Task 2: Fracture Trace Analysis and Geophysical Survey

Task 3: Interim Technical Memorandum

Task 4: Soil Sampling and Analysis

Task 5: Ground Water Monitoring Well Installations

Task 6: Ground Water Monitoring Well Sampling and Analysis

Task 7: Data Interpretation and Report Preparation

To date the following tasks have been completed:

Task 1: Background Information Review

Task 2: Fracture Trace Analysis and Geophysical Survey

Task 3: Interim Technical Memorandum

Task 1 included document compilation and review and a non-invasive site inspection. Task 2 included a visual surficial geologic assessment and a non-intrusive geophysical survey. Task 3 was completed off-site.

The following tasks have yet to be completed:

Task 4: Soil Sampling and Analysis

Task 5: Ground Water Monitoring Well Installations

Task 6: Ground Water Monitoring Well Sampling and Analysis

Task 7: Data Interpretation and Report Preparation

Tasks 4, 5, and 6 involve invasive techniques including drilling and removal of soils and ground water from the subsurface. Task 7 will be completed off-site. Detailed descriptions of these work tasks are provided in the Interim Technical Memorandum (December 1989) and the Quality Assurance Project Plan QAPP) which are provided as a single document which also included this Health and Safety Plan (HASP). This HASP addresses health and safety requirements for personnel completing the on-site activities listed above.

SECTION 2 - PROJECT PERSONNEL

The following responsibilities and authorities have been or will be assigned to designated O'Brien & Gere Engineers personnel for the Enarc-O Site Investigation activities in North Bloomfield, New York.

Project Manager

This person acts in a supervisory capacity over all employees and activities with respect to O'Brien & Gere's contractual obligations to during the Kaddis SI. The Project Manager for this investigation is Mr. James Mickam. The Project Manager is responsible for assuring that Health and Safety responsibilities are carried out in conjunction with this site investigation.

Project Supervisor

This person, under the supervision of Project Manager, oversees field and related activities specific to contractual agreement to Kaddis Corporation. Deborah Wright is appointed to act in this capacity during the SI. (Note: the Project Supervisor is the same as the "Field Operations Manager" as referenced in the QAPP).

Health & Safety Coordinator

The Health & Safety (H&S) Coordinator is responsible solely for O'Brien & Gere's employees, unless otherwise specified in an appropriate written agreement between O'Brien & Gere Engineers, Inc. and the Kaddis Corporation. The Site Health & Safety Coordinator has the following duties:

- responsibility for the field implementation, evaluation, and any necessary field modifications of this Health and Safety Plan.
- responsibility for maintaining adequate supplies of all personal protective equipment as well as calibration and maintenance of all monitoring instrument.
- authority to suspend site operation at the Kaddis Site due to any ineffectiveness of or non-conformance to this Health and Safety Plan.

Mark McGowan, C.I.H. will be the Health & Safety Coordinator. An alternate On-Site Safety Coordinator will be designated by the Health and Safety Coordinator, as necessary.

SECTION 3 - HEALTH AND SAFETY HAZARDS

Table 1 lists chemical compounds which may be present during site investigation (SI) activities, based on available data. The compounds listed have been chosen to provide a framework for the development of this Health and Safety Plan. Several compounds including benzene are present on the site. Of these, benzene has the lowest established Permissible Exposure Limit (PEL). Thus, benzene has been selected as an indicator compound for the health and safety plan based on its toxicity.

Table 2 lists potential health and safety hazards that may be encountered based on general site tasks. This list has been compiled based on scheduled activities and potential site conditions.

SECTION 4 - PERSONAL PROTECTIVE EQUIPMENT

Protective Equipment

All personnel will be provided with appropriate personal safety equipment and protective clothing. Each individual will be properly trained in the use of this safety equipment before the start of field activities. Safety equipment and protective clothing shall be used as directed by the Site Safety Coordinator. All such equipment and clothing will be cleaned and maintained in proper condition by project personnel. The Site Safety Coordinator will monitor the maintenance of personnel protective equipment to ensure proper procedures are followed.

Personal protective equipment will be worn at all times, as designated by this Health and Safety Plan. Levels of protective clothing and equipment have been assigned to specific work tasks at a basic level D. Results from on-site readings will be used to set task and point specific action levels and levels of personal protection. These are detailed below.

The personal protective equipment levels designated below are in conformance with EPA criteria for Level C and D protection. All respiratory protective equipment used will be approved by NIOSH/MSHA.

Level C Protection

A. Full-face or half face air purifying respirator equipped with appropriate organic vapor/dust canisters or cartridges.

B. Chemical-resistant disposable coveralls such as Tyvek[R] or Poly-coated Tyvek[R]. Suits will be one piece with hoods and elastic wrist bands.

C. Outer nitrile gloves and inner latex surgical gloves (taped to suit).

D. Leather, steel-toe boots with rubber overboots (taped to suit).

E. Options as required:

1. Coveralls
2. Disposable outer boots
3. Escape mask
4. Hard hat
5. Face shield
6. Hearing protection
7. Safety glasses

<u>Level D Protection</u>

A. Full-face/half-face air-purifying respirator equipped with appropriate canisters or cartridge must be available for use; and all potential users trained and medically approved for such use:

B. Coveralls or long sleeve shirts and long pants.

C. Outer nitrile gloves at a minimum for all material handling activities. Inner latex surgical gloves are recommended where practical.

D. Leather, steel-toe boots with rubber overboots.

E. Level C clothing protection readily available.

F. Options as required:

1. Disposable outer boots

2. Hard hat

3. Safety glasses

4. Hearing protection

SECTION 5 - SITE ACTIVITIES AND ASSOCIATED PERSONNEL PROTECTIVE REQUIREMENTS

The levels of protection assigned to each activity (below) represent a best estimate of exposure potential and protective equipment needed for that exposure. Determination of levels was based on "worst case" data available from previous site investigations. The site safety officer will revise those levels of protection, up or down, based on air monitoring results and on-site assessment of actual exposures.

Physical Site Activity	Location	Personal Protection Required
Installation of monitoring wells	Clean areas	Level D with safety glasses (or higher, depending upon conditions)
	Contaminated areas	Level C with safety glasses and half-face respirator
Performing ground water and surface water sampling	Monitoring Wells/Run off areas	Level D with Tyvek coverall, outer boots, inner and outer gloves
Soil borings	Various areas	Level D (or higher, depending on conditions) with Tyvek coverall, outer boots, inner and outer gloves
Soil samples	Various areas	Level D with outer boots (or higher, depending on conditions)

Physical Site Activity	Location	Personal Protection Required
Site Surveys (non-intrusive)	Entire Site	Level D with outer boots (or higher depending upon conditions)

SECTION 6 - SITE AIR MONITORING

Field activities associated with the SI may pose potentially hazardous conditions, such as the release of hazardous substances into the breathing space. These substances may be in the form of vapors, dusts, or mists that can enter the body through ingestion, inhalation, adsorption and direct contact. Monitoring of these substances will be performed to ensure appropriate personal protective measures are employed during site activities.

The following describes the monitoring parameters to be evaluated during the SI. Recommended instruments to be used are also provided in the discussion. All instruments to be used during site activities will meet the established requirements set forth OSHA, MSHA, NIOSH, and state agencies were applicable. Table 2-A lists the activities and the associated site monitoring.

Organic Vapor Concentrations - will be monitored in fifteen minute intervals during activities as listed in Table 2-A, in the areas specified with an organic vapor meter model 128 (FID) or TIP II (PID). All activities not denoted in Table 2A can be monitored hourly for the first 2 hours. Organic vapor concentrations will be used as action level criteria for upgrading or downgrading protective equipment (See Section 8) and in implementing additional precautions or procedures. A backup organic vapor meter will be present throughout site activities in the event of an instrument malfunction. Draeger tubes and the associated hand pumps will be employed for the quantification of specific compound concentration, if levels exceed those listed in Table 3.

All site monitoring will be conducted by or under the supervision of the Site Safety Coordinator. All readings obtained will be recorded in a dedicated site notebook by the Project Supervisor or designee. The Site Safety Coordinator will maintain all monitoring instruments throughout the site investigation to ensure their reliability and proper operation.

SECTION 7 - ACTION LEVELS

Action levels have been established for activity cessation, site evacuation, emergency response, and the upgrade or downgrade in the level of personal protective equipment. Table 3 lists the action levels, airborne concentrations and their respective personal protection. Section 6 discusses the minimal personal protection required for specified site activities. Changes to these specified levels are dependent on the results of air monitoring, as described below.

Note that these action levels are for monitoring in the breathing space of workers on the site. The action levels are based on the 1989 Permissible Exposure Limits (PELs) as determined by OSHA for the specific compounds detected during on-site monitoring.

The approach for air monitoring is as follows:

1. The direct-reading PID will be calibrated to most accurately reflect the scope of volatiles identified.
2. Using the PID, work activities will be monitored for organic vapors.
3. Where/when organic vapors are detected with the PID, selected Draeger tubes will be used to identify the presence/absence of benzene. Action levels would then follow the first column of Table 3. The presence of benzene is an important criteria for action levels due to its PEL of 1 ppm.
4. If non-benzene vapors cannot be identified, the third column of Table 3 will be used.
5. Personal monitoring will serve as a back-up to the direct reading instrument data when continuous exposures exceed

the action level in column 1 of Table 3 and provide qualitative and quantitative exposure data for the workers most at risk.

Monitoring for benzene will be performed at the start of every activity, and every fifteen minutes thereafter until the activity is complete. If benzene is detected with the use of Draeger tubes, SKC 224PCXZR7 air sampling pumps and charcoal tubes will be employed for the quantification of the concentration at the breathing zone.

Upon visual observation of air-borne particulate matter associated with on-site activities, a water spray will be applied to the area to control dust/particulate matter generation. If this control is not possible, SKC pumps and PVC filters will be employed for gravimetric analysis.

If organic vapor concentrations are measured (using a photoionization detector) above 1.0 ppm above background at the property line during site operations, said operations will be interrupted and assessed, and only continued if it can be determined that no off site impacts will result.

SECTION 8 - SITE ACCESS AND SITE CONTROL

8.01 Site Access

Access inside the specific worksite location at the Kaddis Corporation will be limited to trained authorized personnel. Such personnel include O'Brien & Gere employees, designated equipment operators, and designated client and state and federal agencies' representatives. However, access into the established exclusion zone where field investigative activities take place will be limited to those authorized personnel wearing appropriate personal protective equipment. The exclusion zones will be cordoned off with flagging tape or other suitable indicators designating the exclusion zone boundary. The zones will also be monitored by the Site Safety Coordinator to ensure personnel do not enter without proper personal protection. The contamination reduction zone, where personnel and equipment are decontaminated, and support zone, where support facilities, extra equipment, transport vehicles, etc. are located, should be located upwind of the current work zone.

Sign-in procedures may be implemented to ensure that authorized personnel only will participate in the investigatory activities. The Project Supervisor will coordinate this effort and maintain the generated documentation accordingly.

8.02 Site Control

Certain procedures must be followed to ensure suitable site control and limitation of access so that those persons who may be unaware of site conditions are not exposed to inherent hazards.

All excavations left open and unattended by site personnel will be appropriately barricaded and visibly posted with "Keep Out Danger", signs, warning flags, or other appropriate signs. Well caps will be secured by suitable locking devices to prevent unauthorized access. All heavy machinery and equipment will be stored in a secured area upon completion of daily activities. Lastly, all potentially contaminated media, such as cuttings and soils, will be secured in an area to prevent unauthorized tampering.

SECTION 9 - MEDICAL MONITORING

The Occupational Safety and Health Administration (OSHA) has established requirements for a medical surveillance programs designed to monitor and reduce health risks for employees potentially exposed to hazardous materials (29 CFR 1910.120). This program has been designed to provide baseline medical data for each employee involved in hazardous waste operations including field activities, and to determine his/her ability to wear personal protective equipment, such as chemical resistant clothing and respirators. Employees who wear or may wear respiratory protection must be provided respirators as regulated by 29 CFR 1910.134. This Standard requires that an individual's ability to wear respiratory protection be medically certified before he/she performs designated duties. Where medical requirements of 29 CFR 1910.120 overlap those of 29 CFR 1910.134, the most stringent of the two will be enforced.

The medical examinations must be administered on a preemployment and annual basis and as warranted by symptoms of exposure or specialized activities. These examinations shall be provided by employers without cost or loss of pay to the employee. For the purposes of this Health and Safety Plan, all subcontractors shall assume the employer's responsibility in obtaining the necessary medical monitoring and training for their employees pursuant to this section of 29 CFR 1910.120.

The examining physician is required to make a report to the employer of any medical condition which would place such employees at increased risk of wearing a respirator or other personal protective equipment. Each employer engaged in site work shall assume the responsibility of maintaining site personnel medical records as regulated by 29 CFR 1910.120 where applicable.

All employees contracted to work at the site designated by this Plan will be responsible to insure their employees have received the proper medical tests as regulated by 29 CFR 1910.120 and shall provide the contractor with certification of same.

SECTION 10 - PERSONNEL TRAINING

All applicable employees must have, at a minimum, received training in the following areas; meeting training requirements specified in 29 CFR 1910.120.

Subcontractor personnel will document their compliance with training and medical program requirements as shown in Exhibit 1.

In addition, site employees will undergo site-specific training prior to the start-up of any given project or task. As activities change at a particular site, related training will address potential hazards and associated risks, site operating procedures, emergency response and site control methods to be employed.

Specialized training will be provided as dictated by the nature of site activities. Specialized training will be provided for activities such as confined space entry, excavations and handling of unidentified substances. Employees involved in these types of activities will be given off-site instruction regarding the potential hazards involved with safety activities and the appropriate health and safety procedures to be followed. Off-site instruction is meant to include any areas where employees will not be exposed to site hazards.

Site personnel involved in the field activities will have received the appropriate basic training plus additional specific training where needed. This Health and Safety Plan must be distributed to all subcontractors prior to the start of field activities. A pre-operation meeting will be held to discuss the content of the Plan. Specialty training will be provided as determine by task and responsibility. All training of personnel will be conducted under direct supervision of qualified Health and Safety Personnel.

SECTION 11 - DECONTAMINATION

It is expected that the highest level of protection used at the Kaddis site will be Level C. Based on the level of expected exposure to contaminants, the following decontamination protocol will be used:

Station 1: Equipment Drop.

1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clip-boards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.

Station 2: Outer Garment, Boots, and Gloves Wash and Rinse.

2. Scrub outer boots, outer gloves and splash suit with detergent water. Rinse off using copious amounts of water.

Station 3: Outer Boot and Glove Removal.

3. Remove outer boots and gloves. Deposit in container with plastic liner.

Station 4: Canister or Mask Change.

4. If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.

Station 5: Boot, Gloves and Outer Garment Removal.

5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.

Station 6: Face Piece Removal.

6. Face piece is removed. Avoid touching face with fingers. Face piece deposited on plastic sheet.

Station 7: Field Wash.

7. Hands and face are thoroughly washed. Shower if body contamination is suspected.

All decontamination waste waters will be collected and disposed of according to applicable regulations. This will be done at the direction of the Project Supervisor or Project Manager.

In general, decontamination involves scrubbing with a nonphosphate soap/water solution followed by clean water rinses. All disposable items will be disposed of in a dry container. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. In addition to being decontaminated, all respirators, nondisposable protective clothing, and other personal articles must be sanitized before they can be used again unless they are assigned to individuals. The manufacturer's instructions should be followed in sanitizing the respirator masks. The Site Safety Coordinator will be responsible for supervising the proper protective equipment.

11.02 Equipment Decontamination

Decontamination will be applicable to all drilling, boring, and sampling activities. All drilling equipment mobilized to the Kaddis Site will receive initial decontamination. Decontamination will consist of steam cleaning of the entire rig to the satisfaction of the Site Supervisor or the responsible Quality Assurance Personnel. All dirt, oil grease or other foreign materials that are visible will be removed from metal surfaces. Scrubbing with a wire brush may be required to remove materials that adhere to the surfaces.

All drilling equipment will be stored on plastic sheeting above ground, either on the drill rig at the drill site or on wooden supports. Equipment not in use will be covered with plastic and stored at a designated storage area.

The rear portion of the drill rig will be decontaminated by steam cleaning between test borings and/or monitoring well installations. In addition all equipment entering a test boring or well boring but not used for sample collection, will be decontaminated using a steam cleaning followed by a control water rinse.

Sample collecting equipment contacting soil and/or rock samples will be decontaminated after each use by a low phosphate detergent brushing followed by a clean water rinse. An isopropyl rinse followed by a final rinse with demonstrated analyte free deionized water will complete the decontamination procedure. Decontaminated equipment will be allowed to air dry before wrapping in aluminum foil, shiny side out, for transport. Isopropanol used for decontamination will be pesticide grade or better and will be stored separately from the demonstrated analyte free deionized water.

It may be necessary to insert hoses and/or narrow diameter pipe into test borings and wells during installation, development, purging, and sampling. These items will also be decontaminated initially, and after each use. The outside of the hose or pipe will be decontaminated as specified above for any item entering a well boring. The inside will be cleaned with soapy water and rinsed with deionized water.

SECTION 12 - EMERGENCY RESPONSE

12.01 Notification of Site Emergencies

In the event of an emergency, site personnel will signal distress with three blasts from an appropriate horn (vehicle horn, air horn, etc.). All appropriate authorities will then be immediately notified of the nature and extent of the emergency.

Table 4 contains Emergency Response Telephone Numbers. This table will be maintained at all work sites by the Site Safety Coordinator, so it is always accessible in case of an emergency. The location of the nearest telephone will be determined prior to initiation of on-site activities.

Should someone be transported to a hospital or doctor, a copy of this Health and Safety Plan must accompany them.

12.02 Responsibilities

The Site Safety Coordinator will be responsible for responding to all emergencies. The Site Safety Coordinator will:

1. Notify appropriate individuals, authorities and/or health care facilities of the activities and hazardous of the investigation;
2. Ensure that the following safety equipment is available at the site: eyewash station, first aid supplies, and fire extinguishers;
3. Have working knowledge of all safety equipment available at the site; and

4. Ensure that a map which details the most direct route to the nearest hospital is prominently posted with the emergency telephone numbers.

12.03 Accidents and Injuries

In the event of a safety or health emergency at the site, appropriate emergency measures will immediately be taken to assist those who have been injured or exposed and to protect others from hazards, (See Figures 4 for Hospital Route Map and 5 for Site Emergency Evacuation Map). The Site Safety Coordinator will be immediately notified and will respond according to the seriousness of the injury. Personnel trained in First-Aid will be present during site activities to provide appropriate treatment of injuries or illnesses incurred during operations. The Project Manager and Project Supervisor will be immediately informed of any serious injuries.

Upon notification of an exposure incident, the Site Safety Coordinator will contact the appropriate emergency response personnel for recommended medical diagnosis and, if necessary, treatment. The Project Supervisor and the Site Safety Coordinator will investigate facility/site conditions to determine whether and at what levels exposure actually occurred, the cause of such exposure and means to prevent the incident from recurring.

An exposure-incident reporting form will be completed by the Site Survey Coordinator, the Project Supervisor and the exposed individual. The form will be filed with the employee's medical and safety records to serve as documentation of the incident and the actions taken.

12.04 Site Communications

Two-way radios are available for use during field activities to facilitate communications. Hand signals will be utilized where radios are impractical or unsafe. If possible, mobile phones will be present during site activities for emergency response and office communications. Public telephones will be located prior to the start-up of activities as back up to the mobile phones or as the primary off-site communication network.

12.05 Safe Refuge

The project personnel's vehicles shall serve as the immediate place of refuge in the event of an emergency. If evacuation from the area is necessary, the vehicles will be used to transport all on-site personnel to safety.

12.06 Site Security and Control

Site security and control shall be maintained by the Project Supervisor and/or their designee, and the Health & Safety Coordinator and/or his designee. Their duties include limiting access to the site to authorized personnel, oversight of project equipment and materials, and general oversight of site activities.

12.07 Emergency Response and Decontamination

In case of an emergency, all personnel should evacuate to safe refuge, both for their own personal safety and to prevent hampering response/rescue efforts. In the case of an evacuation, the Site Safety Coordinator (HSC) will account for all personnel. A log of all individuals entering and leaving the site will be kept to so that everyone can be accounted for in an emergency.

In the event of an emergency, the Site Safety Coordinator will direct all notification, response and follow-up actions. Contacts for any outside response personnel (ambulance, fire department, etc.) will be done at the direction of the Site Safety Coordinator. If necessary, immediate medical care should be provided by individuals trained in first aid procedures. If an individual is transported to a hospital or doctor, a copy of the Health & Safety Plan must accompany the individual.

Follow-up activities must be addressed following an emergency before on-site work is resumed. All necessary emergency equipment must be recharged, refilled or replaced. Government agencies must be notified as appropriate. An investigation of the incident needs to be conducted as soon as possible. The resulting report must be accurate, objective, complete and authenticated (signed and dated).

12.08 Medical/First Aid Response

On-site medical and/or first aid response to an injury or illness will be provided only by trained personnel competent in such matters. The Site Safety Coordinator is responsible for directing these actions and contacting the appropriate off-site response personnel (paramedics, etc.)

12.09 Fire Fighting Procedures

A fire extinguisher will be available in the Project Supervisor's (or his designee's) vehicle during all on-site activities. This is only intended for small fires. Where the fire cannot be controlled with the extinguisher, the area should be evacuated immediately. The HSC will direct the contacting of fire department response personnel.

12.10 Emergency Decontamination Procedure

The extent of emergency decontamination depends on the severity of the injury or illness and the nature of the contamination. Whenever possible, decontamination should consist of (at a minimum) washing, rinsing and/or cutting off of contaminated outer clothing and equipment. If there is not time for this, the person should be given first aid treatment, and then wrapped in plastic or a blanket prior to transport to medical care. If heat stress is a factor in the victim's illness/injury, the outer protective garment must be removed from the victim immediately.

12.11 Emergency Equipment

On-site equipment for safety and emergency response shall be maintained, as follows:

- fire extinguisher
- first aid kit
- eye wash station (wash bottles at a minimum)
- extra copy of the Health and Safety Plan

These will be located in the field vehicle of the on-site Project Supervisor and/or the Site Safety Coordinator.

SECTION 13 - SPECIAL PRECAUTIONS AND PROCEDURES

The Kaddis Site Investigation poses potential exposure risks to both chemical and physical hazards. The chemical risks have been explained in detail in the previous sections. The potential for chemical exposure to hazardous substances is significantly reduced through the use of air monitoring, personal protective clothing, engineering controls, and implementation of safe work practices.

Other potential hazards that are associated with the site activities include working around heavy equipment, heat stress and site refuse. Precautionary measures have been established to reduce these risks to a minimum during site activities.

13.01 Heat and Cold Stress

The timing of this project may be such that heat and/or cold stress may pose a threat to the health and safety of site personnel. Work/rest regimens will be employed as necessary so that personnel do not suffer adverse effects from heat and/or cold stress. Special clothing and an appropriate diet and fluid intake will be recommended to all site personnel to further reduce these temperature-related hazards. The work/rest regimens will be developed following the guidelines in the ACGIH, Threshold Limit Values and Biological Exposure Indices for 1988-1989.

13.02 Heavy Machinery/Equipment

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn frequently during site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others.

13.03 Construction Materials and Site Refuse

All construction materials and site refuse will be contained in appropriate areas or facilities. Site personnel should make certain that fencing, cement, drill cuttings, etc. are not scattered throughout the area of activity and that all trash and scrap materials are immediately and properly disposed of.

13.04 Additional Safety Practices

The following are important safety precautions which will be enforced during this investigation:

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases that probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
4. No excessive facial hair which interferes with the effectiveness of a respirator will be permitted on personnel required

to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit testing will be performed prior to respirator use to ensure a proper seal is obtained by the wearer.

5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles, mud, or other discolored surfaces; kneel on ground; lean, sit or place equipment on drums, containers, vehicles, or the ground.

6. Medicine and alcohol can potentiate the effect from exposure to certain compounds. Controlled substances and alcoholic beverages must not be consumed by personnel involved in the project. Consumption of prescribed drugs must be at the direction of a physician familiar with the person's work.

7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.

8. Work areas for various operational activities should be established.

9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures and locations must be established on the basis of prevailing site conditions.

10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use by the worker.

11. Safety gloves and boots will be taped to the disposable, chemical-protective suits.

12. All unsafe equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.

13. Hearing protection may be required for site personnel working around heavy equipment. This requirement will be at the discretion of the Site Safety Coordinator. Disposable, form-fitting plugs are preferred.

14. Cartridges for air-purifying respirators in use will be changed daily at a minimum.

15. Self-contained breathing apparatus (SCBA) and air-purifying respirators will be inspected daily by the Site Safety Coordinator.

16. All activities in the exclusion zone will be conducted using the "Buddy System". The Buddy is another worker fully dressed in the appropriate PPE, who can perform the following activities:

    - Provide his/her partner with assistance;
    - Observe his/her partner for sign of chemical or heat exposure;
    - Periodically check the integrity of his/her partner's PPE; and
    - Notify others if emergency help is needed.

TABLE 1

POTENTIAL SITE COMPOUNDS AND ASSOCIATED EXPOSURE INFORMATION

Contaminants	TLV/PEL	Characteristics	Route of Exposure	Symptoms of Overexposure*	Target Organs
Benzene	1 ppm	Colorless liquid, aromatic odor	Inhalation, Absorption, Ingestion	(1), (2), (3), (5)	Blood, CNS, skin, bone marrow, eyes, respiratory system
Trichloroethylene	100 ppm	Odorless liquid, sweet odor	Inhalation Ingestion	(1), (2), (3), (5)	Respiratory System, heart, liver, kidney, CNS, skin
1,1,1 Trichloroethane	350 ppm	Colorless liquid, mild sweet odor	Inhalation, Ingestion Contact	(1), (2), (3), (4)	Skin, CNS, CVS, eyes

(1) Eye, Nose, Throat, Skin Irritation or Burns
(2) Headache, Fatigue, Nausea
(3) Lightheaded, Some Nausea, Dull Visual and Audio Response
(4) Central Nervous System (CNS) Disorder, Convulsions, Sweating
(5) Potential or Known Carcinogens
PEL - Permissible Exposure Limits (OSHA) - 8 hour exposure
TLV - Threshold Limit Value (ACGIH) - 8 hour exposure
* Symptoms may include any or all listed depending upon concentration, duration, and route of exposure.

TABLE 2

HEALTH AND SAFETY HAZARDS

Hazard	Description	Location	Procedure Used to Monitor/Reduce Hazard
Heavy Equipment/ Construction Activity	Drill Rigs, Machinery Backhoes	Throughout Site	Personnel maintain eye contact with operators; hard hats, safety shoes, and eye protection as appropriate worn during equipment operation.
Overhead/Underground Utilities	Electrical, Sewer, Gas Water, Communications	To Be Determined	Locate existing utilities prior to site operations. Design installation of additional utilities so that they do not interfere with site operations.
Refuse and Materials	Drums, hoses, etc.	Throughout Site May be Buried	Use caution when walking or working in areas with debris. Clear debris, if possible. Steel toes.
Heat Producing/ Electrical Equipment	Generators/Drill Rigs	Throughout Site	Operate equipment away from vegetation and other materials that may ignite. Maintain fire-fighting equipment in the vicinity of operating equipment.
Heat Stress	Personnel working under extreme temperature are subject to adverse temperature-related effects	Throughout Site	Employ buddy system. Each worker is responsible for visually monitoring his/her partner for signs of heat stress. Site safety personnel will also monitor worker's conditions and establish work/rest regiments and recommend appropriate diet.
Chemical Exposure	Personnel can be exposed to various compounds associated with the site	Throughout Site	Follow guidelines in Safety Plan. Be familiar with signs and symptoms of exposure and first aid procedures. Report suspected over-exposure to supervisor immediately.
Explosion/Flash Fire	Some compounds on sight have flash points between 123°F and 130°F.	Some drummed material	Use caution when working in high temperatures during summer months. Monitor for explosive vapor levels.

TABLE 2A

Task	Environmental Monitoring	Personal Monitoring
Property Survey	Photoionization Detector (PID) with Draeger or charcoal tube quantification if necessary.	None
Site Walkover	PID with Draeger or charcoal tube quantification if necessary.	None
Metal Detector Survey	PID with Draeger or charcoal tube quantification if necessary.	None
*Surface Soil Sampling	PID with Draeger or charcoal tube quantification.	Yes
*Monitoring Well Installation	PID with Draeger or charcoal tube quantification.	Yes
Aquifer Testing	PID with Draeger or charcoal tube quantification if necessary.	Yes
*Surface Water Investigation	PID with Draeger or charcoal tube quantification.	Yes

8Denotes activities which require 15-minute interval organic vapor monitoring.

TABLE 3

ACTION LEVELS

Benzene Present; Organic Vapor Concentrations (ppm)	Benzene Not Present; Known Organic Vapor Concentrations (ppm)	Benzene Not Present; Unknown Organic Vapor Concentrations (ppm)	Level of Personal Protection
LT 1.0	1/2 the lowest 1989 PEL of the contaminants detected as a result of monitoring performed in Section 7	LT 5	Level D with outer booties and safety glasses.
1 to 5	From the action level above to 10X that action level	5 - 50	Level C clothing with half-face respirator and cartridges appropriate for organic vapors, dust, mists, and acid gases; engineering controls to decrease vapor levels.
5 to 50	From 10X the action level to 100X the action level	50 to 500	Level C clothing with full-face respirator and cartridges appropriate for organic vapors, dust, mists, and acid gases; engineering controls to decrease vapor levels.
LT 50	LT 100X the action level	LT 500	Cessation of site activities until engineering controls are implemented to decrease vapor levels.

LT = Less Than

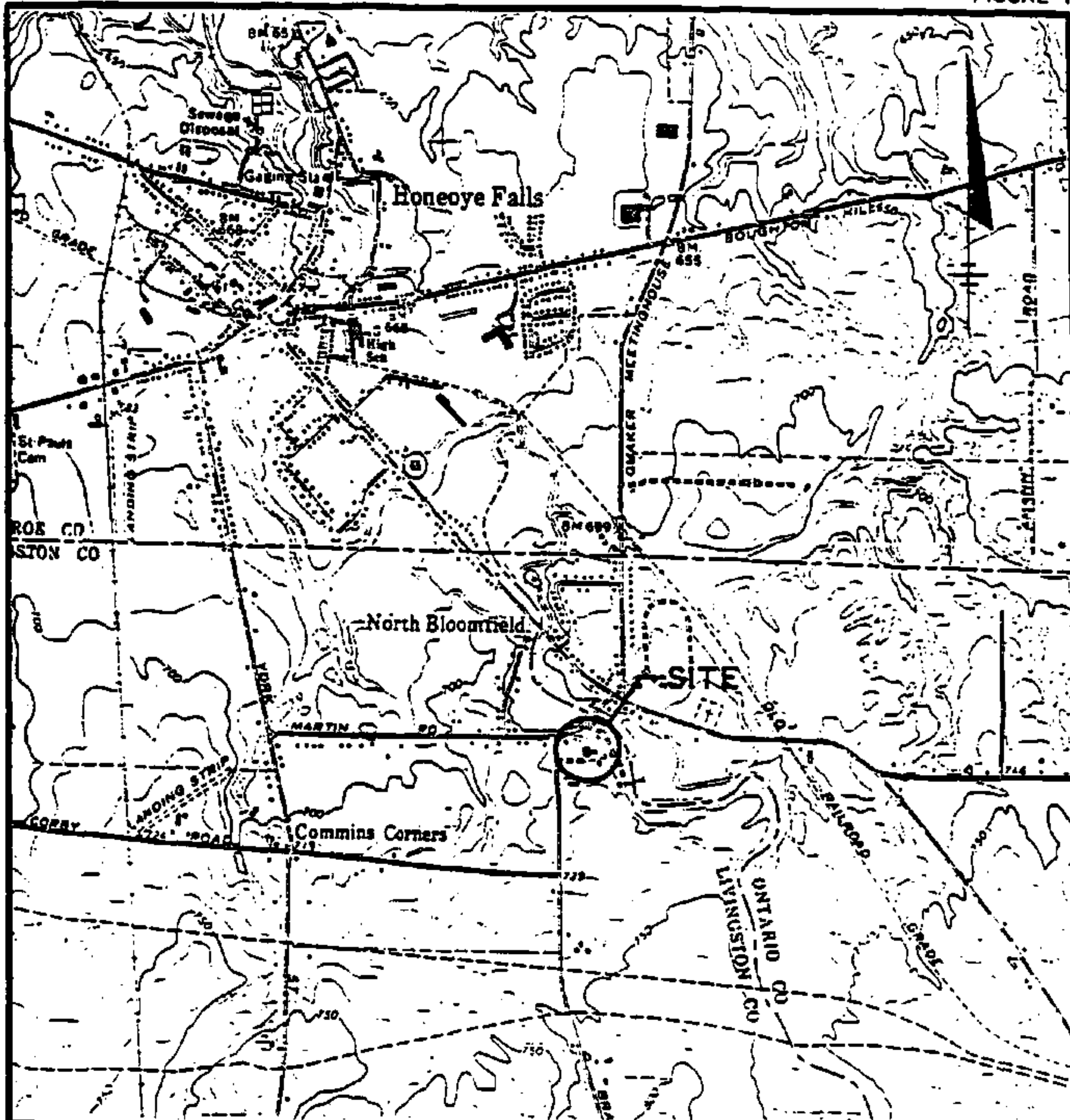
TABLE 4

EMERGENCY RESPONSE TELEPHONE NUMBERS

Agency	Address	Telephone No.
O'Brien & Gere Engineers, Inc. James Mickam Deborah Wright Mark McGowan Ed Wilson Caroline Woodward	5000 Brittonfield Parkway P.O. Box 4873 Syracuse, NY 13221	(315) 437-6100
Hospitals	Canandaigua	(716) 394-1100
	Strong Memorial	(716) 275-4551
Fire Department	Available through Police Department	911
Ambulance		911
EPA Regional Office (Region II)	Federal Building 26 Federal Plaza New York, NY 10278	(212) 264-9589

FIGURES

FIGURE 1



KADDIS CORPORATION
NORTH BLOOMFIELD, NEW YORK

SITE LOCATION MAP

0 2000 4000
SCALE IN FEET

ADAPTED FROM HONEOYE FALLS, NEW YORK 7.5 MIN. U.S.G.S. QUADRANGLE (1971)

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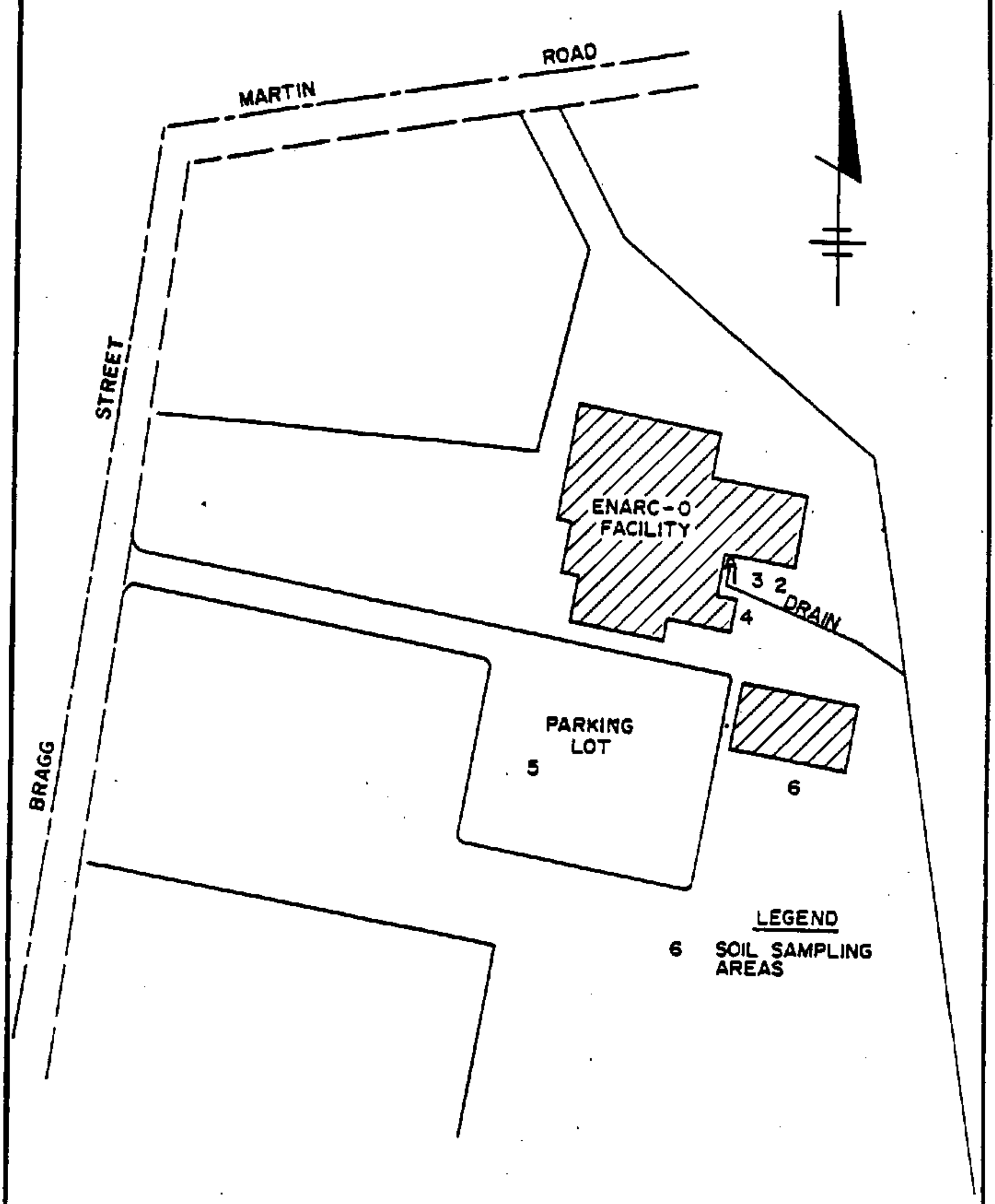
O'BRIEN & GERE ENGINEERS, INC.

FIGURE 2



KADDIS CORPORATION
HONEOYE FALLS, NEW YORK

SITE MAP

(NOT TO SCALE)

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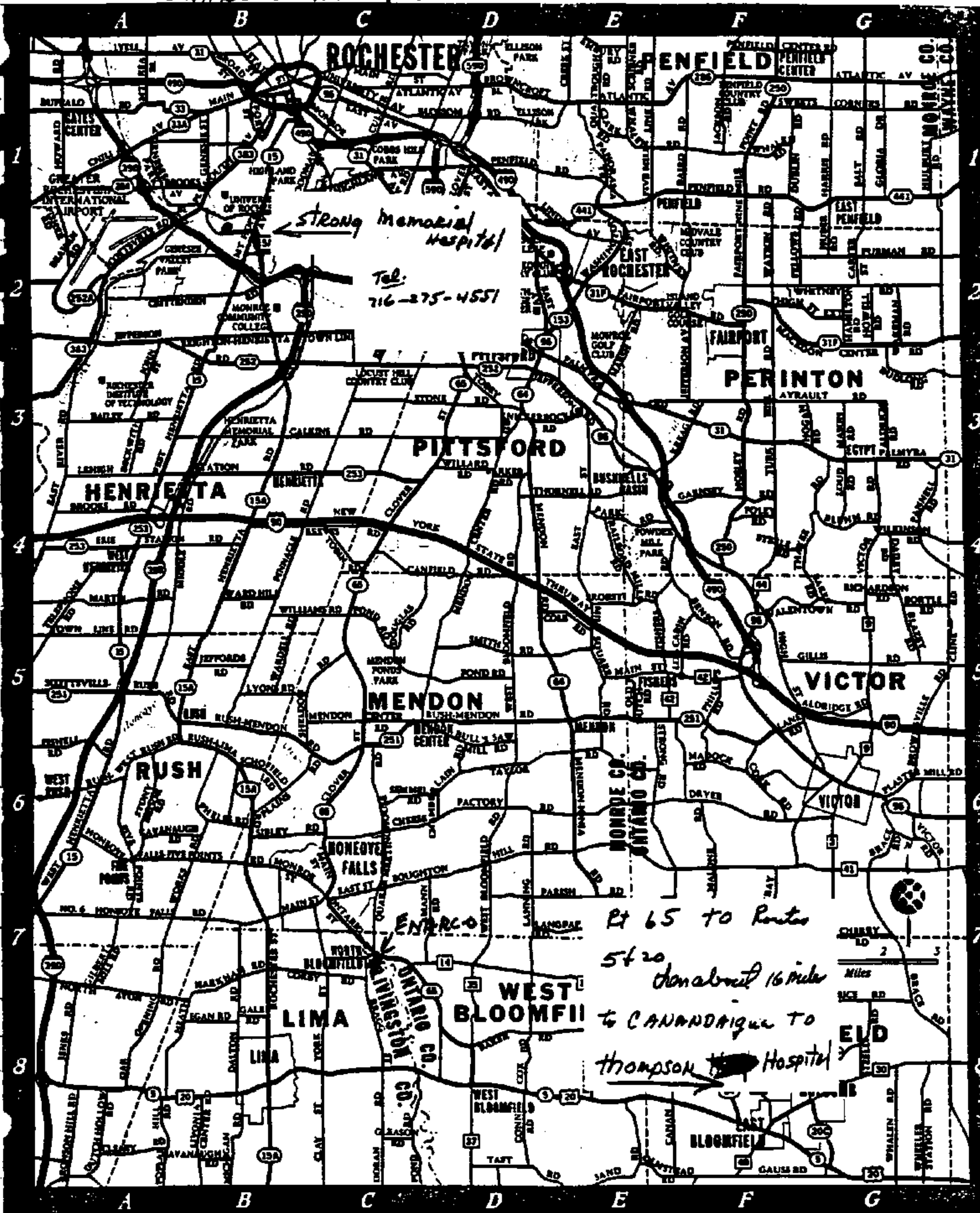
O'BRIEN & GERE ENGINEERS INC

FIGURE 3

Strong Memorial Hosp. At 1.5
ENARC-O At 7.2

North ↑



EXHIBITS

EXHIBIT 1

SUBCONTRACTOR OCCUPATIONAL SAFETY
AND HEALTH CERTIFICATION

PROJECT: ______________________________

SUBCONTRACTOR: ______________________________

1. Contractor certifies that the following personnel to be employed during the Enarc-O Site Investigation have met the following requirements of the OSHA Hazardous Waste Operations Standard (29 CFR 1910.120) and other applicable OSHA standards, as required by O'Brien & Gere Engineers, Inc.

Subcontractor Personnel	Training	Respirator Certification	Medical Exam

2. Subcontractor certifies that it has received a copy of the Site Safety and Health Plan and will ensure that its employees are informed and will comply with its requirements.

3. Subcontractor further certifies that it has read and understands and will comply with all provisions of its contractual agreement.

RAW:jcp/27.25
May 1989