Work Plan

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Site Name ENDICOTT JOHNSON
Site # 704018
County BROOME
Town UNION
Foilable X Yes ___ No
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Remedial Investigation/ Feasibility Study

Franklin Street Property

Endicott Johnson Corporation
Endicott, New York

July 1986

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Appendices

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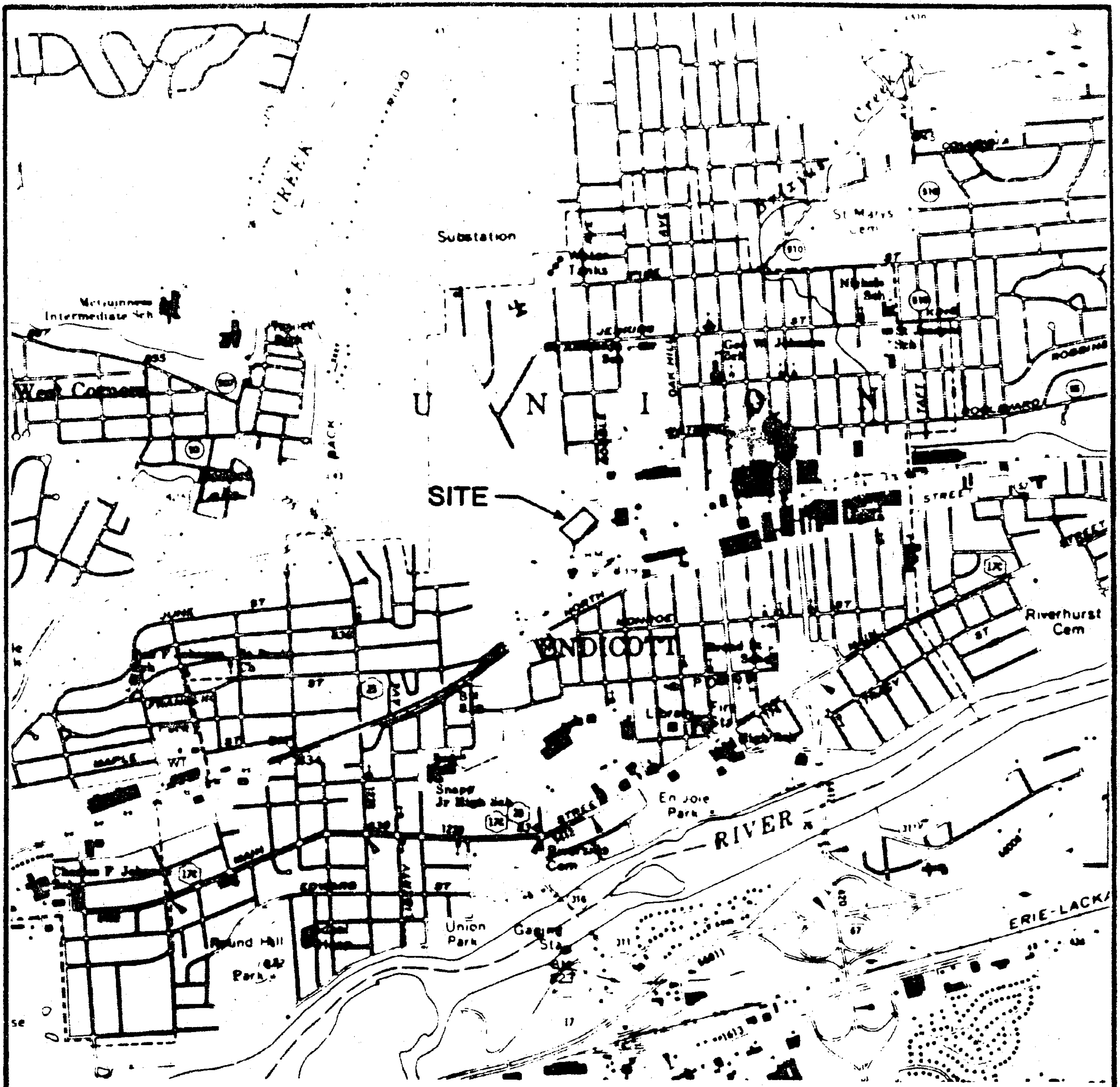

ENDICOTT JOHNSON COMPANY
FRANKLIN STREET PROPERTY
AREA MAP

N

SCALE IN FEET
1000 0 1000

Source: USGS 7.5 Min Series
Endicott, N.Y.

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Figures

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TABLE 8

FIELD INVESTIGATION MATRIX

Proposed Location(1)	Air Sampling	Surface Soil Sampling	Subsurface Soil Sampling	Monitoring Well
2	-	-	x	x
30	x	x	-	-
31	-	x	-	-
32	x	x	-	-
33	-	x	-	-
34	x	x	x Test borings	-
35	x	x	x	-
36	-	x	-	-
37	x	-	x Test Borings	-
38	x	-	x	-
39	x	x	-	-
40	x	x	x Test Borings	-
41	x	x	x	-
42	x	x	-	-
43	-	x	x [illegible] test boring	-
44(2)	-	-	-	x

Note:
"x" indicates activity to be conducted
"-" indicates activity not to be conducted

(1) See Figure 2 for approximate location.
(2) Located on Figure 3

TABLE 7

PRIORITY POLLUTANT METALS

- Antimony
- Arsenic
- Beryllium
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Selenium
- Silver
- Thallium
- Zinc

TABLE 5
GROUND WATER QUALITY DATA - 1985
(concentration in mg/l)

Parameter	Well 1	Well 2	Well 3	Well 4
Chloroethylene	LT 0.001	LT 0.001	0.001	LT 0.001
Chloroethane	LT 0.001	2.20	0.005	LT 0.001
Methylene Chloride	LT 0.001	0.004	LT 0.001	LT 0.001
1,1-Dichloroethylene	LT 0.001	LT 0.001	LT 0.001	LT 0.001
1,1-Dichloroethane	LT 0.001	0.03	0.038	0.10
trans-1,2-Dichloroethylene	LT 0.001	LT 0.001	LT 0.001	LT 0.001
Freon 113	LT 0.001	LT 0.001	LT 0.001	LT 0.001
1,2-Dichloroethane	LT 0.001	0.01	LT 0.001	LT 0.001
1,1,1-Trichloroethane	LT 0.001	LT 0.001	0.029	0.18
Trichloroethylene	LT 0.001	LT 0.001	LT 0.001	LT 0.001
1,1,2,2-Tetrachloroethylene	LT 0.001	LT 0.001	LT 0.001	LT 0.001
Benzene	LT 0.001	0.059	LT 0.001	0.008

Note: LT indicates less than

Source: IBM Corporation

TABLE 5

SOIL QUALITY DATA - 1984

Concentration in mg/kg wet weight

Six Foot Below Ground	Toluene	Acetone	MEK	Ethyl Acetate	Naptha
1	9	LT 1	LT 1	LT 1	LT 1
2	78	LT 1	LT 1	LT 1	LT 1
3	2,800	170	120	350	LT 1
4	580	140	110	90	LT 1
5	4	LT 1	LT 1	LT 1	LT 1
6	20	LT 1	LT 1	LT 1	LT 1
7	560	LT 1	LT 1	LT 1	LT 1
8	3,700	260	500	270	LT 1
9	400	590	300	300	LT 1
10	9	LT 1	LT 1	LT 1	LT 1
11	38	LT 1	LT 1	LT 1	LT 1
12	130	15	8	5	LT 1
13	6,300	1,700	1,100	800	LT 1
14	29	LT 1	LT 1	LT 1	LT 1
15	LT 1	LT 1	LT 1	LT 1	LT 1
16	LT 1	LT 1	LT 1	LT 1	LT 1
Ten Foot Below Ground					
4	620	170	92	87	LT 1
5	5	LT 1	LT 1	LT 1	LT 1
10	9	LT 1	LT 1	LT 1	LT 1
15	LT 1	LT 1	LT 1	LT 1	LT 1
16	LT 1	LT 1	LT 1	LT 1	LT 1
Fifteen Foot Below Ground					
4	400	290	330	160	LT 1
5	1	LT 1	LT 1	LT 1	LT 1
10	7	LT 1	LT 1	LT 1	LT 1
15	LT 1	LT 1	LT 1	LT 1	LT 1
16	LT 1	LT 1	LT 1	LT 1	LT 1

NOTE: MEK indicates Methyl Ethyl Ketone
LT indicates Less Than

SOURCE: Friend Laboratory, Inc., August 1984

TABLE 4

GROUND WATER QUALITY DATA - 1983
Concentration in mg/l

Well Location	Toluene	Acetone	MEK	Ethyl Acetate	Naptha	Isopropyl Alcohol	pH (s.u.)	Conductivity (micro mhos/cm)
W-1	0.0027	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	11.25	820
W-2	0.00078	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	8.15	740
W-3	0.0016	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	7.65	620
W-4	0.00091	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	7.75	730

NOTE: MEK indicates Methyl Ethyl Ketone
LT indicates Less Than

SOURCE: RECRA Research Report, November 1983

TABLE 3

SOIL QUALITY DATA - 1983
Concentration mg/kg, Wet Weight

Soil Composite(1)	Toluene	Acetone	MEK	Ethyl Acetate	Naptha	Isopropyl Alcohol
B-1, S-1 & S-2	.013	LT 1	LT 1	LT 1	LT 1	LT 1
B-1, S-3 & S-4	.014	LT 1	LT 1	LT 1	LT 1	LT 1
B-2, S-1 & S-2	.010	LT 1	LT 1	LT 1	LT 1	LT 1
B-2, S-3	.073	LT 1	LT 1	LT 1	LT 1	LT 1
B-3, S-1 & S-2	.0096	LT 1	LT 1	LT 1	LT 1	LT 1
B-3, S-3	.22	LT 1	LT 1	LT 1	LT 1	LT 1
B-4, S-1 & S-2	.034	LT 1	LT 1	LT 1	LT 1	LT 1
B-4, S-3	.0015	LT 1	LT 1	LT 1	LT 1	LT 1

NOTE: MEK indicates Methyl Ethyl Ketone
LT indicates Less Than

SOURCE: RECRA Research Report, November 1983

(1) B-1, S-1, S-2 represents a composite of Sample 1 and Sample 2 from Boring 1. Boring logs presented in Exhibit B provide information on soil characteristics and depths sampled.

TABLE 2

SOIL QUALITY DATA - 1983
Concentration mg/kg Wet Weight

Soil Samples from Composite Grid	Toluene	Acetone	MEK	Ethyl Acetate
3	26,000	ND	ND	--
6	12,500	114	1,160	--
7	30	53	30	--
8	833	65	ND	--
12	3	62	ND	--
Soil Sample Obtained at Various Depths as Tanks Were Removed				
W-1	43,000	6,300	245	ND
W-2	39	40	ND	ND
W-3	2	ND	ND	ND
G-1	60	ND	ND	ND
G-2	7,000	ND	ND	2.7
G-6	ND	ND	ND	ND
G-7	1,060	ND	500	ND
G-11	ND	ND	ND	ND
G-1-8	11,720	ND	525	1900
G-2-6	140	ND	ND	ND
G-3-5B	ND	ND	ND	ND
G-8-5A	1,685	ND	ND	800
G-9-2	80	ND	ND	ND
G-9-2A	355	ND	ND	ND
G-9-4	5	ND	ND	ND
G-9-4A	ND	ND	ND	ND
G-12-7	5,712	ND	536	ND
G-16-10	ND	ND	ND	ND

NOTE: ND indicates Not Detected
MEK indicates Methyl Ethyl Ketone

SOURCE: Friend Laboratory, Inc., March 1983

TABLE 1

COMPOUNDS STORED IN TANKS

	NYS Standard(1)	Flashpoint(2) °F	TWA ppm	Odor(2) ppm	Toxicity(2) Ingestion
Toluene	50	40	100	0.17	2
Methyl Ethyl Ketone	None	20	200	10	2
Isopropanol	None	65	400		1
Ethyl Acetate	None	24	400	1	2
Acetone	None	4	750	100	1
Naptha	None	gt 100	200	NA	2

(1) Ambient Surface Water Standard Expressed in Micrograms/Liter 6 NYCRR 701-702

(2) U.S. Coast Guard - CHRIS 11/78
1 - 5-15 g/kg (rat)
2 - 0.5-5 g/kg (rat)

(3) 8 hr TWA, 1985-86

Tables

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sign criteria, preliminary site and facility layouts, budget cost estimate (including operation and maintenance costs), operating and maintenance requirements and duration, and an outline of the safety plan including cost impact on implementation. Any additional information required as the basis for the completion of the final remedial design will also be included.

3.05 Feasibility Study Report

The Feasibility Study Report to be submitted to the DEC will recommend the alternative to be implemented for site clean up of contaminated areas. The report will contain:

- A summary of all health and environmental hazards and potential hazards attributable to the site.
- Identification of remedial actions necessary to eliminate existing or potential hazards.
- Identification of technologies capable of achieving the project objectives.
- For each applicable technology, an evaluation according to Section 3.03.
- Identification of a recommended alternative, including implementation schedule.

3. Operation and Maintenance Requirements. Preference will be given to projects with lower O&M requirements, other factors being equal.

4. Environmental Effects. Alternatives posing the least impact (or greater improvement) on the environment will be favored.

5. Safety Requirements. On-site and off-site safety requirements during implementation of alternatives should be considered. Alternatives with lower safety impact and cost will be favored.

6. Cost. The remedial alternative with the lowest total present worth cost will be favored. Total present worth cost will include capital cost of implementing the alternative and cost of operations and maintenance of the proposed alternative over an agreed upon time period.

The lowest cost alternative that is technologically feasible and reliable and that adequately protects (or mitigates damage to) public health, welfare, or the environment will be considered the cost-effective alternative. A report presenting the results of the alternatives evaluation and the recommended remedial alternative will be prepared and submitted to the state.

3.04 Conceptual Design

A conceptual design of the selected remedial alternative shall include, but is not limited to, the engineering approach including implementation schedule, special implementation requirements, institutional requirements, phasing and segmenting considerations, preliminary de-

9. A review of any off-site disposal facilities to ensure compliance with applicable RCRA requirements.

An Environmental Assessment (EA) for each alternative shall include, at a minimum, an evaluation of each alternative's environmental effects, an analysis of measure to mitigate adverse effects, physical or legal constraints, and compliance with CERCLA. Each alternative will be assessed in terms of the extent to which it will mitigate damage to, or protect, public health, welfare, and the environment, in comparison to the other remedial alternatives.

The cost of each feasible remedial action alternative (and for each phase or segment of the alternative) will be presented as a present worth cost and will include the total cost of implementing the alternative and the annual operating and maintenance cost. A distribution of costs over time will be provided.

Alternatives shall be evaluated using technical, environmental, and economic criteria. At a minimum, the following areas will be used to evaluate alternatives:

1. Reliability. Alternatives that minimize or eliminate the potential for release of wastes into the environment will be considered more reliable than other alternatives.
2. Implementability. The requirements of implementing the alternatives will be considered, including phasing alternatives into operable units and segmenting alternatives into project areas on the site. The requirements for permits, zoning restrictions, right of ways and public acceptance are also examples of factors to be considered.

3.03 Detailed Evaluation of Alternatives

Alternative remedies which pass through the initial screening will be evaluated in depth prior to recommending the most cost effective alternative. The alternative evaluation shall include a detailed description, environmental assessment, and cost analysis as presented below.

A detailed description of each alternative will be prepared which will address the following issues.

1. Description of appropriate treatment and disposal technologies.
2. Special engineering considerations required to implement the alternative (e.g., pilot treatment facility, additional studies needed to proceed with final remedial design).
3. Environmental impacts and proposed methods, and costs, for mitigating any adverse effects.
4. Operation, maintenance, and monitoring requirements of the remedy.
5. Off-site disposal needs and transportation plans.
6. Temporary storage requirements.
7. Safety requirements for remedial implementation (including both on-site and off-site health and safety considerations).
8. A description of how the alternative could be phased into individual operable units. The description should include a discussion of how various operable units of the total remedy could be implemented individually or in groups, resulting in a significant improvement to the environment or savings in costs.

3.02 Screening of Alternatives

The alternatives identified will be screened to eliminate alternatives that are clearly not feasible or appropriate.

Four broad considerations will be used as a basis for the initial screening: cost, effects of the alternative, environmental protection and implementation. More specifically, the following factors must be considered:

1. Cost. An alternative whose cost far exceeds that of other alternatives will usually be eliminated. Total cost will include the cost of implementing the alternative and the cost of operation and maintenance.
2. Environmental effects. Alternatives posing significant adverse environmental effects will be excluded.
3. Environmental protection. Only those alternatives that satisfy the response objectives and contribute substantially to the protection of public health, welfare, or the environment shall be considered further. Source control alternatives shall achieve adequate control of source materials. Off-site alternatives shall minimize or mitigate the threat of harm to public health, welfare, or the environment.
4. Implementability and reliability. Alternatives that may prove extremely difficult to implement, will not achieve the remedial objectives in a reasonable time period, or rely on unproven technology will be eliminated.

SECTION 3 - FEASIBILITY STUDY

3.01 Development of Alternatives

Based on the results of the remedial investigation a limited number of alternatives for source control or off-site remedial actions or both will be developed. Remedial response objectives will be identified as will appropriate remedial technologies. Site-specific remedial response objectives shall be based on public health and environmental concerns, information gathered during the remedial investigation, and Section 300.68 of the National Contingency Plan (NCP).

Remedial alternatives will be developed to incorporate remedial technologies, response objectives, and other appropriate considerations into a comprehensive, site-specific approach. Alternatives will include non-cleanup (e.g., alternative water supply, relocation) and no-action options, if appropriate.

The alternatives to be evaluated must include, but are not limited to, the following, or combinations of the following control options:

1. Establish site security.
2. Control surface water impacts by drainage control.
3. Control infiltration by installation of a low permeability soil cap.
4. Control groundwater movement by providing a groundwater cutoff wall and/or groundwater collection and treatment.
5. Selected removal and secure disposal of identified sources of contaminants likely to have an impact and be mobile.
6. Provide alternative water supplies to downgradient users.

- Geology of the site including soil types and depths, lithology and thickness of unconsolidated deposits, bedrock depth and type.
- A determination of the areal and vertical extent of wastes including cross sections of affected areas.
- Site plan with locations of all wells, test borings and surface water/sediment sampling points.
- Vertical and horizontal variations in groundwater quality.
- Types and concentrations of hazardous constituents detected in the air, soils, and ground water.
- The location and influence of private and public wells on the movement of groundwater.
- The current or potential impacts on the environment and human health.
- Supporting data including: test boring logs, well specifications, field investigation procedures, chemical analyses, in-situ permeability test data, and monitoring well water level elevations.
- A list of remedial programs to be evaluated as part of the feasibility study.
- References to all scientific or technical literature used to prepare the Report.
- Names, titles, and disciplines of all professionals engaged in Report preparation.

wildlife receptor acting together in such a way that the receptor can be exposed to wastes from the site are termed "complete". These scenarios will be evaluated in the second phase of the assessment.

The second phase is a quantitative estimation of the probability and magnitude of each of the "complete" exposure scenarios identified and the human and wildlife health risks associated with those exposures. This approach is consistent with procedures and guidelines appearing in the USEPA Superfund Health Assessment Manual (Draft, 1985), the USEPA Guidance on Remedial Investigations Under CERCLA (1985), and the USEPA Endangerment Assessment Handbook (1985).

2.03 Remedial Investigation Report

Following the completion of the field investigation all field data will be compiled into a draft report of the Remedial Investigation. The Report shall meet the objectives of the Work Plan, the terms of the NYSDEC Consent Order and will include descriptions of the following:

- Available information on solvent storage including installation dates, materials stored, removal dates and removal procedures.
- Available information on drainage systems within and surrounding the "A" and "B" plants.
- A topographic survey and resultant plot plan including on-site bench marks.
- A summary of all relevant environmental conditions including annual and seasonal climatic conditions.

also a crucial component of the remedial action program, for it becomes the basis for comparison of the effectiveness and applicability of various remedial designs; that is, it is an evaluation of the "no action" alternative.

An endangerment assessment is not simply an evaluation of whether chemical releases for a source area violate available environmental criteria. It is an exercise which is designed to evaluate all of the factors associated with the situation which contribute to or, in some cases, reduce the likelihood of the situation resulting in harm to human health or the environment. The endangerment assessment unifies the source, transport route and receptor components associated with an environmental release and evaluates them as an integral process. The completed assessment determines the actual impacts associated with existing and potential releases of chemical components from the site under various exposure and release scenarios.

An objective of the proposed study is to provide an endangerment assessment of the Franklin Street Property in Endicott, New York. The first phase will involve a qualitative evaluation to identify and evaluate the potential exposure pathways. This phase will consist of a consideration of each of the possible exposure pathways (air, soil, surface water and groundwater) for their potential to facilitate exposures of chemical components within the site to receptors identified at on and off-site locations. Various transport and exposure scenarios will be presented and evaluated. Those transport scenarios determined to have a functioning waste source, transport mechanism and human or subsurface geologic formations. The tests will be conducted in accordance with Appendix F by removing a volume of water from the well and measuring the water level recovery rate. The data will be evaluated to estimate on-site ground water flow velocities.

Groundwater samples will be collected at two separate occasions from all on-site monitoring wells in accordance with the procedures outlined in Appendix I. Following sample collection, all groundwater samples will be properly preserved and promptly transported to the O'Brien & Gere laboratory in Syracuse, where they will be analyzed for the compounds identified on Table 6, as well as pH, conductivity, and total dissolved solids. In addition, monitoring well 2, located furthest hydraulically downgradient will be sampled and analyzed on one occasion for acid extractable and base neutral extractable organics per EPA Method 625 and Pesticides and PCBs per EPA Method 608. This sample will also be analyzed for the thirteen priority pollutant metals presented on Table 7 after field filtration.

2.02 Endangerment Assessment

In the context of this Work Plan, an endangerment assessment is defined as a measure of the potential for chemical wastes to escape from a source area and expose sensitive receptors to waste components at levels harmful to health, welfare, and the environment. In this sense, an endangerment assessment is an essential component of any remedial investigation; for it provides an interpretation of the relevance of the data generated. It defines the level of impact represented by the site and those aspects which need to be addressed during remediation. It is well will be installed in the 48" diameter sewer bedding. The sample location, illustrated on Figure 3, was selected to intersect materials moving from/through the site within both sewer beddings.

The well will be constructed in accordance with the procedures detailed in Appendix F. A well screen will extend five feet above the water table to measure seasonal fluctuations of the water table and to detect immiscible compounds (i.e, toluene) floating on the ground water surface. In addition, the well screen will extend approximately two feet into the native soil, which is estimated to occur at a depth of 10 to 15 feet.

The use of the three hydraulically downgradient Wells #2, #3, and #4 provide information horizontal ground water flow in the water table. The observed presence of solvents at Well #2 in the screened interval at the top of the till layer suggest determination of vertical flow potential. Consequently, a well will be installed adjacent to Well #2 within the glacial till. A five (5) foot screen will be installed to sample the strata between elevations of approximately 805 ft and 810 ft USGS. The well will be constructed in accordance with the procedures detailed in Appendix F.

Following the completion of the test borings, a field survey will be conducted to establish the location and elevation of all the field sampling locations. At least two sets of groundwater elevations will be measured from all existing wells to determine the direction of groundwater flow.

In-situ permeability tests will be performed on all of the monitoring wells to measure the hydraulic conductivity of the

The abandoned 12 inch diameter sanitary sewer has an invert elevation near "B" Plant of 825 feet. RECRA Research reported ground water elevation in that area during August to be approximately 825 feet. Therefore, during portions of the year the sewer bedding material could be within the water table. As illustrated on Figure 3 this sewer merges with the 48 inch diameter storm sewer at the western edge of the property.

The 48 inch diameter sewer beneath "B" plant has an invert elevation of approximately 828 feet with a ground water elevation of approximately 823 feet.

The 48 inch diameter identified as the Old Tannery Sewer has an approximate invert elevation of 823 feet. Ground water elevations in this area are high enough that the bedding material may be in contact with ground water during portions of the year.

Areas serviced by these sewers have been sampled for halogenated organics with detectable concentrations reported. The observed concentrations resulted in the installation of a groundwater recovery well approximately 400 feet hydraulically downgradient of the Franklin Street Property (M. Nerchi, 1986). The transport of groundwater contaminants along underground sewers has been reported at several locations, consequently it appears that the observed concentrations in Wells 2, 3, and 4 of halogenated organics is not related to activities at the Franklin Street Property.

To provide a data base to support this hypothesis, the soil borings in the tank storage area will be analyzed for these volatile organics as described in Section 2.01.05. In addition, monitoring chemical analysis. The two samples will be analyzed for the purgeable organics identified in Table 6. The two samples with the highest total purgeable organic concentration will be submitted for further analyses. All peaks within 15% of the largest peak will be compared to substances contained in the GCMS library to provide an indication of composition. Detection limits for substances in soils will be targeted at 1 mg/kg, however, matrix effects may impact analytical detection limits.

2.01.06 Groundwater Monitoring

Groundwater samples collected during 1983 and 1985 from the four monitoring wells identified on Figure 2 were analyzed for volatile organic compounds, pH, and conductivity. The 1983 analytical results, presented as Table 4, detected toluene in each of the four wells at concentrations ranging from 0.0008 to 0.0027 milligrams/liter. Other parameters tested were reported at less than the detection limit of 0.5 milligrams/liter. Supplemental sampling during 1985 resulted in the detection of several volatile halogenated organics reportedly never used at the Franklin Street property. The results of those analyses are presented as Table 6.

Examination of the 1985 data indicates that the hydraulically upgradient well did not contain detectable concentrations of volatile organics at the time of sampling. Based on the 1985 analyses, the existing well 1 will be used as the hydraulically upgradient well.

A review of the underground utilities within the area reveal three sewers located between the storage tank facility and Franklin Street, as illustrated in Figure 2 and Figure 3.

est chemical concentrations were detected in the vicinity of Tanks 8 and 5A. Concentrations of the four compounds were not detected above 10 milligrams/kilogram as far east as Tank 4 or as far west as Tank 9. Although the previous investigations have defined the eastern and western extent of the elevated organics detected within the soils, neither the northern nor southern extent has been well defined. In addition, the previous investigations have not clearly defined the vertical extent of the organic compounds within subsurface soils. As a result, additional test borings to further define the horizontal and vertical extent of organic chemicals within the subsurface soils are included in the field activities.

Six (6) test borings will be completed in the vicinity of the former underground tanks to define the vertical and horizontal extent of organic compounds within the subsurface soils. The proposed locations of the borings are shown in Figure 2 and Table 8. The test borings will be completed using the hollow stem auger drilling method in accordance with the procedures described in Appendix E. Soil samples will be collected continuously from the land surface to the subsurface till layer, which is estimated to occur at an average depth of 20 feet. After the completion of each test boring, the open borehole will be sealed with a bentonite/cement grout, mixed with the boring cuttings.

Following the completion of each test boring, all soil samples will be field screened using an HNU photoionizer. These analyses, as well as the descriptive logs for each boring, will be used to select two soil samples from each boring for more detailed

2.01.3 Surface Soils and Sediments

The data generated to date regarding soil quality pertains to subsurface soils only. In order to adequately define the horizontal and vertical extent of contamination of soils, surface soils will be obtained in addition to the subsurface soil samples which are described in Section 2.01.5.

To characterize surface soil quality, samples will be obtained at the locations identified in Figure 2 and Table 8. One composite sample will be collected from each of these locations using the compositing procedures discussed in Appendix D. Each of the composites will be collected from ground surface to 3 inches of depth, and will be analyzed for volatile organic compounds listed in Table 6 using EPA Methods 601 and 602.

2.01.4 Surface Water

The site is unpaved with no apparent surface water runoff. Consequently, no surface water samples will be collected during the field activities.

2.01.5 Subsurface Soils

Previous investigations at the site have identified that the subsurface soils in the vicinity of the underground tanks were found to contain elevated concentrations of toluene, acetone, methyl ethyl ketone, and ethyl acetate. The soil sample locations are shown in Figure 2 and the chemical analyses of those soils are shown in Tables 2, 3, and 5. The analyses reveal that the high-

SECTION 2 - REMEDIAL INVESTIGATION

2.01 Site Characterization

2.01.1 Site Definition

A topographic survey will be prepared for a portion of the Franklin Street property. The survey will encompass the manufacturing area as defined in Figure 2. The survey will extend hydraulically upgradient to locate horizontally and vertically Well 1. In addition, the survey will locate existing manholes, fire hydrants and other fixed objects which might be of interest during evaluation of site conditions and remedial technologies. The survey will be prepared at a scale of 1 inch equals 8 feet with contours at 1 foot intervals.

2.01.2 Atmosphere

Ambient air quality monitoring will be conducted on the site to determine if emissions of the volatile organics pose a risk to the environment and/or public health. A photoionization detector (HNU) will be used to determine the concentration of solvents in the air at ten locations on the site. The air sampling locations are indicated in Figure 2 and Table 8. At each location, samples will be collected at a heights of approximately one half inch and 4 feet above the ground surface. Testing will be conducted when the wind velocity is below 10 miles/hour and it is not raining.

All investigations, reports, supplements and revisions thereto described in this Work Plan or the corresponding Order shall address both on and off-site contamination caused by the presence of hazardous wastes at the Franklin Street Property. Investigations shall be executed in accordance with Requisite Technology.

by the program for soil and groundwater quality are presented as Tables 3 and 4, respectively. The locations of the test borings, monitoring wells, and soil samples are indicated in Figure 2.

Additional soil samples were obtained from the tank storage facility area by Earth Dimensions under the supervision of CECOS in May 1984. Samples were collected at various locations identified in Figure 2 at depths of 6 feet, 10 feet, and 15 feet below grade. The samples were analyzed by Friend Laboratory, Inc. for toluene, acetone, MEK, ethyl acetate, and naptha. The results of the analyses are presented as Table 5.

In August 1984 the four groundwater monitoring wells installed by RECRA Research, Inc. were sampled by IBM. The samples were analyzed for chlorinated hydrocarbons. The results of the analyses are presented as Table 6.

1.03 Objectives

The purpose of this Work Plan is to supplement the existing data compiled at the Franklin Street Property in order to complete a Remedial Investigation/Feasibility Study. The Work Plan is designed to accomplish the following goals:

A. Determine the nature of, and the areal and vertical distribution of, any hazardous wastes present on the property.

B. Evaluate the on and off site impacts that any past, present or future release or migration of hazardous wastes may have on public health or the environment.

C. Screen possible response actions in accordance with the National Contingency Plan 40 CFR Section 300.68.

as the Demolished "A" Plant and the Demolished "B" Plant, were located as shown on Figure 2.

Soil samples from the tank storage facility area, obtained in 1983 and 1984, indicated the presence of solvents which had been stored in the tanks. The Endicott Johnson Corporation and the New York State Department of Environmental Conservation (DEC) are in the process of drafting an Order on Consent (Consent Order) to prepare a Remedial Investigation and Feasibility Study (RI/FS) to address the extent of contamination resulting from past practices.

1.02 Previous Studies

Several studies have resulted in the generation of analytical data regarding soil and groundwater quality in and near the tank storage facility area. CECOS International, Inc. (CECOS) excavated and disposed of the buried storage tanks in February 1983. At the time of excavation, CECOS obtained soil samples at various depths, as the tanks were removed. The samples were analyzed by Friend Laboratory, Inc. for toluene, acetone, MEK, and ethyl acetate. The resulting data are presented as Table 2. The sampling locations corresponding to the data are shown in Figure 2.

In July and August 1983 RECRA Research, Inc. conducted a Site Assessment Program at the site which included the drilling of five test borings, installation and development of four groundwater monitoring wells, and collection of soil and groundwater samples. Exhibit B presents the subsurface logs for the monitoring wells and test borings. The soil and groundwater samples were analyzed for toluene, acetone, MEK, ethyl acetate, naptha, and isopropyl alcohol. The data generated

SECTION 1 - INTRODUCTION

1.01 Site History

The Endicott Johnson Corporation operated a facility on its Franklin Street Property in Endicott, New York from about 1918 to 1983. The approximate location of the site is shown in Figure 1. The tank storage facility was used to store toluene, acetone, methyl ethyl ketone (MEK), ethyl acetate, naptha, and isopropyl alcohol, which were used in the manufacture of shoe cement. There were 12 tanks ranging in volume from 1,000 gallons to 12,400 gallons. The previous locations of the storage tanks are presented in Figure 2. Pertinent information on these compounds is presented in Table 1 and Exhibit A.

Filling of nine of the tanks was accomplished through piping which lead from the eastern boundary of the Franklin Street Property, which provided access by trucks, to each of the tanks. Two 1,000 gallon tanks (tanks X and Y) had no associated piping. Nine of the tanks (tanks 2, 3, 4, 5A, 5B, 6, 7, 8, and 9) had access piping leading to points in the basement of Demolished "A" Plant. Five of the tanks (tanks 3, 4, 5A, 5B, and 6) were accessed through piping which lead to Demolished "B" Plant.

In 1983 the storage tanks and associated piping were excavated and disposed of off-site. At the time of excavation, the tanks reportedly were in good structural condition. Photographs of the excavated tanks which indicate their structural integrity are available.

In 1984 two buildings adjacent to the excavated tank storage facility were razed to their foundations. The two buildings, referred to

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3381.001

WORK PLAN

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FRANKLIN STREET PROPERTY

ENDICOTT JOHNSON CORPORATION
ENDICOTT, NEW YORK

JULY, 1986

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13224

APPENDIX A

SAFETY PROTOCOL

SAFETY PROTOCOL

The Project Manager will advise any personnel involved with on-site work of known hazardous condition(s). The project manager will also inform the project coordinator of required safety practices and monitor the site investigation program for safety matters.

The on-site project coordinator designated by the project manager will implement the safety program, make sure proper clothing and supplies are available and maintained, further educate personnel regarding risks and precautionary measures and inform the project manager of existing site conditions.

All personnel directly involved with drilling operations shall wear at a minimum the following safety equipment: coveralls, rubber boots and gloves and hard hats. Groundwater samplers shall wear at a minimum the following safety equipment: coveralls, rubber boots and gloves and safety glasses. Field boots and appropriate field clothing will be worn during other site activities. If the site specific compound evaluation reveals compounds which may require increased safety levels, the safety protocol will be revised. Eye protection and dual filter respirators with organic vapor/acid gas filters will be accessible at all times in the event deemed necessary. In the immediate vicinity of a work site a first aid kit and portable eyewash station will be accessible to field personnel. Suits, rubber boots, and gloves should be left on-site and properly disposed of at the end of the field project.

A Photoionization Detector will be utilized to provide information on the ambient concentrations of volatile organic chemicals in the atmosphere. If readings approach dangerous levels, personnel will notify project manager and measures will be taken to alleviate hazardous potentials. An HNU meter will be used on selected split spoon soil samples extracted to determine presence of gross contamination and if organic vapor concentrations in the working area necessitate further protective equipment.

APPENDIX B

MAGNETOMETER SURVEY PROTOCOL

MAGNETOMETER SURVEY PROTOCOL

A grid system will be established by standard surveying techniques to document the location of each grid point and surface elevation. All elevations will be in feet above mean sea level. The grid spacing will be sufficient to detail the site(s) location and boundaries.

A Geometric proton magnetometer, Model G-816/G826 or the equivalent, will be used to conduct the survey. The magnetometer will be operated in accordance with the operating manual.

A base station will be established outside the survey area in an area with no known buried or surface ferrous-metallic objects. Readings at the base station will be repeated every one (1) hour and at the beginning and end of each day. At each point of the grid system, the time, station location and magnetometer readings will be recorded.

APPENDIX C

AIR SAMPLING PROTOCOL

AIR SAMPLING PROTOCOL

I. Draeger Tubes

Draeger tubes are used to determine the concentrations of specific compounds in ambient air. The necessary equipment consists of a hand operated bellows pump which delivers 100 cc of air per stroke and the appropriate Draeger tube. A specific tube is used for each compound to be monitored. The procedure is as follows:

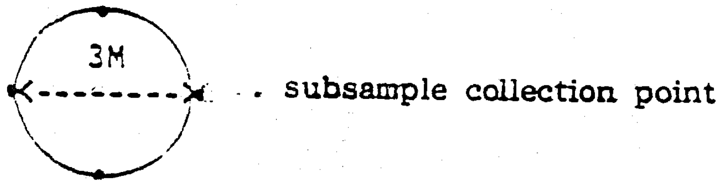
1. Break both tips of the new Draeger tube by placing each end in the break-off plate attached to the bellows pump.
2. Insert the effluent end of the new Draeger tube in the pump head (arrow indicator on the tube should point in the direction of the pump).
3. Operate the bellows pump the prescribed number of times, which is indicated on the Draeger tube.
4. Read the concentration corresponding to the color change of the tube packing as indicated by the graduations on the tube.

APPENDIX D

SURFACE SOILS AND SEDIMENT SAMPLING PROTOCOL

SURFACE SOILS AND SEDIMENT SAMPLING PROTOCOL

Surface soil and sediment samples will be obtained by compositing subsamples of approximately 40 grams each collected from four equally spaced locations on the arc of a three meter circle. One subsample will be collected at the northernmost point of the arc, one at the southernmost point, one at the easternmost point, and one at the westernmost point, as illustrated below.



A 3/4-inch diameter Lexan tube capable of a vertical penetration into mineral soil three inches deep shall be used to extract the four, three-inch deep core subsamples. The composite samples will consist of all four subsamples placed in the same sample container. A new Lexan corer will be used to collect subsamples at each location. The Lexan corer will be disposed of appropriately after sampling.

The sample shall consist only of mineral soil. If sod layers are encountered, such as grass, remove the vegetative sod material by dissection using a scalpel. Discard the scalpel blade and replace with a new blade after sampling at all four subsites.

The subsamples will be homogenized in the field and packed in the sample containers in such a manner so as to minimize volatilization of any constituents (i.e., homogenization will be performed rapidly and samples will be packed as headspace-free as practicable in the sample containers).

The sample containers shall be 40 ml glass vials with teflon caps. The sample containers shall be kept in a covered container to minimize atmosphere contamination at ambient meteorological conditions

APPENDIX E

DRILLING/SAMPLING PROCEDURES FOR TEST BORINGS

DRILLING/SAMPLING PROCEDURES FOR TEST BORINGS

I. Drilling Procedures

All drilling for test borings will be completed employing the auger drilling method. This method involves drilling with a hollow rotating augers stem through which soil samples will be received at selected depths. The inside diameter of the augers shall be 3 3/4". Upon completion of each borehole, the borehole shall be fully grouted its entire length with bentonite cement grout.

II. Soil Sampling Procedure

Split spoon soil samples will be collected from the test borings continuously from land surface to the bottom of the test boring. The sampling method employed shall be ASTM D-1586/Split Barrel Sampling (Method). Soil samples will be retrieved using 2.5' x 2" O.D. split spoons.

A geologist will be on site during the drilling operations to fully describe each soil sample include 1) soil type, 2) color, 3) moisture content, 4) odor, 5) percent (%) recovery and 6) miscellaneous observations such as organic content. The supervising geologist will be responsible for retaining representative portions of each sample in three (3) separate glass containers labelled with 1) the site, 2) the boring number, 3) the interval retained 4) the date, 5) the time of collection and the sampling personnel.

To insure the integrity of the soil samples a chain of custody procedures (Appendix G) will be initiated at the time of shipping and ended upon arrival at the designated laboratory.

A survey control program will be conducted using standard instrument survey techniques to document the test boring locations and ground elevations.

III. Field Screening Procedure

Upon the completion of each test boring all soil samples will be field screened with an HNU meter for gross contamination. Further screening analyses will be determined by site conditions and goals of the site investigation. All screening data will be recorded on a field data sheet.

IV. Equipment Decontamination

All drilling equipment and associated tools including drill rods, sampling equipment, mud tanks, wrenches and any other equipment or tools that may have come in contact with contaminated materials shall be decontaminated using a control water source scrub to remove any residual soil. The sampling equipment will be decontaminated using a methanol followed by distilled water rinse. Spent methanol will be containerized and disposed of properly.

APPENDIX F

MONITORING WELL INSTALLATION PROCEDURES

MONITORING WELL INSTALLATION PROCEDURES

I. Drilling/Sampling Procedures

Test borings shall be completed using the hollow stem auger drilling method, to a depth specified by the supervising geologist/engineer. The inside diameter of the augers shall be 3-3/4" inches. The auger stem is to be turned by a rotary drive head which is mounted on a hydraulic feed mechanism.

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 2.5' long 2" outside diameter split spoon sampler 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 and retained by O'Brien & Gere for possible testing. Chain of custody procedures will be practiced following Section 15, EPA-600/4-82-029, Handbook for Sampling and Sample Preservation of Water and Wastewaters.

Note: Samples collected by split spoon will be field screened by methods outlined in the Drilling/Sampling protocol for test boring completion.

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, 5) time of sample collection, and 6) sampling personnel. This data will be reported in the geologist's field book for later reference.

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 sampler in 6-inch increments) and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

II. Monitoring Well Completion

All monitoring wells will be constructed of PVC flush joint threaded well screen and riser casing (Schedule 40 or 80) that will extend from the screened interval to approximately 2' above existing grade. A #20 slot screen will be used and compatible sandpack is to be used. Other materials utilized for completion will be washed silica sand, bentonite grout, Portland Cement. A protective steel well casing and cap with locks will be used.

The monitoring well installation method for 2" wells shall be to place the screen and casing assembly into the auger string once the screen interval has been selected. At that time a washed silica sand pack will be placed if required to prevent screen plugging. Bentonite grout will then be added to the annulus between the casing and the inside auger wall at a minimum thickness of two feet above the sand pack. A cement/bentonite Grout will 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 grout, frequent measurements will be made to check the height of the sand pack and thickness of bentonite-layers by a weighted tape measure.

A vented protective four (4) inch diameter steel casing shall be located over the vented PVC standpipe extending 2-3' above grade secured by a Portland Cement seal. The cement seal shall extend laterally at least one foot (1') 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 and a steel hasp shall be welded on one side of each steel casing so that the cap may be secured with a steel lock.

The supervising geologist is responsible for recording the exact well details as relayed by the drilling contractor and actual measurement. Both the supervising geologist and drilling contractor are responsible for tabulating all well materials used such as footage of casing and screen or bags of grout, cement or sand.

A field survey control program will be conducted using standard instrument survey techniques to document well location, ground, inner and outer casing elevations.

III. Well Development

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 groundwater. The development will be by one of three methods, air surging, pumping or bailing groundwater from the well until it yields relatively sediment-free water. The determination of which method to use is dependent upon the size and depth of the well and the volume of groundwater in the well.

The air surging method of development consists of extending a clean propylene tube down into the screened portion of the well. This tube attached to an air compressor. The compressed air displaces the water and suspends finegrained material from the well. The well is allowed to surge until the groundwater clears.

If either the pumping or bailing method is used a decontaminated pump or bailer will be utilized and subsequently decontaminated after each use. Groundwater will be pumped from the bottom of the well using a keck model stainless steel submersible pump or equivalent. Bailing will utilize a stainless steel bailer and new polypropylene rope on the bailer at each well. Pumping or bailing will cease when the groundwater yeilds sediment-free water.

IN-SITU PERMEABILITY TEST PROTOCOL

An in-situ permeability test will be performed on selected monitoring wells. The test will be conducted by evacuating or adding a sufficient volume of water from a well to create a potential hydraulic difference between the well and the surrounding aquifer.

Water levels will be measured and recorded at specific time intervals for four (4) hours or until the water level returns to the initial static water level. These measurements will monitor the rate of recovery which is a function of the hydraulic conductivity of the aquifer material.

All water level measurements will be recorded to the nearest hundredth of a foot on the attached field log sheet. The water level probe will be cleaned with methanol swabbing and distilled water rinse between each monitoring well.

Values for the hydraulic conductivity will be calculated using Hvorselv's formulae.

IN–SITU PERMEABILITY TEST
FIELD LOG

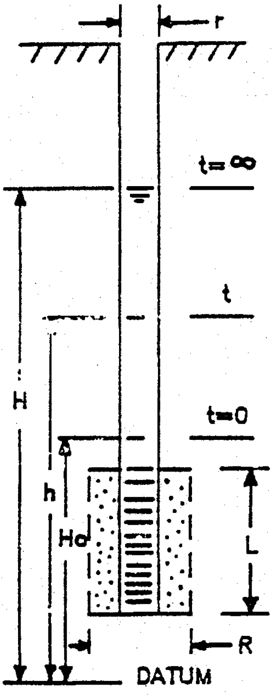
PROJECT ____________________

WELL NUMBER ____________

DATE ______________________

LOCATION __________________________

ELEVATION __________________________



STATIC HEAD (H) ______

PIPE RADIUS (r) ______

SCREEN RADIUS (R) ______

SCREEN LENGTH (L) ______

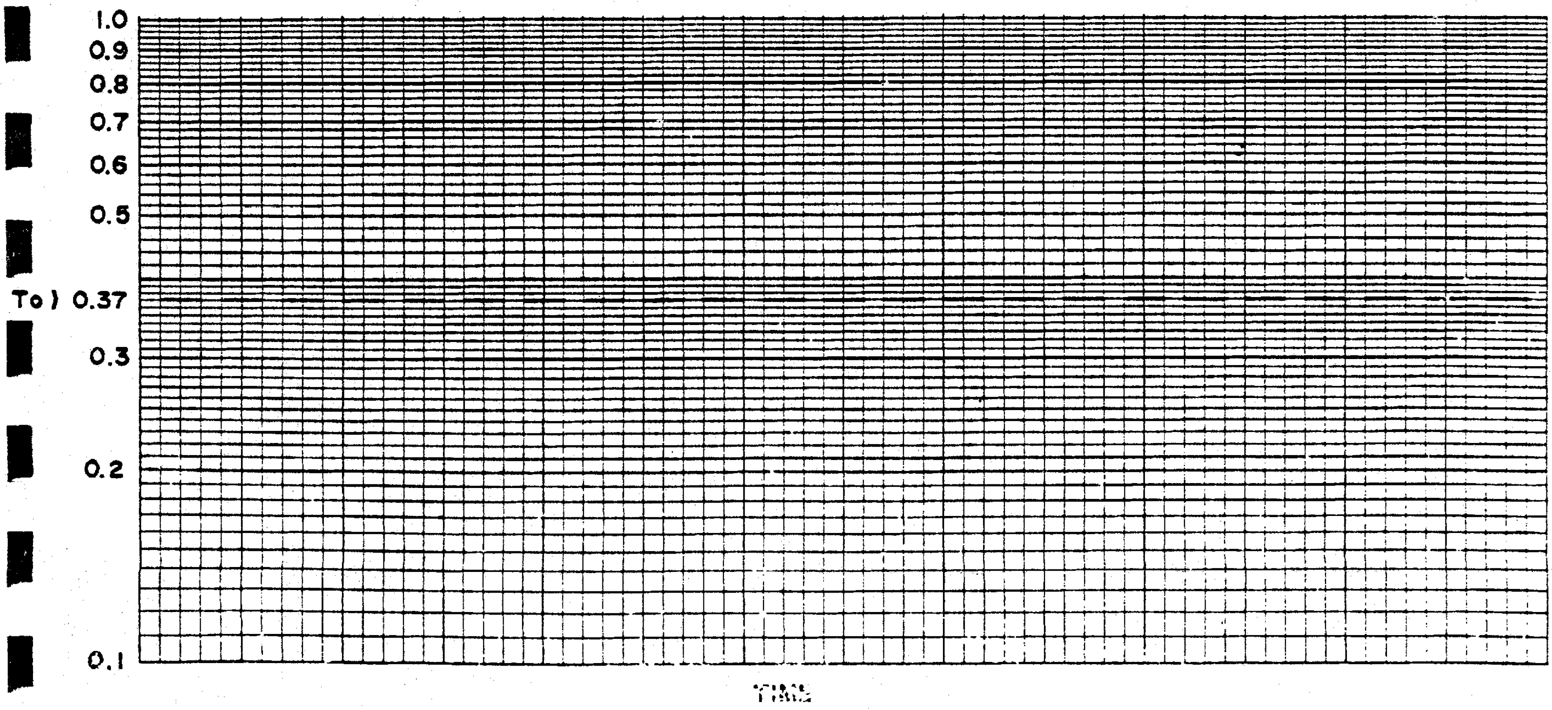
INITIAL HEAD (Ho) ______

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

K= __________________________

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-H_o}$



APPENDIX G

SAMPLE PRESERVATION AND SHIPMENT

SAMPLE PRESERVATION

To maintain the integrity of the groundwater samples, appropriate selection of containers, pretreatment of containers if necessary and the holding times form the integral part of the sample preservation program. The recommenced choice of preservatives, type of sample container, and holding time for various constituents are shown in Table 1 which is taken from the USEPA recommended methods for chemical analysis. The recommended sample volumes are given in Table II.

TABLE 1

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES AND HOLDING TIMES

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]
Physical Properties			
Color	P,G	Cool, 4°C	24 hours
Specific Conductance	P,G	Cool, 4°C	24 hours
Hardness	P,G	Cool, 4°C HNO_3 to pH 2	6 months
Odor	G only	Cool, 4°C	24 hours
pH	P,G	Det. on site	6 hours
Bacterial Tests			
Coliform, fecal and total	P,G	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	6 hours
Fecal streptococci 0.008%, $Na_2S_2O_3$[6]	P,G	Cool, 4°C	6 hours

(Table I - Continued)

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]
Inorganic Tests			
Acidity	P,G	Cool, 4°C	14 days
Alkalinity	P,G	Cool, 4°C	14 days
Ammonia	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days
Biochemical oxygen demand	P,G	Cool, 4°C	48 hours
Biochemical oxygen demand, carbonaceous	P,G	Cool, 4°C	48 hours
Bromide	P,G	None required	28 days
Chemical oxygen demand	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days
Chloride	P,G	None required	28 days
Chlorine, total residual	P,G	None required	Analyze Immediately
Color	P,G	Cool, 4°C	48 hours
Cyanide, total and amenable to chlorination	P,G	Cool, 4°C NaOH to pH 12 0.6g ascorbic acid[6]	14 days[9]
Fluoride	P	None required	28 days
Hardness	P,G	HNO_3 to pH 2	6 months
Kjeldahl and organic Nitrogen	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days
Metals[4]			
Chromium VI	P,G	Cool, 4°C	24 hours
Mercury	P,G	HNO_3 to pH 2	28 days
Metals, except above	P,G	HNO_3 to pH 2	6 months

(Table I - Continued)

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]
Nitrate	P,G	Cool, 4°C	48 hours
Nitrate-nitrite	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days
Oil and grease	G	Cool, 4°C H_2SO_4 to pH 2	28 days
Organic carbon	P,G	Cool, 4°C HCl or H_2SO_4 to pH	28 days
Orthophosphate	P,G	Filter immediately Cool, 4°C	48 hours
Oxygen, Dissolved Probe	G bottle and top	None required Immediately	Analyze
Winkler	G bottle and top	Fix on site and store in dark	8 hours
Phenols	G only	Cool, 4°C H_2SO_4 to pH 2	28 days
Phosphorus (elemental)	G	Cool, 4°C	48 hours
Phosphorus, total	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days
Residue, total	P,G	Cool, 4°C	7 days
Residue, Filterable	P,G	Cool, 4°C	7 days
Residue Non-filterable (TSS)	P,G	Cool, 4°C	7 days
Residue, settleable	P,G	Cool, 4°C	48 hours
Residue, volatile	P,G	Cool, 4°C	7 days
Silica	P	Cool, 4°C	28 days
Specific conductance	P,G	Cool, 4°C	28 days
Sulfate	P,G	Cool, 4°C	28 days

(Table I - Continued)

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]
Sulfide	P,G	Cool, 4°C, add zinc acetate plus sodium hydroxide to pH 9	7 days
Sulfite	P,G	Cool, 4°C	Analyze Immediately
Surfactants	P,G	Cool, 4°C	48 hours
Temperature	P,G	Non required	Analyze Immediately
Turbidity	P,G	Cool, 4°C	48 hours
<u>Organic Tests</u>			
Purgeable halocarbons	G, Teflon-lined septum	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	14 days
Purgeable aromatics	G, Teflon-lined septum	Cool, 4°C 0.008% $Na_2S_2O_3$[6] HCL to pH 2[10]	14 days
Acrolein and acrylonitrile	G, Teflon-lined septum	Cool, 4°C 0.008% $Na_2S_2O_3$[6] Adjust pH to 4-5[11]	14 days
Phenols	G, Teflon-lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction
Benzidines	G, Teflon-lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction
Phthalate esters	G, Teflon-lined cap	Cool, 4°C	7 days until extraction, 40 days after extraction
Nitrosamines	G, Teflon-lined cap	Cool, 4°C store in dark 0.008% $Na_2S_2O_3$	7 days until extraction, 40 days after extraction

(Table I - Continued)

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]
PCB's	G, Teflon-lined cap	Cool, 4°C[8] pH 5-9	7 days until extraction, 40 days after extraction
Nitroaromatics and isophorone	G, Teflon-lined cap	Cool, 4°C	7 days until extraction, 40 days after extraction
Polynuclear aromatic hydrocarbons	G, Teflon-lined cap	Cool, 4°C store in dark 0.008% $Na_2S_2O_3$[6]	7 days until extraction 40 days after extraction
Haloethers	G, Teflon-lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction
Chlorinated hydrocarbons	G, Teflon-lined cap	Cool, 4°C	7 days until extraction, 40 days after extraction
TCDD	G, Teflon-lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction
Pesticides Tests			
Pesticides	G, Teflon-lined cap	Cool, 4°C pH 5-9[8]	7 days until extraction, 40 days after extraction
Radiological Tests			
Alpha, beta and radium	P,G	HNO_3 to pH 2	6 months

NOTES

1. Polyethylene (P) or Glass (G).
2. Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
3. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of samples under study are stable for the longer time. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.
4. Samples should be filtered immediately on-site before adding preservative for dissolved metals.
5. Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.
6. Should only be used in the presence of residual chlorine.
7. For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

8. The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted with 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.

9. Maximum holding time is 24 hours when sulfide is present.

10. Sample receiving no pH adjustment must be analyzed within seven days of sampling.

11. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

12. When any sample is to be shipped by common carrier or set through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table I, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCL) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

TABLE II

RECOMMENDATIONS FOR SAMPLING VOLUME OF SAMPLES ACCORDING TO MEASUREMENT

Measurement	Volume	Container
Metals	1 pt	plastic bottle/cap
Phenols	1 qt	glass bottle/teflon lined cap <u>only</u>
Pesticides	1 qt	glass bottle/teflon lined cap
Herbicides	1 qt	glass bottle/teflon lined cap
Inorganics	1 qt	plastic bottle/cap
Cyanide	1 pt	plastic bottle/cap
Nutrients	1 pt	plastic bottle/cap
Demand	1 pt	plastic bottle/cap
VHO	40 ml	duplicate glass bottle/teflon septum cap
THMS	40 ml	duplicate glass bottle/teflon septum cap
Extractable (base/neutrals/ acid) organics	1 qt	glass bottle/teflon lined cap
Solids	1 qt	plastic bottle/cap
Oil & Grease	1/2 gal	glass bottle/teflon lined cap <u>only</u>

CHAIN-OF-CUSTODY PROCEDURES

Because any sample is physical evidence of a current situation in the environment, possession must be traceable from the time the samples are collected until they are submitted to the laboratory for analysis. To maintain and document sample possession, the following chain-of-custody procedures are to be followed.

Field Custody Procedures

1. Collect only that number which provides a good representation of the media being sampled. To the extent possible, the quantity and types of samples and sample locations are determined prior to the actual field work. As few people as possible should handle samples.
2. Appropriate field sheets must be completed at the time of sample collection. In addition, a bound field notebook must be maintained by the survey leader to provide a daily record of significant events. All entries must be signed and dated. All members of the survey party must use this notebook. Keep the notebook as a permanent record.
3. The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly.
4. The Project Coordinator determines whether proper custody procedures were followed during the field work and decides if additional samples are required.

Transfer of Custody and Shipment

1. Samples are accompanied by a Chain-of-Custody Record (Attached). When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the analyst in a mobile laboratory or at the laboratory.
2. Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate custody record accompanying each shipment (for example, one for each field laboratory, one for samples driven to the laboratory). Shipping containers will be padlocked or sealed for shipment to the laboratory. The method of shipment, courier name(s) and other pertinent information are entered in the bottom of the form.
3. All shipments will be accompanied by the Chain-of-Custody Record identifying its contents. The original record will accompany the shipment, and a copy will be retained by the Project Coordinator.
4. If sent by mail, the package will be registered with return receipt requested. Freight bills, Post Office receipts, and Bills of Lading will be retained as part of the permanent documentation.
5. Upon receipt in laboratory, custody will be transferred by the signature of a staff member recording date and time.

This document becomes a permanent record and is filed with the data report form. The lab staff will then assign each sample a unique number for data storage and retrieval purposes.

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

SURVEY	SAMPLERS: *(Signature)*

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

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:			

APPENDIX H

ANALYTICAL PROCEDURES

ANALYTICAL PROCEDURES

All samples are to be analyzed in accordance with one of the standard analytical methods cited and described in 40 CFR Part 136. These standard analytical methods are described in detail in one of the following references.

1. Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980 or any more recent addition.
2. ASTM Annual Book of Standards, Part 31, Water, 1975.
3. EPA Methods for Chemical Analysis of Water and Waste, 1974.
4. EPA Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, 1982.

Under certain circumstances, the samples may be analyzed by other methods providing that the such other methods are previously approved by the New York State Department of Health.

APPENDIX I

GROUNDWATER SAMPLING PROTOCOL

GROUNDWATER SAMPLING PROTOCOL

Materials

1. Disposable Latex Gloves
2. Plastic Sheeting (10 ft. by 10 ft. minimum)
3. Bailers (top filling) - 1½ inch stainless steel
4. Polypropylene Rope
5. Distilled Water
6. Acetone Solvent
7. Clean Disposable Towels
8. "Soiltest" Water Level Indicator or 100 Ft. Steel Tape
9. "Jabsco" Impeller Pump
10. Tygon Tubing (3/8-inch)
11. Insulated Transport Containers
12. Graduated Pail
13. Conductivity Meter
14. pH Meter
15. Safety Glasses or Goggles
16. Appropriate Sampling Containers
17. Vacuum Flasks (1,000 ml and 250 ml) and Associated Fittings

General

The following procedures must be adhered to during all well developing and sampling operations. Hard hats and safety glasses or goggles must be worn at all times during well development or sampling to prevent splashing of potentially contaminated water into the eyes. Sampling of wells must be discontinued during precipitation periods.

Procedures

Use of the following procedures for the sampling of groundwater observation wells is dependent upon the depth of the water level in the well to be sampled. To obtain representative groundwater samples from wells where water levels are at a depth greater than 25 feet, the bailing procedure should be used. To obtain representative groundwater samples from wells where water levels are at a depth less than 25 feet, the bailing procedure or the pumping procedure can be used. Each of these procedures is explained in detail below.

A. Sampling Procedures (BAILER)

1. Identify the well and record the location on the Groundwater Sampling Field Log. (Attached)
2. Cut a slit in one side of the plastic sheet and slip it over and around the well, creating a clean surface onto which the sampling equipment can be positioned. This clean working area should be a minimum of 10 feet by 10 feet. Do not kick, transfer, drop, or in any way let soils or other materials fall onto this sheet unless it comes from inside the well. Do not place meters, tools, equipment, etc. on the sheet unless they have been cleaned first with a clean rag.
3. Put on a new pair of disposable gloves.
4. Clean the well cap with a clean towel and remove the well cap and plug, placing both on the plastic sheet.
5. Clean the first ten feet of the steel 100 foot tape or electric water level indicator with a methanol soaked towel, rinse with

distilled water and measure the depth to the water table. Record this information on the Groundwater Sampling Field Log.

6. Compute the volume of water in the well using the formulae and information provided on the Groundwater Sampling Field Log. Record this volume on the Groundwater Field Log.
7. 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 it completely.
8. Pull the bailer out of the well, keeping the polypropylene rope on the plastic sheet. Empty the groundwater from the bailer into a new glass quart container and observe its appearance. Return the glass quart to its proper transport container. Note: This sample will not undergo laboratory analysis, and is collected to observe the physical appearance of the groundwater only.
9. Record the physical appearance of the groundwater on the Groundwater Sampling Field Log.
10. Lower the bailer to the bottom of the well and agitate the bailer up and down to resuspend any material settled in the well.
11. Initiate bailing the well from the well bottom making certain to keep the polypropylene rope on the plastic sheet. All groundwater should be dumped from the bailer into a graduated pail to measure the quantity of water removed from the well.

12. Continue bailing the well from the bottom until three times the volume of groundwater in the well has been removed, or until the well is bailed dry. If the well is bailed dry, allow sufficient time (several hours to overnight) for the well to recover before proceeding with Step 13. Record this information on the Groundwater Sampling Field Log.

13. 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 for Total Organic Halogens first.

14. Initiate sampling by lowering the bailer slowly into the well, making certain to submerge it only far enough to fill it completely. Minimize agitation of the water in the well. Fill each sample container following the instructions in the Sample Preservation Procedures. Return each sample bottle to its proper transport container.

15. Record the physical appearance of the groundwater observed during sampling on the Groundwater Sampling Field Log.

16. After the last sample has been collected, record the date and time, empty one bailer of water from the surface of the water in the well into the 250 ml flask, measure and record the pH, specific conductivity and temperature of the groundwater following the procedures outlined in the equipment operation manuals. Record this information on the Groundwater

Sampling Field Log. The 250 ml flask must then be rinsed with acetone and distilled water prior to reuse.

17. Replace the well plug and lock the well protection assembly before leaving the well location.
18. Place the polypropylene rope, gloves, towels and plastic sheeting into a plastic bag for disposal.
19. Begin Chain of Custody procedures.

B. Sampling Procedures (PUMP)

1. Identify the well and record the location on the Groundwater Sampling Field Log.
2. Cut a slit in one side of the plastic sheet and slip it over and around the well, creating a clean surface onto which the sampling equipment can be positioned. This clean working area should be a minimum of 10 feet by 10 feet. Do not kick, transfer, drop, or in any way let soils or other materials fall onto this sheet unless it comes from inside the well. Do not place meters, tools, equipment, etc. on the sheet unless they have been cleaned first with a clean rag.
3. Put on a new pair of disposable gloves.
4. Clean the well cap with a clean towel and remove the well cap and plug, placing both on the plastic sheet.
5. Clean the first ten feet of the steel 100 foot tape or electric water level indicator with a methanol soaked towel, rinse with distilled water and measure the depth to the water table. Record this information on the Groundwater Sampling Field Log.

6. Compute the volume of water in the well using the formulae and information provided on the Groundwater Sampling Field Log. Record this volume on the Field Log.

7. Install a measured length of 3/8-inch ASTM 304 stainless steel tubing into the well such that it is two feet from the bottom of the well. The stainless steel tubing is to be thoroughly cleaned with acetone and distilled water before installation. Once installed, the tubing is left in the well permanently.

8. The top of the stainless steel tubing is connected to a 250 ml flask by pushing it through a silicone stopper (see attached Figure 1) and connected to a 120 V "Jabsco" impeller pump with a piece of 3/8-inch tygon tubing. Another piece of tygon tubing is connected to the pump discharge and runs into a 1000 ml vacuum flask, as shown in attached figure.

9. Use the manually operated vacuum pump to draw water up through the tubing, into the 250 ml flask and through the pump which primes the Jabsco pump. Start the pump, remove the 1000 ml vacuum flask, and pump into a graduated pail until three times the well volume of water in the well is removed, or until the well is pumped dry. If the well is pumped dry, allow sufficient time for the well to recover before proceeding with step 11.

10. Record the physical appearance of the groundwater in the Groundwater Sampling Field Log.

11. 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 bottles to allow for convenient filling. Always fill the bottles for Total Organic Halogens first.

12. Continue pumping the well and remove the silicone stopper from the 250 ml flask while the pump is still running to avoid any runback from the pump. Fill the appropriate sample container following the instructions on the Sample Preservation Procedures. Return each sample bottle to its proper transport container.
13. Record the physical appearance of the groundwater observed during sampling on the Groundwater Sampling Field Log.
14. After the last sample has been collected, record the date and time and pump water from the well into the 250 ml flask, filling it approximately halfway. Measure and record the pH and conductivity of the groundwater following the procedures outlined in the equipment operation manuals. Record this information on the Groundwater Sampling Field Log. The 250 ml flask must then be rinsed with acetone and distilled water prior to reuse.
15. Replace the well plug and lock the well protection assembly before leaving the well location.
16. Place the gloves, towels, and plastic sheeting into a plastic bag for disposal.
17. Begin Chain-of-Custody procedures.

Sample Location ____________________ Well No. ________

Sampled By ____________________ Date __________ Time __________

Weather ____________________ Sampled with Bailer ____ Pump ______

A. Water Table

Well depth (from top of standpipe) ______ Well elevation (top of standpipe) ______

Depth to water table (from top of standpipe ______ Water table elevation ______

Length of water column (LWC) ________ (feet)

Vol~~ume of water~~ in well - 2" diameter wells = 0.163 x (LWC) = ____________ gallons
- 4" diameter wells = 0.653 x (LWC) = ____________ gallons
- 6" diameter wells = 1.469 x (LWC) = ____________ gallons

B. Physical Appearance At Start

Color ______________ Odor ______________ Turbidity ______________

Was an oil film or layer apparent? ______________

C. Preparation of Well for Sampling

Amount of water removed before sampling ____________ gallons

Did well go dry? ______________

D. Physical Appearance During Sampling

Color ______________ Odor ______________ Turbidity ______________

Was an oil film or layer apparent? ______________

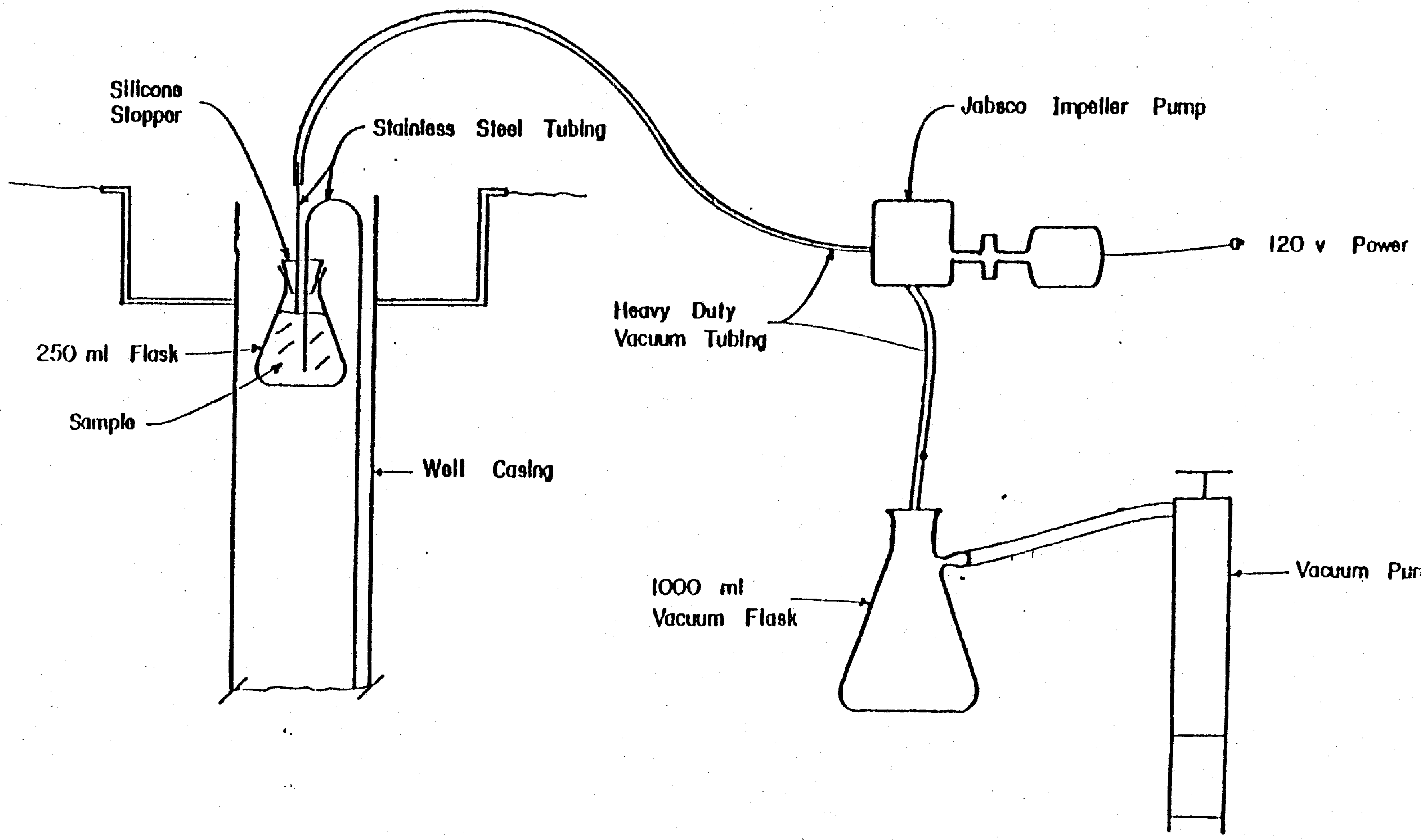
E. Well Sampling

Analysis	Bottle No.	Special Sampling Instructions
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

F. Conductivity ____________________ pH ____________________

O'BRIEN & GERE

WELL PUMPING - SAMPLING SYSTEM



Exhibits

O'BRIEN & GERE

EXHIBIT A

TOL — TOLUENE

Common Synonyms
Toluol
Methylbenzene
Methylbenzol

Watery liquid Colorless Pleasant odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning—high flammability
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methylbenzene
Methylbenzol
Toluol

3.2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon

3.3 **Chemical Formula:** $C_6H_5CH_3$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1294

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent; aromatic, benzene-like; distinct, pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.

5.2 **Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** 600 ppm for 30 min.

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** Kidney and liver damage may follow ingestion.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.17 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 40°F C.C.; 55°F O.C.

6.2 **Flammable Limits in Air:** 1.27%–7%

6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 997°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 5.7 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1180 mg/l/96 hr/sunfish/TL_m/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0%, 5 days; 38% (theor.), 8 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
   Houston, Tex. 77001
2. Shell Chemical Co
   Petrochemicals Division
   Houston, Tex. 77001
3. Sun Oil Co.
   St. Davids, Pa. 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research, reagent, nitration—all 99.8+%; industrial, contains 94+%, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 92.14

13.3 **Boiling Point at 1 atm:** 231.1°F = 110.6°C = 383.8°K

13.4 **Freezing Point:** −139°F = −95.0°C = 178.2°K

13.5 **Critical Temperature:** 605.4°F = 318.6°C = 591.8°K

13.6 **Critical Pressure:** 596.1 psia = 40.55 atm = 4.108 MN/m^2

13.7 **Specific Gravity:** 0.867 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089

13.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86.1 cal/g = 3.61×10^5 J/kg

13.13 **Heat of Combustion:** −17,430 Btu/lb = −9686 cal/g = -405.5×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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ACT

ACETONE

Common Synonyms
Dimethyl ketone
Propanone

Watery liquid | Colorless | Sweet odor

Floats and mixes with water. Flammable, irritating vapor is produced.

Stay upwind and use water spray to "knock down" vapor.
Shut off ignition sources and call fire department. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Avoid contact with liquid and vapor
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, may cause difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
Not irritating to skin.
IF IN EYES, hold eyelids open and flush with plenty of water.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning—high flammability
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dimethyl ketone
2-Propanone

3.2 **Coast Guard Compatibility Classification:** Ketone

3.3 **Chemical Formula:** CH_3COCH_3

3.4 **IMCO/United Nations Numerical Designation:** 3.1/1090

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweetish: pleasant, resembling that of mint or fruit; pungent; sharp, penetrating residual; ketonic, pleasant, non-residual

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; synthetic rubber gloves; chemical safety goggles or face splash shield.

5.2 **Symptoms Following Exposure:** INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. INGESTION: low order of toxicity but very irritating to mucous membranes. SKIN: prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis.

5.3 **Treatment for Exposure:** INHALATION: if victim is overcome, remove to fresh air and call a physician; administer artificial respiration if breathing is irregular or stopped. INGESTION: if victim has swallowed large amounts and is conscious and not having convulsions, induce vomiting and get medical help promptly; no specific antidote known. SKIN: wash well with water. EYES: flush with water immediately for at least 15 min. Consult a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm

5.5 **Short-Term Inhalation Limits:** 1000 ppm for 30 min.

5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} 5 to 15 g/kg (dog)

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors cause moderate irritation of the eyes or respiratory system. Effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin.

5.10 **Odor Threshold:** 100 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 4°F O.C.; 0°F C.C.

6.2 **Flammable Limits in Air:** 2.6%—12.8%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water in straight hose stream will scatter and spread fire and should not be used.

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 869°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 3.9 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
14,250 ppm/24 hr/sunfish/killed/tap water
13,000 ppm/48 hr/mosquito fish/TL_m/turbid water

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** (Theor) 122%, 5 days

8.4 **Food Chain Concentration Potential:** None noted

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Specialty Chemicals Div.
Wilmington Turnpike
Marcus Hook, Pa. 19061

2. Shell Chemical Co.
Industrial Chemicals Div.
Houston, Texas 77001

3. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N. Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical: 99.5% plus 0.5% water
Reagent: 99.5% plus 0.5% water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 58.08

13.3 **Boiling Point at 1 atm:** 133°F = 56.1°C = 329.3°K

13.4 **Freezing Point:** −138°F = −94.7°C = 178.5°K

13.5 **Critical Temperature:** 455°F = 235°C = 508°K

13.6 **Critical Pressure:** 682 psia = 46.4 atm = 4.70 MN/m^2

13.7 **Specific Gravity:** 0.791 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.0

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.127

13.12 **Latent Heat of Vaporization:** 220 Btu/lb = 122 cal/g = 5.11×10^5 J/kg

13.13 **Heat of Combustion:** −12,250 Btu/lb = −6808 cal/g = -285.0×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 6)

NOTES

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MEK

METHYL ETHYL KETONE

Common Synonyms	Liquid	Colorless	Sweet odor
MEK 2-Butanone Ethyl methyl ketone	Floats and mixes with water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

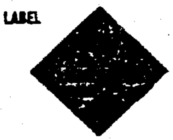
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning—high flammability
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Butanone
Ethyl methyl ketone
MEK
3.2 **Coast Guard Compatibility Classification:** Ketone
3.3 **Chemical Formula:** $CH_3COCH_2CH_3$
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1193

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like acetone; pleasant; pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack; plastic gloves; goggles or face shield.
5.2 **Symptoms Following Exposure:** Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: wash with plenty of water for at least 15 min. and call physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits:** 290 mg/m^3 for 60 min.
5.6 **Toxicity by Ingestion:** Grade 2; 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 10 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 20°F C.C.; 22°F O.C.
6.2 **Flammable Limits in Air:** 1.8%—11.5%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 961°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 4.1 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5640 mg/l /48 hr/bluegill/TL$_m$/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 214%, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N. Y. 10017
2. Exxon Chemical Co.
Houston, Tex. 77001
3. Shell Chemical Co
Industrial Chemicals Division
Houston, Tex. 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 72.11
13.3 **Boiling Point at 1 atm:** 175.3°F = 79.6°C = 352.8°K
13.4 **Freezing Point:** −123.3°F = −86.3°C = 186.9°K
13.5 **Critical Temperature:** 504.5°F = 262.5°C = 535.7°K
13.6 **Critical Pressure:** 603 psia = 41.0 atm = 4.15 MN/m^2
13.7 **Specific Gravity:** 0.806 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.075
13.12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g = 4.44 × 10^5 J/kg
13.13 **Heat of Combustion:** −13,480 Btu/lb = −7491 cal/g = −313.6 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 4)

NOTES

REVISED 1978

ETA

ETHYL ACETATE

Common Synonyms			
Acetic acid, ethyl ester Acetic ester Vinegar naphtha	Watery liquid	Colorless	Pleasant fruity odor
	Floats on water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause headache, dizziness, nausea, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

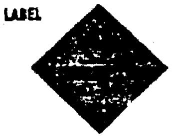
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning—high flammability
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid, ethyl ester
Acetic ester
Acetic ether
Ethyl ethanoate

3.2 **Coast Guard Compatibility Classification:** Ester

3.3 **Chemical Formula:** $CH_3COOCH_2CH_3$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1173

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pleasant, fruity

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or air mask; goggles or face shield.

5.2 **Symptoms Following Exposure:** Headache, irritation of respiratory passages and eyes, dizziness and nausea, weakness, loss of consciousness.

5.3 **Treatment for Exposure:** INHALATION: if victim is overcome, move him to fresh air immediately and call a physician; if breathing is irregular or stopped, start resuscitation and administer oxygen. EYES: flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 400 ppm

5.5 **Short-Term Inhalation Limits:** 1000 ppm for 15 min.

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 1 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 24°F C.C.; 55°F O.C.

6.2 **Flammable Limits in Air:** 2.2%—9.0%

6.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide or dry chemicals

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 800°F

6.8 **Electrical Hazard:** Class I, group D

6.9 **Burning Rate:** 3.7 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** (Theor.) 66%, 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Kodak Co.
   Tennessee Eastman Co., Div.
   Kingsport, Tenn. 37662
2. Monsanto Co.
   Monsanto Industrial Chemicals Co.
   800 North Lindbergh Blvd.
   St. Louis, Mo. 63166
3. Union Carbide Corp.
   Chemicals and Plastics Div.
   270 Park Ave.
   New York, N. Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 85—100%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 88.11

13.3 **Boiling Point at 1 atm:** 171°F = 77°C = 350°K

13.4 **Freezing Point:** −117°F = −83°C = 190°K

13.5 **Critical Temperature:** 482°F = 250°C = 523°K

13.6 **Critical Pressure:** 558 psia = 38 atm = 3.8 MN/m²

13.7 **Specific Gravity:** 0.902 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 6.79 dynes/cm = 0.00679 N/m at 30°C

13.10 **Vapor (Gas) Specific Gravity:** 3.0

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.080

13.12 **Latent Heat of Vaporization:** 158 Btu/lb = 87.6 cal/g = 3.67×10^5 J/kg

13.13 **Heat of Combustion:** −10,110 Btu/lb = −5616 cal/g = -235.1×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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NSV NAPHTHA: SOLVENT

Common Synonyms
Petroleum solvent

Watery liquid Colorless Gasoline-like odor

Floats on water. Vapor is produced.

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with foam, dry chemical or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Not irritating to eyes, nose or throat.
If inhaled, will cause dizziness or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Light naphtha
Petroleum solvent
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1256

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like kerosene and gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline).
5.2 **Symptoms Following Exposure:** High concentration of vapors may cause intoxication. If liquid is swallowed, it may get into lungs by aspiration; not very irritating to skin or eyes.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, treat symptoms. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for 15 min. SKIN: wipe off, wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits:** 500 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD$_{50}$ 0.5 to 5 g/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** >100°F C.C.
6.2 **Flammable Limits in Air:** 0.8%—5.0%
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 444°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 4 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pennsylvania Refining Co.
Butler, Pa. 16001

2 Sun Oil Co.
St. Davids, Pa. 19087

3 Union Oil Co.
Amsco Division
3100 S. Meachem Rd.
Palatine, Ill. 60067

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Refined solvent; crude light solvent; crude heavy solvent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 266—311°F = 130—155°C = 403—428°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.85—0.87 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 19—23 dynes/cm = 0.019—0.023 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 39—51 dynes/cm = 0.039—0.051 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030
13.12 **Latent Heat of Vaporization:** 130—150 Btu/lb = 71—83 cal/g = 3.0—3.4 × 10^5 J/kg
13.13 **Heat of Combustion:** (est.) −18,200 Btu/lb = −10,100 cal/g = −424 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

IPA

ISOPROPYL ALCOHOL

Common Synonyms

Isopropanol
2-Propanol
Dimethylcarbinol
sec-Propyl alcohol
Rubbing alcohol

Watery liquid | Colorless | Unpleasant alcohol odor like rubbing alcohol

Floats and mixes with water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
Harmful if swallowed.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

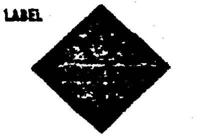
Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning—high flammability
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**

Dimethylcarbinol	2-Propanol
Isopropanol	sec-Propyl alcohol
Petrohol	Rubbing alcohol

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $CH_3CH(OH)CH_3$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1219

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like ethyl alcohol; sharp, somewhat unpleasant; characteristic mild alcoholic; nonresidual

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; chemical goggles or face splash shield.

5.2 **Symptoms Following Exposure:** Vapors cause mild irritation of eyes and upper respiratory tract; high concentrations may be anesthetic. Liquid irritates eyes and may cause injury; harmless to skin; if ingested causes drunkenness and vomiting.

5.3 **Treatment for Exposure:** INHALATION: if victim is overcome by vapors, remove from exposure immediately; call a physician; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 400 ppm

5.5 **Short-Term Inhalation Limits:** 400 ppm for 10 min.

5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} 5 to 15 g/kg (rat: LD_{50}: 5.84 g/kg)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold:** 90 mg/m^3

6. FIRE HAZARDS

6.1 **Flash Point:** 65°F O.C.; 53°F C.C.

6.2 **Flammable Limits in Air:** 2.3% – 12.7%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 750°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 2.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 900-1100 ppm/24 hr/chub/critical range, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 133%, 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. ARCO Chemical Co.
   260 South Broad St.
   Philadelphia, Pa. 19101
2. Shell Chemical Co.
   Industrial Chemical Division
   Houston, Tex. 77001
3. Union Carbide Corp.
   Chemicals and Plastics Division
   270 Park Ave.
   New York, N. Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 91%, 95%, Anhydrous

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 60.10

13.3 **Boiling Point at 1 atm:** 180.1°F = 82.3°C = 355.5°K

13.4 **Freezing Point:** −127.3°F = −88.5°C = 184.7°K

13.5 **Critical Temperature:** 455.4°F = 235.2°C = 508.4°K

13.6 **Critical Pressure:** 691 psia = 47.0 atm = 4.76 MN/m^2

13.7 **Specific Gravity:** 0.785 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.1

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.105

13.12 **Latent Heat of Vaporization:** 286 Btu/lb = 159 cal/g = 6.66×10^5 J/kg

13.13 **Heat of Combustion:** −12,960 Btu/lb = −7,201 cal/g = -301.5×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = -0.2×10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

EXHIBIT B

BORING LOGS

Legend

≡	Stabilized Water Level Reading
⩧	Water Level at Time of Boring
▤	Well Screen
△	Cuttings and Cave-In Materials
░	Sandpack
▓	Bentonite
▨	Grout
▩	Concrete

NOTES CORRESPONDING TO SUBSURFACE LOGS

1.) Soil investigations by auger borings performed in accordance with ASTM designation D 1452-65 (1972).

2.) Penetration test and split-barrel (SB) sampling of soils performed in accordance with ASTM designation D 1586-67 (1974).

3.) Description of soils (subsurface logs in accordance with ASTM designation D 2488-69 (1975).

- Munsell color designations based on in-situ moisture content of soils
- Abbreviated textural descriptions for sand and gravel are as follows:
  - Fine (F)
  - Medium (M)
  - Coarse (C)
- Dashed stratification lines not labelled on the subsurface logs are approximate where in-situ.
- Hydrochloric acid used was 0.95 normal HCl.

TABLE 1

MONITORING WELL CONSTRUCTION SUMMARY

Well #	Elevation	Total Depth Drilled (ft)	Screened[1] Interval	Top of[1] Sand	Top of[1] Bentonite
1	841.01	21.2	17.6 - 12.6'	12.0'	11.5'
2	830.42	13.0	12.0 - 7.0'	6.0'	4.5'
3	832.64	13.0	12.0 - 7.0'	6.0'	5.0'
4	832.65	13.0	12.3 - 7.3'	5.5'	4.5'

[1] Reported as feet below ground surface

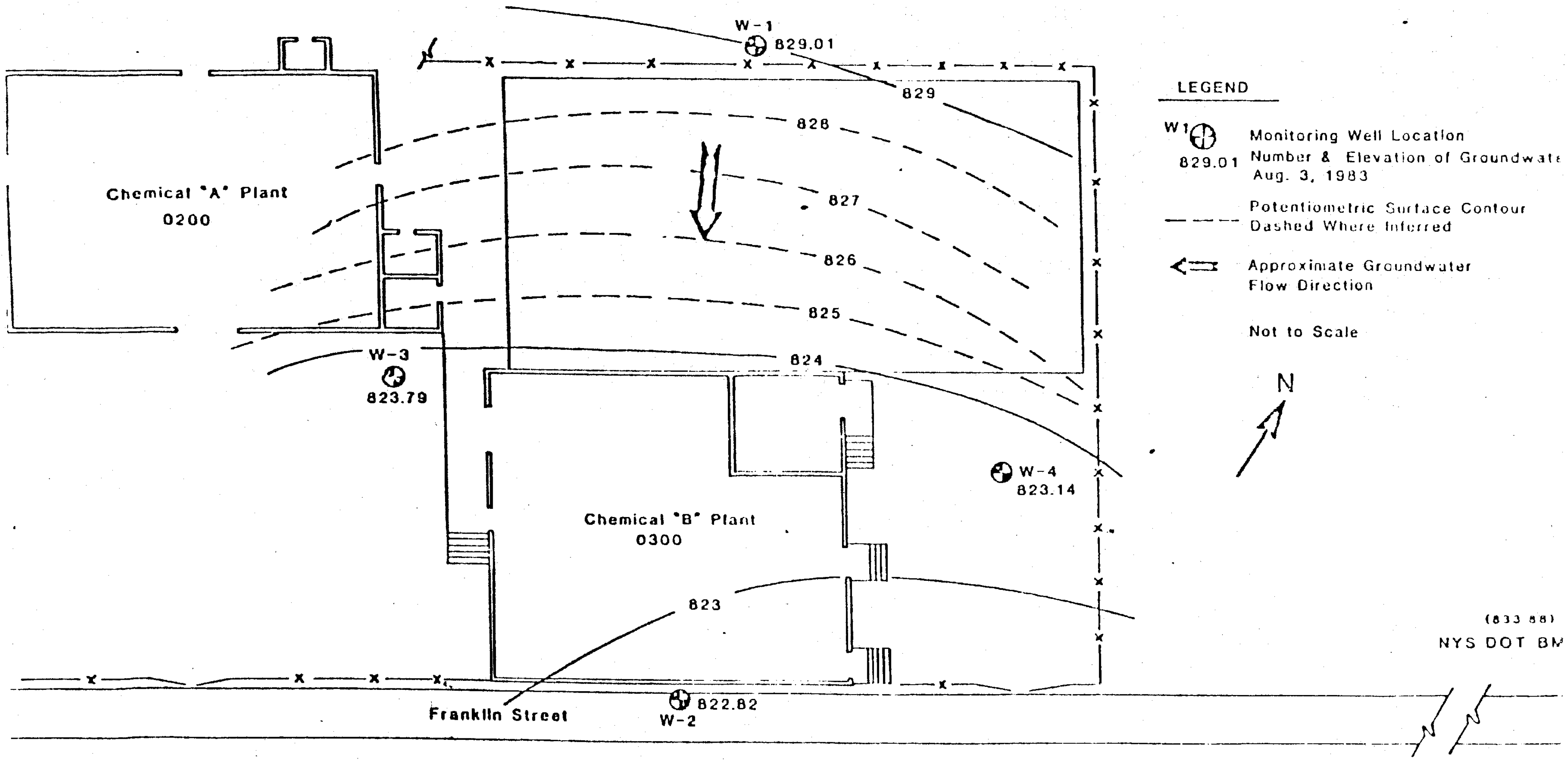


Figure 4

GROUNDWATER CONTOUR MAP

August 3, 1983

RECRA RESEARCH, INC.

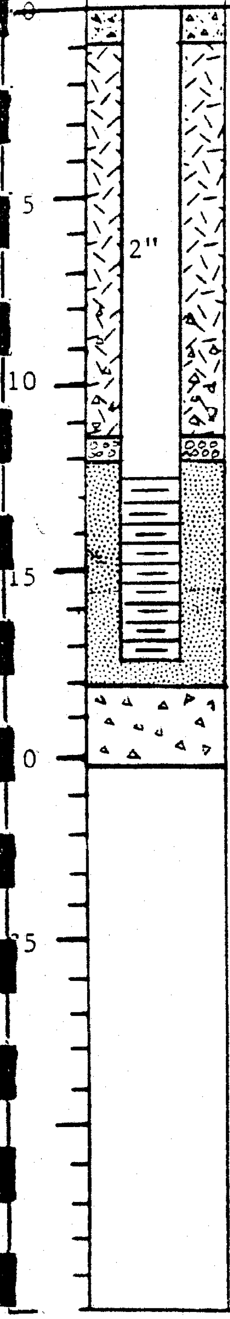
SUBSURFACE LOG

DATE STARTED 7-26-83
FINISHED 7-26-83
SHEET 1 OF 1

HOLE NO. W-1
SURFACE ELEV 841.0
G.W. DEPTH 829.01

PROJECT Endicott Johnson Site Assessment #3C508158
LOCATION Franklin Street Site, see plan diagram

W-1 LOG Well Installation



SAMPLE TYPE	SAMPLE NO	BLOWS ON SAMPLER 0-6 / 12-18	BLOWS ON SAMPLER 6-12 / 18-24
SB	1	18	36
		36	36
	2	8	10
		50	41
	3	26	61
		40	31
	4	22	25
		43	26
	5	15	18
		23	19
	6	36	50
		31	28
	7	34	24
		24	30
	8	24	21
		28	33
	9	29	32
		27	26
	10	6	18
		27	34
	11	18	15
		100/.2	

DESCRIPTION

Moist faintly mottled dark olive gray (5Y 3/1) dark yellow orange (10 YR 4/6) partly organic CLAYEY-SILT, earthy odor, slightly plastic, very stiff in-situ, no reaction to HCL

grades to 2.0'

Moist faintly mottled dark olive gray (5Y 3/1) dark yellow orange (10 YR 4/6) CLAYEY-SILT w/trace (c) SAND and occasional angular shale COBBLE, slight-medium plasticity, homogeneous soil structure, no reaction to HCL

-at 6.0 ft., mottling not apparent (10 YR 4/6)
-at 8.0 ft., with increasing concentration of (c) SAND and (f) GRAVEL

10.0'

Moist dark yellow orange (10 YR 4/6) CLAYEY-SILT with 15-20% shale GRAVEL, slightly plastic, homogeneous soil structure

grades to 12.0'

Saturated dark yellow orange (10 YR 4/6) SANDY-SILT and GRAVELLY SAND, dense non-plastic, homogeneous soil structure

16.0'

Saturated dark yellow orange (10 YR 4/6) SILTY-CLAY with 20-30% Shale GRAVEL, medium-high plasticity, homogeneous soil structure, no reaction to HCL

20.0'

Saturated olive gray (5Y 3/2) SANDY-CLAY with 25% GRAVEL and COBBLE, slight to medium plasticity, homogeneous soil structure

21.2'

NOTES

Boring advanced with 3 3/4" ID hollow stem auger, truck mounted CME 55 drill

8.3% recovery on SB sample #8

W.L. measured at 14'9" from ground-surface, 10:15, 7-26-83

Boring completed at refusal

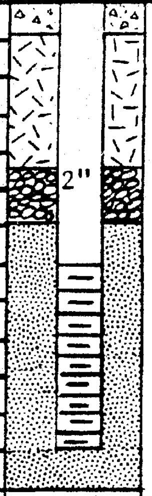
CLASSIFICATION Visual
METHOD OF INVESTIGATION Truck Mounted Auger/ASTM D-1586

DATE STARTED 8-1-83 FINISHED 8-1-83 SHEET 1 OF 2	**RECRA RESEARCH, INC.** **SUBSURFACE LOG**	HOLE NO. B-2 SURFACE ELEV 830.4 G.W. DEPTH 822.82

PROJECT Endicott Johnson Site
Assessment #3C508158

LOCATION Franklin Street Site, see
plan diagram

W-2 LOG Well Install-ation



DEPTH-FT	SAMPLE TYPE	SAMPLE NO	BLOWS ON SAMPLER 0-6	6-12	12-18	18-24	DESCRIPTION	NOTES
0	SB	1	1	8	8		Moist brownish black (5YR 2/1) mottled dark yellow brown (10 YR 4/2) partly organic SANDY-SILT with 20% subangular to subrounded limestone GRAVEL, slightly plastic fines, homogeneous soil structure, reacts to HCL	Boring advanced with 3 3/4" ID hollow stem auger, truck mounted CME 55 drill
		2	7	12	12	13		
5							Moist light gray (N6) mottled dark yellow orange (10 YR 6/6) SILTY-CLAY with 30% GRAVEL and occasional COBBLE, slight-medium plasticity, no reaction to HCL	
10		3	6	5	3	4	Saturated brownish black (5 YR 2/1) GRAVELLY-SILT, non-plastic, loose, homogeneous soil structure, no reaction to HCL	
15		4	7	8	10	9	Saturated olive gray (5Y 4/1) CLAYEY-SILT, slight-medium plasticity, firm, homogeneous structure, no reaction to HCL	Detected transition by auger penetration at 18 ft. from ground surface, probable transition
20		5	13	10	9	13	at 20.0 ft., with 10% shale GRAVEL becoming very stiff	
25		6	15	21	28	70	Saturated olive gray (5Y 4/1) SILTY-CLAY with 10% GRAVEL, very stiff, slight-medium plasticity, homogeneous structure, no reaction to HCL	
30		7	15	20	20	51		

CLASSIFICATION Visual

METHOD OF INVESTIGATION Truck Mounted Auger/ASTM D-1586

RECRA RESEARCH, INC.

SUBSURFACE LOG

DATE STARTED 8-1-83
FINISHED 8-1-83
SHEET 2 OF 2

HOLE NO. B-2
SURFACE ELEV 830.4
G.W. DEPTH 822.82

PROJECT Endicott Johnson Site Assessment #3C508158
LOCATION Franklin Street Site, see plan diagram

DEPTH-FT	LOG	SAMPLE TYPE	SAMPLE NO	BLOWS ON SAMPLER 0-6	BLOWS ON SAMPLER 6-12	BLOWS ON SAMPLER 12-18	BLOWS ON SAMPLER 18-24	DESCRIPTION	NOTES
35		SB	8	20	21	27			See sheet #1 for description
40				38	32	37	41	at 40.0 ft., with 30% GRAVEL	
45				15	16	15		at 45.0 ft., with 15% GRAVEL	
50									49.5' Auger refusal, boring completed

CLASSIFICATION Visual
METHOD OF INVESTIGATION Truck Mounted Auger/ASTM D-1586

DATE
STARTED 7-28-83
FINISHED 7-28-83
SHEET 1 OF 2

RECRA RESEARCH, INC.

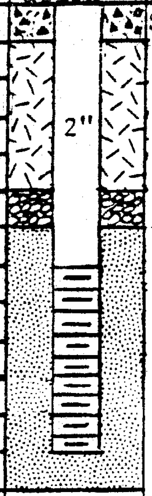
SUBSURFACE LOG

HOLE NO. B-3
SURFACE ELEV 832.6
G.W. DEPTH 823.79

PROJECT Endicott Johnson Site Assessment #3C508158

LOCATION Franklin Street Site, see plan diagram

W-3 LOG Well Installation



DEPTH-FT	SAMPLE TYPE	SAMPLE NO	BLOWS ON SAMPLER 0-6 / 12-18	BLOWS ON SAMPLER 6-12 / 18-24	DESCRIPTION	NOTES
0	SB	1	8 3	4	Dry grayish olive green (5 GY 4/2) SILTY-CLAY, slight to medium plasticity, firm, no reaction to HCL	Boring advanced w/ 3 3/4" ID hollow stem auger, truck mounted CME 55 rig
5		2	1 2	3 3	Moist olive black (5Y 2/1) SILTY-CLAY with 15% coarse subrounded shale and limestone GRAVEL, medium plasticity, soft, homogeneous soil structure	
10		3	6 9	4 16	at 10.0 ft., saturated	
15		4	18 69	23 75/.1	Moist olive black (5Y 2/1) SILTY-CLAY with 20% shale GRAVEL, slight-medium plasticity, very stiff to hand, homogeneous soil structure, no reaction to HCL	Distinct increase in drilling resistance at approximately 13 ft. from ground surface, probable transition
20		5	20	125		
25		6	21 48	20 25		
30		7	25 42	67 59		Boring advanced with 3 1/4" diameter drag bit (wash boring) from 30 ft. below grade to completion

CLASSIFICATION Visual

METHOD OF INVESTIGATION Truck Mounted Auger/ASTM D-1586

DATE
STARTED 7-28-83
FINISHED 7-28-83
SHEET 2 OF 2

RECRA RESEARCH, INC.

SUBSURFACE LOG

HOLE NO. B-3
SURFACE ELEV 832.6
G.W. DEPTH 823.79

PROJECT Endicott Johnson Site Assessment #3C508158
LOCATION Franklin Street Site, see plan diagram

DEPTH-FT	LOG	SAMPLE TYPE	SAMPLE NO	BLOWS ON SAMPLER 0/6	BLOWS ON SAMPLER 6/12	BLOWS ON SAMPLER 12/18	BLOWS ON SAMPLER 18/24	DESCRIPTION	NOTES
35		SB	8	27	87	54			See sheet #1 for description
40			9	75/.3				Saturated dark gray (N5) GRAVELLY-CLAY, slightly plastic, hard in-situ, no reaction to HCL	41.5' boring completed at refusal

CLASSIFICATION Visual
METHOD OF INVESTIGATION Truck Mounted Auger/ASTM D-1586

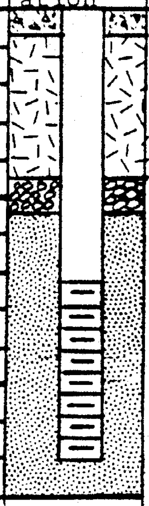
DATE STARTED 7-26-83
FINISHED 7-27-83
SHEET 1 OF 2

RECRA RESEARCH, INC.

SUBSURFACE LOG

HOLE NO. B-4
SURFACE ELEV 832.6
G.W. DEPTH 823.14

PROJECT Endicott Johnson Site Assessment #3C508185
LOCATION Franklin Street Site, see plan diagram



DEPTH-FT	SAMPLE TYPE	SAMPLE NO	BLOWS ON SAMPLER 0-6	6-12	12-18	18-24	DESCRIPTION	NOTES
0	SB	1	2	3	3	3	Moist dark yellowsih brown (10YR 4/2) SILTY-CLAY with 10% GRAVEL, slight-medium plasticity, partly organic, firm, no reaction to HCL	Boring advanced with 3 3/4" ID hollow stem auger, truck mounted CME 55 drilling rig
5		2	4	7	6	7	Moist grayish black (N2) SILT with 20% GRAVEL, slightly plastic, firm, no reaction to HCL	W.L. measured at 7.6' from top of auger casing at 07:30, 7-27-83
10		3	2	4	1	2	Saturated dark gray (N3) SANDY-SILT, poorly graded, fines are non-slightly plastic, no reaction to HCL	
15		4	4	7	8	8	Saturated medium olive gray (5Y 4/2) SILT, uniformly graded, non-plastic, firm, no reaction to HCL	
20		5	16	10	27		Saturated light olive gray (5Y 5/2) SILTY-CLAY with 15-20% GRAVEL, slight-medium plasticity, very stif in-situ, homogeneous soil structure, no reaction to HCL	20.3' transition as determined from SB #5
25		6	11	18	20	16		
30		7	15	32	40	55	at 30.0 ft., with 25% GRAVEL, predominately coarse textured	

CLASSIFICATION Visual
METHOD OF INVESTIGATION Truck Mounted Auger/ASTM D-1586

DATE STARTED 7-26-83 FINISHED 7-27-83 SHEET 2 OF 2	RECRA RESEARCH, INC. SUBSURFACE LOG	HOLE NO. B-4 SURFACE ELEV 832.6 G.W. DEPTH 823.14

PROJECT Endicott Johnson Site Assessment

LOCATION Franklin Street Site, see plan diagram

DEPTH-FT	LOG	SAMPLE TYPE	SAMPLE NO	BLOWS ON SAMPLER 0-6 / 12-18	BLOWS ON SAMPLER 6-12 / 18-24	DESCRIPTION	NOTES
35		SB	8	61	64		See sheet #1 for description
				68			
40			9	28	46		
				100			
45			10	69	100/.3		
							48.0 ft. boring completed at auger refusal
50							

CLASSIFICATION Visual

METHOD OF INVESTIGATION Truck Mounted Auger/ASTM D-1586

DATE
STARTED 7-27-83
FINISHED 7-27-83
SHEET 1 OF 1

RECRA RESEARCH, INC.

SUBSURFACE LOG

HOLE NO. B-5
SURFACE ELEV 833.1
G.W. DEPTH

PROJECT Endicott Johnson Site Assessment #3C508158

LOCATION Franklin Street Site, see plan diagram

DEPTH-FT	LOG	SAMPLE TYPE	SAMPLE NO	BLOWS ON SAMPLER 0-6 12-18	BLOWS ON SAMPLER 6-12 18-24	DESCRIPTION	NOTES
0		SB	1	4 14	11 11	Dry dark yellowish brown (10 YR 4/2) SAND-SILT-CLAY with 25% subrounded GRAVEL, slight-medium plastic fines, medium dense, slight reaction to HCL	Boring advanced with 3 3/4" ID hollow stem auger, CME 55 truck mounted drill
5			2	3 3	3 3	Moist brownish gray (5 YR 4/1) SILTY-CLAY, medium plasticity, firm, no reaction to HCL	
10			3	1 1	2 2	Saturated brownish black (5 YR 2/1) SILT, non-slightly plastic, soft, homogeneous soil structure, no reaction to HCL	
15			4	2 7	6 11	Saturated brownish black (5 YR 2/1) SANDY-SILT, non-slightly plastic, medium dense in-situ	
20			5	5 5	5 5	Saturated dark olive gray (5 Y 3/1) SILTY-CLAY, slightly plastic, firm, homogeneous structure	
25			6	33 25	14 24	Saturated dark olive gray (5 Y 3/1) SILTY-CLAY with 15% shale GRAVEL, very stiff, medium plasticity	Detected change of auger penetration
							27.0 ft. boring completed

CLASSIFICATION Visual

METHOD OF INVESTIGATION Truck Mounted Auger/ASTM D-1586