LITERATURE SEARCH
FOR THE
MALTA ROCKET FUEL AREA
SUPERFUND SITE
TOWNS OF MALTA AND STILLWATER
SARATOGA COUNTY, NEW YORK

Volume I

October 1991

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November 25, 1991

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26 Federal Plaza - Room 737
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Attn: Alison Hess, Project Manager
Malta Rocket Fuel Area Site, Malta, NY
(3 copies)

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50 Wolf Road - Room 222
Attn: Jon Greco, Project Manager
Malta Rocket Fuel Area Site, Malta, NY
(3 copies)

Re: Malta Rocket Fuel Area Site Literature Search Report - Modifications to the Inventory of Underground and Aboveground Storage Tanks, Soil Gas Grids, and Dry Well Sampling Program

Dear Ms. Hess et al.:

Inventory of Underground and Aboveground Storage Tanks

We have reviewed preliminary comments to the Literature Search Report provided by EPA and NYSDEC in a letter dated November 5, 1991. Item 12 of the general comments on soil-gas surveys indicates that additional information is needed by the agencies to determine whether soil-gas surveys will be required for certain aboveground and underground storage tanks. As discussed with Ms. Hess during a subsequent phone conversation, the supporting information available to exclude hydrocarbon storage tanks and pressurized gas tanks from the soil gas program should be added to Table 9, which provides an inventory of present and former storage tanks at the site. In addition, several USTs/ASTs that were inadvertently omitted from Table 9 have been added. Our revisions to Section 9 and Table 9 are attached for your review.

Soil Gas Grids

As requested in your letter, soil gas grids for the Building 13, Building 25, and Building 14 septic systems (figures D-1, D-4, and D-5 respectively) have been revised and are attached for your review. A soil gas grid showing the second MTI septic system is also included (figure D-3).

Two new tanks containing alcohol are included on Table 9: Building 3 (3,000 gallon AST) and Building 25 (3,000 UST). Please note that soil gas surveys are already planned for Building 25 and Building 3. Although soil borings are recommended for these tanks in accordance with the POP, more extensive soil gas surveys of the tanks are not proposed. We do not believe such a survey would provide any useful information. Alcohol degrades rapidly and is very soluble in water, and the likelihood of the gas chromatograph detecting alcohol would be remote.

Soil gas sampling around the Isolde Project Area was included in the draft Literature Search Report simply because it appeared to be required based on criteria provided in the Work Plan and POP for further investigation of ASTs/USTs, and modification of that criteria was not considered a viable option. Upon further consideration, we do not believe a soil gas survey of this area is appropriate. Similar to the situation with alcohol, nitric acid would not be detected in the soil gas analysis, so there is no reason to undertake this effort. If EPA requires soil gas sampling at this site, then we recommend modification of the soil gas sampling grid proposed in the Literature Search Report (figure D-12) based on information obtained by ERM during a site visit.

The Isolde structure is comprised of two small semi-circular corrugated metal "silos" with concrete retaining walls for footers. This structure is about 10 ft X 20 ft X 15 ft. The only known chemical storage at this structure is nitric acid, which was stored in a tank within the silo located farthest from the Building 27C magazine bunker. The soil gas sampling grid provided in the Literature Search Report gives the impression that the Isolde Project Area is large; that is incorrect. The square (dashed line) which purports to be the area boundary is not the actual boundary. In fact, there is no indication that the Isolde Project Area encompassed any area other than the two silos for the reported production of about six gallons of a fuel through mixing chemicals with nitric acid. Also, the current sampling grid would place sampling points in the woods and on top of an earthen covered magazine bunker.

Should EPA require a soil gas survey of this area, ERM recommends placing three soil gas probes in the immediate proximity (within 5 feet) of the Isolde structure where any spills associated with the fuel mixing would have been most likely to have occurred. As with other areas at which soil gas surveys are being conducted, the extent of the soil gas survey can be expanded if constituents are detected at these locations. A sketch reflecting existing and recommended soil gas probe locations is attached.

Modifications to the Dry Well Sampling Program

We propose to modify Section 10.3 (Dry Well Sampling) of the Literature Search Report as a result of some recent field inspection and report revisions that were inadvertently omitted when the report was submitted to EPA on October 15, 1991. The inventory of dry wells presented in Table 12 contains some inaccuracies that we propose to correct. A revised Section 10.3 and Table 12 are included with this letter.

In the Literature Search Report, several interviewees indicated that they believed that floor drains existed in several buildings at the Malta Superfund Site. Specifically, floor drains were reported to exist in Building 6 (Interviewee S, see Page 6-16), in Building 15 (Interviewee W, see Page 6-23), in Building 18 (Interviewee E, see Page 6-5), and in Buildings 27A through 27D (Interviewee E, see Page 6-7). These buildings were added to Table 12 of the Literature Search Report, and it is now apparent that some of this information was incorrect.

Since the report was submitted, each of these building was field checked by ERM to determine if any floor drains are present. In addition, the floor drains identified on an old map of the GE-Exxon building were also checked. The results are provided below.

Building 6

Wright-Malta has indicated that Building 6 does not have a floor drain, and this will verified as soon at the Building is unrestricted. The reference to a floor drain in Building 6 is probably to Building 6A, where one floor drain is present. The drain is in a concrete sump, which is about 3 ft X 5 ft X 4 ft. The drain is in the bottom of the sump pit and is connected to a pipe that trends in the direction of Building 6. This drain pipe appears to leads to Muggetts Pond or to another drain pipe, shown on the site utility map, which also leads to Muggetts Pond. If Building 6 does have a floor drain, it probably leads to one of these drain pipes also. Since Muggetts Pond is scheduled to be sampled as part of the RI, sampling the floor drain is unnecessary.

Building 15

One floor drain is present. The purpose of the drain is to direct potable supply water out of the building should too much water back up into the overflow basin. The drain leads to a concrete trough that leads to the Muggetts Pond drainage ditch. Both ditch systems are scheduled to be sampled as part of the RI. Since the ditch systems are to be sampled, sampling of the floor drain is not necessary.

Building 18

There is a concrete containment sump inside Building 18 below a grated floor where chemicals were stored. A drain is present in the bottom of the concrete containment sump and any spillage/leakage from storage or overflow pipes would enter the drain. The drain line from Building 18 is shown on Figure 3 of the Literature Search Report. The

discharge from the end of this line ultimately enters the on-site drainage ditch connected to Muggetts Pond, which will be investigated as part of the RI. We propose to take the Building 18 surface soil sample at the discharge point of the line.

Building 27

The magazine area consists of four bunkers identified as 27A through 27D. No floor drains were visible during ERM's inspection of the bunkers. A ditch covered by a grate is present several feet in front of bunkers 27A and 27B. The same ditch passes in front of Bunkers 27C and 27D, but a corrugated metal pipe is under the paved area in front of these bunkers; there is no grate. The floor in each bunker slopes toward the ditch. If any spills/leaks occurred inside the bunkers, they would drain into the ditch. One surface soil sample is to be taken from each bunker area, and we recommend that they be taken from the ditch areas in front of the bunkers.

GE-Exxon Building

Five floor drains were identified in an old diagram; however, only one drain was located during the site inspection. Sampling and analysis of the sediment from this floor drain is recommended.

These recommendations have been incorporated into a revised Section 10.3 (Dry Well Sampling) and a revised Table 12, which are attached for your review.

Please call if you have any questions or require additional information.

Very truly yours,

Barbara C. Hotchkin

Barbara Hotchkin
Facility Coordinator

Attachment

cc: Hal Brodie, NYSERDA
Dennis Colton, Geraghty & Miller
Don Hooker, US Army Corps of Engineer
Jane Gardner, Esq., GE
Philip Gitlen, Esq, Whiteman, Osterman, and Hanna
William Miller, ERM
Angus Macbeth, Esq.,/Peggy O'Brien, Esq., Sidley and Austin
August Spallo, Esq., US Army Corps of Engineers

9.0 INVENTORY OF UNDERGROUND AND ABOVEGROUND STORAGE TANKS

A large number of underground storage tanks and aboveground storage tanks were used throughout the site (Table 9). Prior inventories of these tanks are shown on a 1952 map of the site (Figure 2 in RI Work Plan), which has been reproduced as Figure 10 of this report, and also on the 1959 site utility maps (Figures 3 and 4).

Many underground storage tanks were removed by GE in 1961, but none of them were known to be leaking (2). In April 1991, Wright-Malta removed five tanks in Area A and near Building 15. The tanks had been installed in 1945 or 1946 and had been empty for approximately 20 years. Historical evidence indicated that these tanks had been used solely for hydrocarbon storage. No holes were observed in any of the tanks or piping, and any evidence of surficial rusting and pitting was minor. Evidence of contaminated soil was not observed (3).

In December 1990, NYSERDA removed five tanks from the vicinity of Building 17, 20, and 25 (4). The tanks were found to be petroleum storage tanks. No holes were observed in the tanks and there was no evidence of soil contamination. NYSERDA received a Notice of Substantial Compliance from the NYSDEC. The PRPs recommended that the tanks removed in 1990 and 1991 be excluded from further RI work.

Geraghty & Miller compiled an inventory of all past and present underground and aboveground storage tanks during site visits on May 3 and August 29, 1991. Storage tanks and pressurized gas tanks shown on the 1952 and 1959 maps were inventoried to determine their location, number of tanks, tank construction material, tank size, contents, and status (Table 9). Each building was inventoried to determine whether new tanks had been installed. Tank sizes were estimated if not known and the information on the site maps was field-checked. Additional information was acquired from building plans.

Several previously unidentified tanks were discovered during the literature search review and these tanks were included in the inventory presented in Table 9. The tank locations are shown on Figure 7. The past and present use of each identified tank was also described by Wright-Malta employees. The status of each tank is described including whether the tank is present or whether it has been removed, whether it is in use or empty, and whether it is hooked up to a pump or a furnace, or if it had been hooked up in the past (e.g., pipes formerly used to connect a furnace to a fuel oil storage tank).

Tanks that contained pressurized gas cylinders, cryogenic liquid gases, and hydrocarbons were not selected for further investigation in accordance with the RI Work Plan. Tanks requiring further investigation (see Table 9, Figure 9, and Appendix D), as required by the RI work plan, are those used to store rocket fuels, alcohols, or nitric acid. Soil-gas surveys and borings are recommended for tanks used to store rocket fuel. Only borings are recommended for the nitric acid and alcohol-containing tanks, since these compounds would not be detected by the gas chromatograph.

The soil-gas sampling grids provided in Appendix D were based on Geraghty & Miller's preliminary site investigations. Although the sample spacing of 50 ft was maintained when possible, it was often more efficient to place sample points along each accessible side of the known tank location. Due to unpredictable field conditions, modifications to some grid locations may be necessary.

Table 9. Inventory of Underground and Aboveground Storage Tanks at the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Location	Number	Type	Size	Contents	Status*	Tanks Requiring Soil Borings (see Figure 9)
Tanks Present on 1952 Location Map (Figure 10) and 1959 Utility Maps (Figures 3 & 4)						
Building 3	1	Steel AST	500,000 cu.ft.	Liquid Oxygen	Removed (no date)	–
Building 3	1	Steel AST	600,000 cu.ft.	Liquid Oxygen	Removed (no date)	–
Building 3	1	Steel AST	3,000 gallon	Alcohol	Removed (no date)	X
Building 3	1	Steel AST	3,000 gallon	Gasoline	Removed (no date), Formerly Hooked to Pump, Pump Removed	–
Building 5	1	Steel UST	550 gallon	No. 2 Fuel Oil	Present & Empty, Formerly Hooked to Furnace, Furnace Removed	–
Building 5	Unknown	Gas Bottles	Unknown	Gas Bottles	Removed (no date)	–
Building 6A	1	Steel UST	550 gallon	No. 2 Fuel Oil	Present & Empty, Formerly Hooked to Furnace, Furnace Removed	–
Building 7	1	Steel UST	3,000 gallon	No. 2 Fuel Oil	Present & Empty, Hooked to Furnace	–
Building 7	1	Steel UST	550 gallon	No. 2 Fuel Oil	Present & Empty, Hooked to Furnace	–
Building 7	1	Steel AST	300,000 cu.ft.	Compressed Air	In Use	–
Building 7	1	Steel AST	300,000 cu.ft.	Nitrogen	Removed (no date)	–
Building 10	1	Steel AST	3,000 gallon	Diesel Fuel	In Use	–
Building 10	1	Steel UST	550 gallon	Diesel Fuel	In Use, Hooked to Pump	–
Building 10	1	Steel AST	550 gallon	No. 2 Fuel Oil	Removed (no date), Hooked to Furnace	–
Building 11	1	Steel UST	3,000 gallon	No. 2 Fuel Oil	In Use, Hooked to Furnace	–
Building 11C	1	Steel UST	550 gallon	No. 2 Fuel Oil	In Use, Hooked to Furnace	–
Building 13	1	Steel UST	10,000 gallon	No. 2 Fuel Oil	In Use, Hooked to Furnace	–
Building 13	1	Steel UST	1,000 gallon	No. 2 Fuel Oil	Present & Empty, Hooked to Furnace	–
Building 14	1	Steel UST	4,000 gallon	No. 2 Fuel Oil	In Use, Hooked to Furnace	–
Building 15	1	Steel UST	3,000 gallon	Gasoline	Removed 4/91, Formerly Hooked to Pump, Pump Removed	–
Building 15	3	Steel UST	10,000 gallon	No. 2 Fuel Oil	In Use, Hooked to Pump	–
Building 15	1	Steel UST	550 gallon	Gasoline	Removed 4/91, Formerly Hooked to Pump, Pump Removed	–
Building 15	1	Steel UST	550 gallon	No. 2 Fuel Oil	Removed 4/91, Formerly Hooked to Furnace, Furnace Present	–
Building 16	1	Steel UST	1,000 gallon	No. 2 Fuel Oil	Removed (no date), Formerly Hooked to Furnace, Furnace Removed	–
Building 17	1	Steel UST	550 gallon	No. 2 Fuel Oil	Removed 12/90, Formerly Hooked to Furnace	–
Building 18	2	Aluminum AST	500 gallon	Hydrogen Peroxide (90%)	Present & Empty	–
Building 18	1	Steel UST	550 gallon	No. 2 Fuel Oil	Present & Empty, Hooked to Furnace	–
Building 20	1	Steel UST	5,000 gallon	No. 2 Fuel Oil	Removed 12/90, Formerly Hooked to Furnace	–
Building 20	1	Steel UST	4,000 gallon	No. 2 Fuel Oil	Removed 12/90, Formerly Hooked to Furnace	–
Building 20	1	Steel UST	550 gallon	Gasoline	Could not Locate	–
Building 21	1	Steel UST	5,000 gallon	No. 2 Fuel Oil	In Use, Hooked to Furnace	–
Building 21	1	Steel UST	2,000 gallon	No. 2 Fuel Oil	Present & Empty, Hooked to Furnace	–
Building 21	1	Steel UST	5,000 gallon	Kerosene	Present & Empty, Formerly Hooked to Pump, Pump Removed	–
Building 21	1	Steel UST	10,000 gallon	Kerosene	Present & Empty, Formerly Hooked to Pump, Pump Removed	–
Building 21	1	Steel AST	5,000 gallon	Water (Condensate)	Removed (no date)	–
Building 23	1	Steel UST	4,000 gallon	No. 2 Fuel Oil	In Use, Formerly Hooked to Pump, Pump Removed	–
Building 23	1	Steel UST	3,000 gallon	Gasoline	In Use, Hooked to Pump	–
Building 24	1	Steel UST	2,000 gallon	No. 2 Fuel Oil	Removed 1983, Formerly Hooked to Furnace, Furnace Removed	–

Table 9. Inventory of Underground and Aboveground Storage Tanks at the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

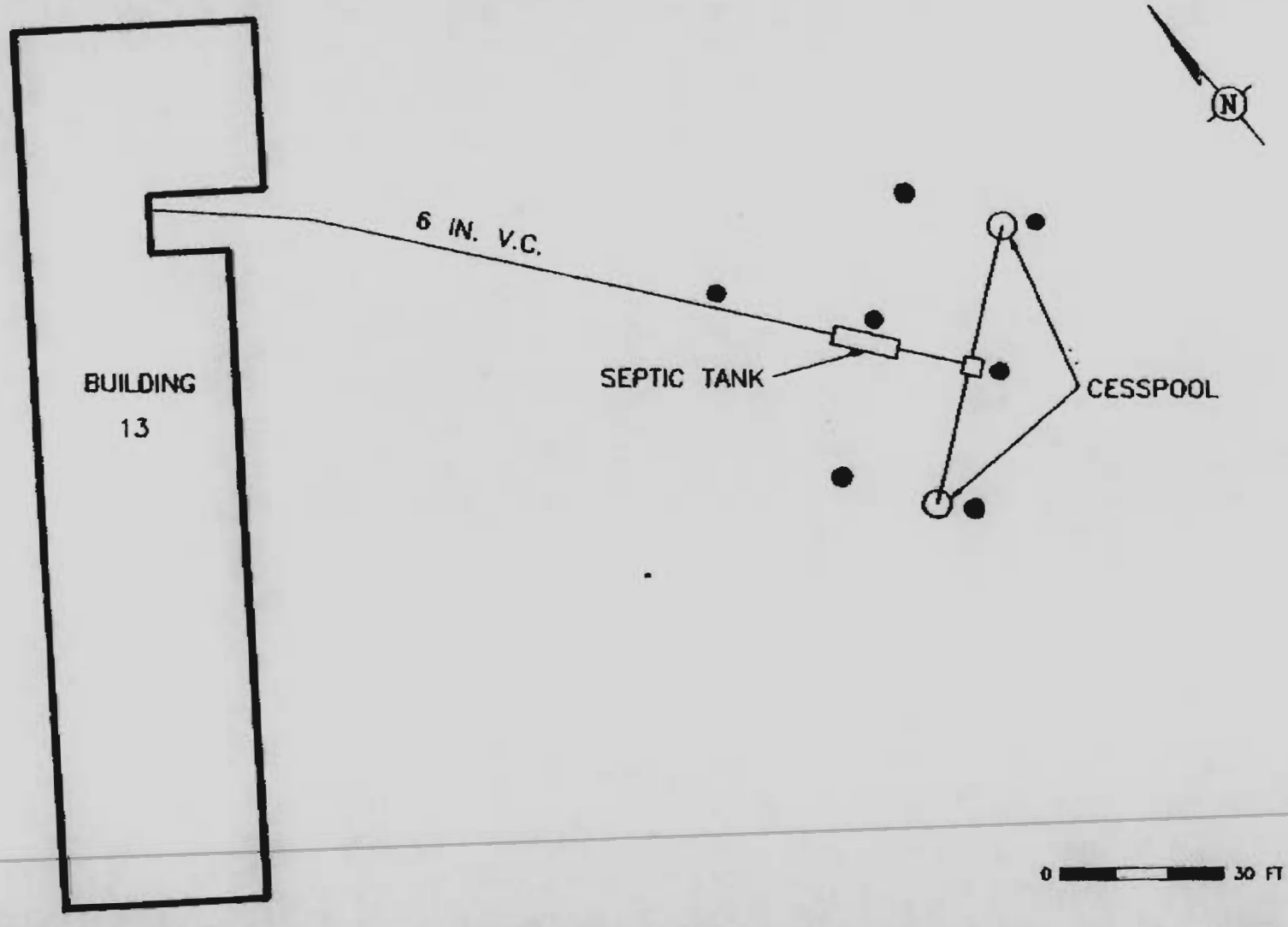
Location	Number	Type	Size	Contents	Status*	Tanks Requiring Soil Borings (see Figure 9)
Tanks Present on 1952 Location Map (Figure 10) and 1959 Utility Maps (Figures 3 & 4)						
Building 25	1	Steel AST	1,500,000 cu.ft.	Liquid Oxygen	Removed (no date)	–
Building 25	1	Steel UST	10,000 gallon	JP4	Removed 12/90, Formerly Hooked to Pump, Pump Present	–
Building 25	1	Steel UST	10,000 gallon	No. 2 Fuel Oil	Removed 12/90, Formerly Hooked to Furnace, Furnace Present	–
Building 25	1	Steel UST	3,000 gallon	Alcohol	Could Not Locate	X
Building 25	1	Steel UST	550 gallon	Gasoline	Could Not Locate	–
Building 28	2	Steel UST	6,000 gallon	No. 2 Fuel Oil	Removed 4/91, Formerly Hooked to Pump, Pump Removed	–
Building 28	2	Steel AST	3,000 gallon	Alcohol	Removed (no date)	X
Building 28	1	Steel AST	650 gallon	Rocket Fuel	Removed (no date)	X
Building 28	1	Steel UST	550 gallon	No. 2 Fuel Oil	Removed (no date) Formerly Hooked to Furnace, Furnace Present	–
Building 28	1	Steel AST	3,000 gallon	Rocket Fuel	Removed (no date)	X
Building 29	2	Steel UST	6,000 gallon	No. 2 Fuel Oil	Present & Empty Formerly Hooked to Pump, Pump Removed	–
Building 29	2	Steel UST	10,000 gallon	No. 2 Fuel Oil	Present & Empty Formerly Hooked to Pump, Pump Removed	–
Building 30	1	Steel UST	10,000 gallon	No. 2 Fuel Oil	Present & Empty, Hooked to Furnace	–
Building 30	1	Steel UST	3,000 gallon	No. 2 Fuel Oil	Present & Empty, Hooked to Furnace	–
Building 30	1	Steel UST	550 gallon	No. 2 Fuel Oil	Present & Empty, Hooked to Furnace	–
Tanks Found During 1991 Literature Search						
Building 1	2	Steel AST	30 gallon**	Rocket Fuel	Removed (no date)	X
Building 2	2	Steel AST	30 gallon**	Rocket Fuel	Removed (no date)	X
Building 2	6***	Gas Bottles	Various	Nitrogen Bottles	Present & Empty	–
Building 3	2	Steel AST	5,000-10,000 gallon**	Rocket Fuel	Present & Empty	X
Building 3	17***	Gas Bottles	Unknown	Gas Bottles	Removed (no date)	–
Building 4	2	Steel AST	1,000 gallon**	Rocket Fuel	Present & Empty	X
Building 4	1	Steel AST	1,000 gallon**	Kerosene	In Use	–
Building 4	1	Steel AST	3,000 gallon**	Kerosene	Present & Empty	–
Building 5	1	Steel UST	6,000 gallon**	Liquid Oxygen	Present & Empty	–
Building 6A	14***	Gas Bottles	Various	Gas Bottles	Present & Empty	–
Building 7	10***	Gas Bottles	Various	Gas Bottles	Present & Empty	–
Building 7B	Unknown	Gas Bottles	230 cu.ft.	Nitrogen	Removed (no date)	–
Building 17	1	Steel AST	275 gallon	No. 2 Fuel Oil	Installed 11/15/91, Hooked to Furnace	–
Building 20	1	Steel AST	250 gallon	No. 2 Fuel Oil	In Use, Hooked to Furnace	–
Building 20	1	Steel AST	5,000 gallon	No. 2 Fuel Oil	In Use, Hooked to Furnace	–
Building 24	3***	Gas Bottles	Unknown	Gas Bottles	Removed 1983	–
Building 24	4	Steel AST(Roof)	Unknown	Rocket Fuel	Removed 1983	–
Isolde	1	Steel AST	700 gallon**	Nitric Acid	Present & Empty	X
GE Exxon	1	Steel AST	250 gallon	No. 2 Fuel Oil	In Use, Hooked to Furnace	–

* Tanks determined by EPA to have only contained petroleum products or pressurized gases, as documented by records or due to their location and piping system (i.e., No. 2 fuel tanks connected to heating systems), will not be investigated (Pages 91 and 93 of RI Work Plan).

** Estimated size.

*** Approximate.

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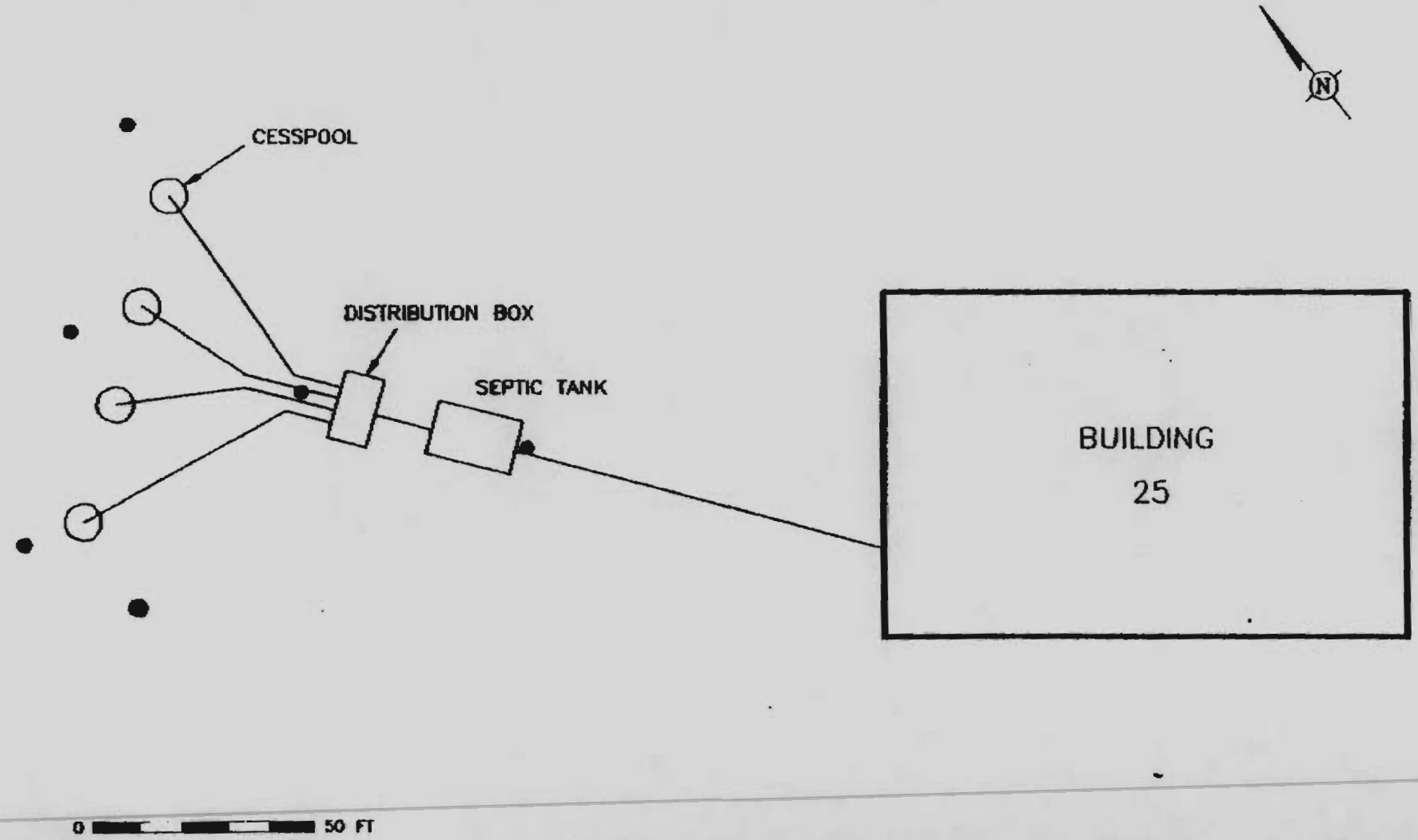
GERAGHTY & MILLER, INC.
Environmental Services

SOIL-GAS GRID: SEPTIC SYSTEM NEAR BUILDING 13

MALTA ROCKET FUEL AREA
SUPERFUND SITE
MALTA/STILLWATER, NEW YORK

FIGURE
D-1

DWG DATE: 6-5-91	PRJCT NO.: NY04605	FILE NO.: 1206	DRAWING: BLDG25	CHECKED: DS	APPROVED: LV	DRAFTER: GS



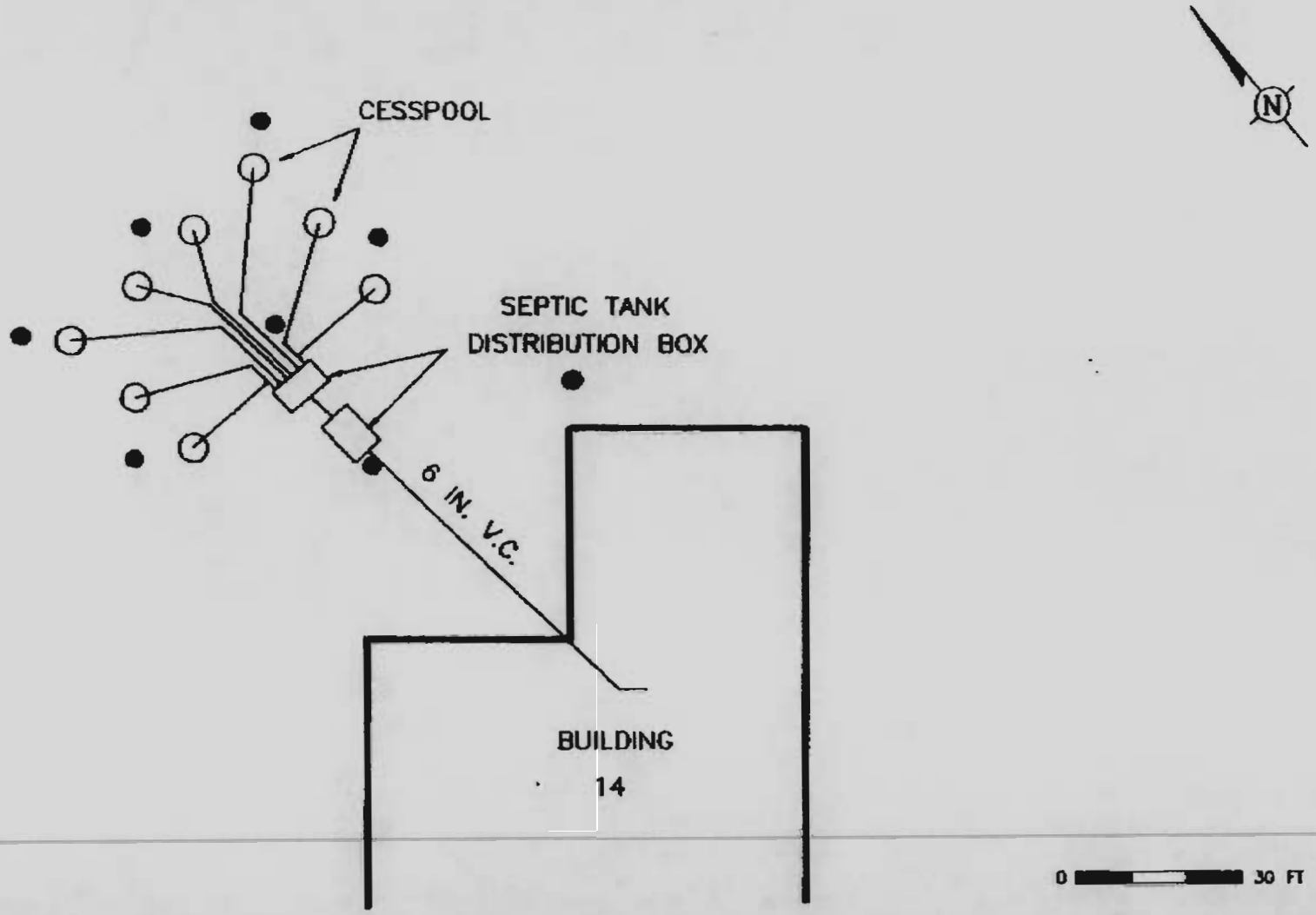
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SOIL–GAS GRID: SEPTIC SYSTEM NEAR BUILDING 25

MALTA ROCKET FUEL AREA
SUPERFUND SITE
MALTA/STILLWATER, NEW YORK

FIGURE
D-4

DWG DATE: 6-5-91	PRJCT NO.: NY04605	FILE NO.: 1208	DRAWING: BLDG13	CHECKED: GS	APPROVED: LY	DRAFTER: GS



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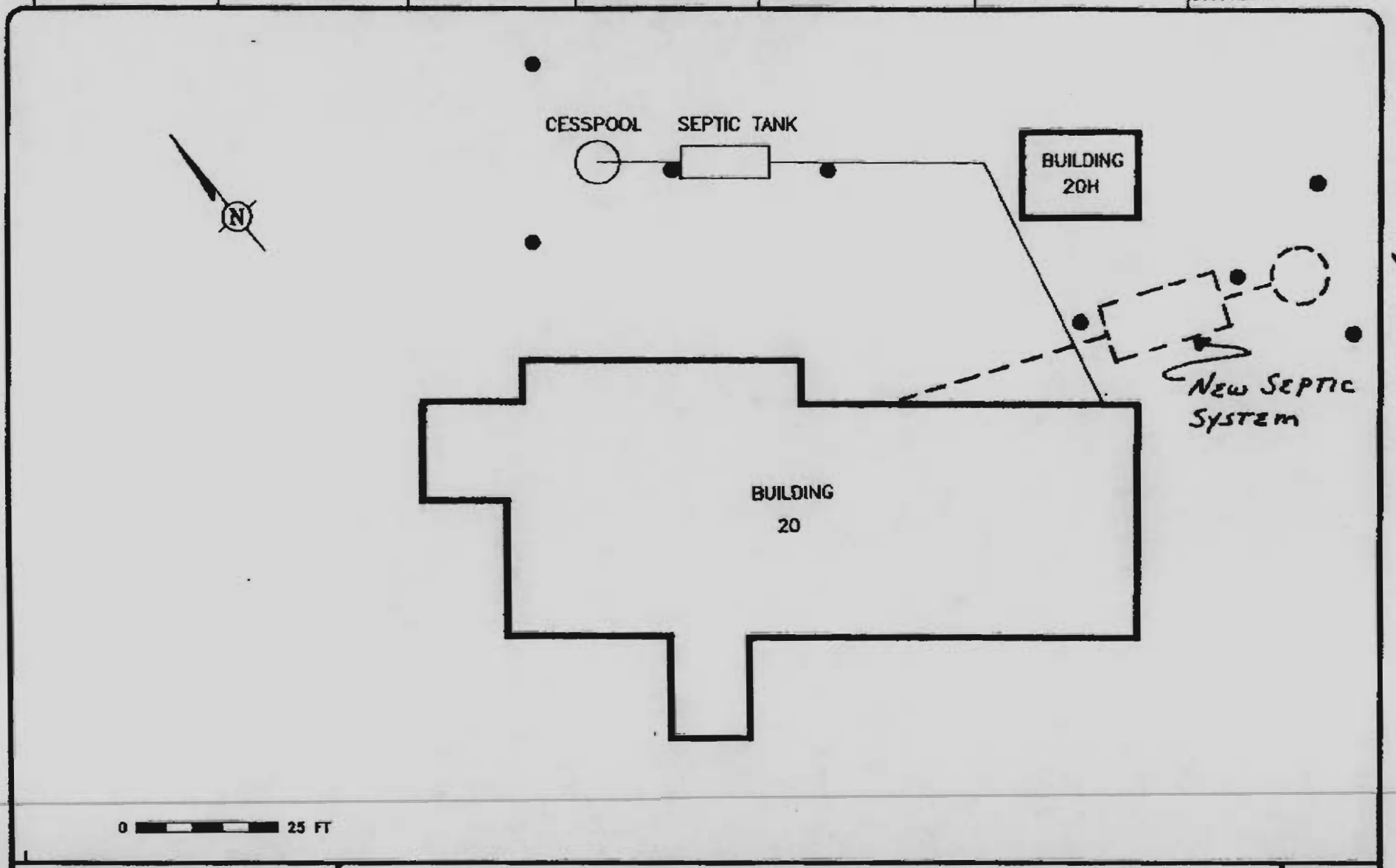
SOIL-GAS GRID: SEPTIC SYSTEM NEAR BUILDING 14

MALTA ROCKET FUEL AREA
SUPERFUND SITE
MALTA/STILLWATER, NEW YORK

FIGURE
D-5

11. 26. 91 02:36PM *G & M INC. N. Y.

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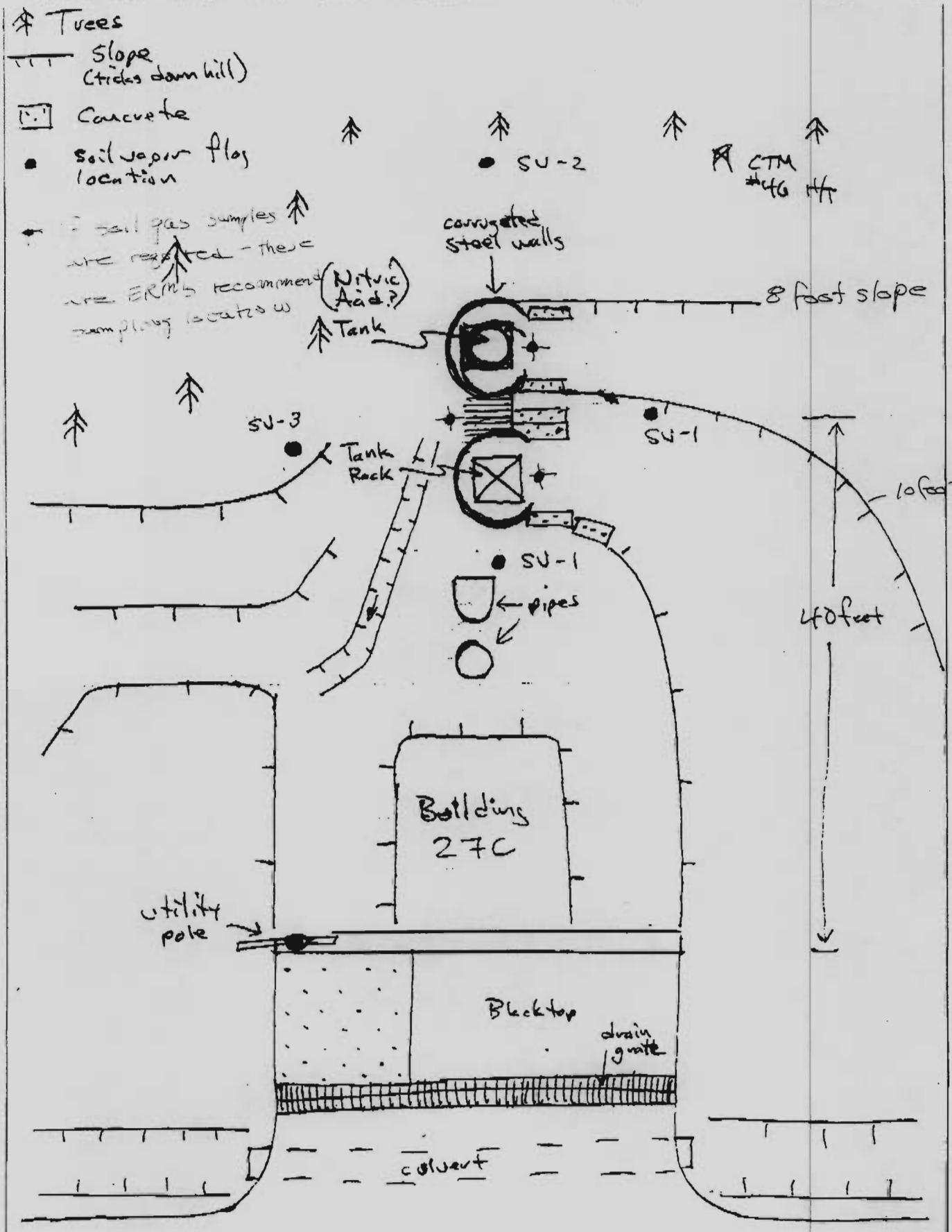
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SOIL–GAS GRID: SEPTIC SYSTEM NEAR BUILDING 20

MALTA ROCKET FUEL AREA
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MALTA/STILLWATER, NEW YORK

FIGURE
D-3

11. 26. 91 02:25PM *G & M INC. N. Y.



SKETCH OF MAGAZINE "C"

ISOLDE AREA

10.3 DRYWELL SAMPLING

In accordance with the RI Work Plan, an inventory of dry wells was conducted for the MRFA site (Table 12). The locations and piping of the drywells (Figures 7 and 8) were compiled from historical maps and building construction diagrams. During the August 29, 1991 site visit, Geraghty & Miller took an inventory of visible dry wells. The results are listed in Table 12.

Most of the drywells identified during the literature search served as floor drainage receptors. These wells will require sediment sampling, where possible, in accordance with the RI Work Plan. However, several dry wells or drains do not require sampling as described below.

- Floor drains were not found in Building 6; however, one drain is present in Building 6A. The drain is in the bottom of the sump pit and is connected to a pipe that trends in the direction of Building 6. This drain pipe appears to lead to Muggetts Pond or to another drain pipe, shown on the site utility map (Figure 3), which also leads to Muggetts Pond. Since the pond is scheduled to be sampled during the RI, we have not proposed this drain for sampling.

- A floor drain located in Building 15 is used to direct potable supply water out of the building if water overflows the on-site water supply system's overflow basin. If this occurs, the water will flow to the on-site drainage ditch which leads to Mugget's Pond. The ditch and pond are scheduled to be sampled as part of the RI. Therefore, we have not proposed this drain for sampling.

- There is a concrete bunker inside Building 18 which is below an area where chemicals were stored. A drain is present in the bottom of the concrete bunker and any spillage/leakage from storage or overflow pipes would enter the drain. The drain line from Building 18 appears to be shown on Figure 3 of the Literature Search Report. Discharge from the end of this line would enter the on-site drainage ditch connected to Muggett's Pond. The ditch area is not proposed for additional sampling because it is scheduled to be investigated as part of the RI.

11. 26. 91 02:25PM *G & M INC. N. Y. P04

- The drywell located near Building 20 was connected to a potable water line valve pit and, therefore, it is not proposed for sampling.

- A drywell outside the former GE/Exxon Nuclear building was used for storm drainage and it is not proposed for sampling. Of the five drywell/drains located on a diagram of the building, only one could be located during a site inspection, and therefore, only one is proposed for sampling.

Table 12. Inventory of Dry Wells at the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Location (see Figure 7)	Number of Dry Wells	Function	Sampling Recommended
Building 1A	3	Drained Floors	Yes
Building 1B	1	Drained Floors	Yes
Building 2	3	Drained Floors	Yes
Building 3	2	Rocket Fuel Tank Emergency Drainage	Yes
Building 4	2	Rocket Fuel Tank Emergency Drainage	Yes
Building 5	2	Drained Floors	Yes
Building 8	2	Drained Floors	Yes
Building 9	2	Drained Floors	Yes
Building 20 (SW Side)	1	Drained Valve Pit for Potable Water Lines	No
Building 20H	1	Drained Floors	Yes
Building 20E	1	Sewer Dry Well	Yes
GE/Exxon Nuclear Building - Inside (see Figure 8)	5 (1 located)	Drained Floors	Yes
GE/Exxon Nuclear Building - Outside (see Figure 8)	1	Covered Storm Drain (outside building)	No

LITERATURE SEARCH
FOR THE
MALTA ROCKET FUEL AREA
SUPERFUND SITE
TOWNS OF MALTA AND STILLWATER
SARATOGA COUNTY, NEW YORK

October 14, 1991

Geraghty & Miller, Inc. is submitting this report to the Malta Rocket Fuel Area Superfund Site Potentially Responsible Parties for work performed at the Malta Rocket Fuel Area Superfund Site. The report was prepared in conformance with Geraghty & Miller's strict quality assurance/quality control procedures to ensure that the report meets the highest standards in terms of the methods used and the information presented. If you have any questions or comments concerning this report, please contact one of the individuals listed below.

Respectfully submitted,

GERAGHTY & MILLER, INC.

David Stockar
Staff Scientist

Laine Vignona
Principal Scientist/Project Manager

Dennis Colton
Project Director/Project Officer

DS/LV/DC:vk
malta.rpt

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B. List of Pertinent Documents Reviewed in the Literature Search.

C. Summary of Analytical Results.

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LITERATURE SEARCH
FOR THE
MALTA ROCKET FUEL AREA
SUPERFUND SITE
TOWNS OF MALTA AND STILLWATER
SARATOGA COUNTY, NEW YORK

1.0 INTRODUCTION

The Literature Search Report for the Malta Rocket Fuel Area (MRFA) Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York, is Task 1 of the Revised Remedial Investigation (RI) Work Plan and the Project Operations Plan (POP) that were prepared by Geraghty & Miller, Inc. The RI Work Plan received conditional approval from the United States Environmental Protection Agency (USEPA) in February 1991. The POP received conditional USEPA approval in August 1991. A potentially responsible party (PRP) response addressing the conditions of USEPA's approval was provided on August 15, 1991.

In accordance with Section 4.2 of the Revised RI Work Plan, a literature search was conducted to further determine the history of operations at the site, as well as geologic, hydrogeologic, and environmental quality information. The following potential sources of information were contacted by letter of July 11, 1990: Whiteman, Osterman & Hanna on behalf of the New York State Energy Research and Development Authority; Wright-Malta Corporation; Mechanical Technology, Inc.; Sidley & Austin on behalf of General Electric (GE); Advanced Nuclear Fuels, Inc.; Olin Corporation; U.S. Army Corps of Engineers; Higgins, Roberts, Beyerl & Coan on behalf of Power Technologies, Inc.; and Curtiss-Wright Corporation. Whiteman, Osterman & Hanna, Wright-Malta, Sidley & Austin, the U.S. Army Corps of Engineers, Olin Corporation and Exxon Company USA provided documents pertinent to the MRFA. A January 18, 1991 follow-up letter was written to those respondents who had not answered the July 11 letter.

The New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH), and USEPA provided additional documents.

All documents obtained by Geraghty & Miller were reviewed to determine those that contained pertinent information on the MRFA site. The evaluation of these documents is included in this report and a bibliography of all references obtained by Geraghty & Miller is provided in Appendix B.

The purpose of the literature search was to identify areas or activities that may be related to the release or threatened release of hazardous substances; to determine, to the extent possible, the nature of chemicals used at the site, the storage and disposal of such chemicals onsite, and the chemical and physical properties of those chemicals detected at the site that are not listed on the USEPA Target Compound List (TCL). This report includes:

- Summaries of interviews with persons associated with the site concerning hazardous substances used or generated at the site and their chemical and physical properties; quantities of such material used; transportation of such material to or from the site; and treatment, storage, disposal and handling of such material.

- A review of available regulatory agency files containing data from permits, sampling episodes, and historical reports; available regulatory agency files concerning the public and private water supply wells within a 3-mile radius of the site, and information concerning the location and ownership of each property bordering the site.

- An evaluation of historical aerial photographs, maps and photographs and identification of areas subjected to soil disturbance and/or construction activity.

- Summaries of documents that provided information concerning site history and operations.

- Locations of all known underground and overhead utilities at the site and locations of all areas of activity or disturbance not already included in the RI Work Plan as areas of concern.

- An inventory of aboveground and underground storage tanks, septic systems, and dry wells.

- A review of newly obtained data in terms of the analytical levels (1 through 5) set forth in the guidance document "Data Quality Objective For Remedial Response Activities" (USEPA, 1987).

- New York State 1A Cultural Resource Survey.

2.0 SITE DESCRIPTION

The MRFA site, also known as the Saratoga Research and Development Center, is located in the Towns of Malta and Stillwater, Saratoga County, New York (Figure 1). The MRFA site includes 445 acres, 165 of which comprise the MRFA Test Station, established by the U.S. Government in 1945 for rocket testing, and 280 acres of which are primarily undeveloped forest used as part of the 1-mile radius safety easement for the Site (1).

The site is located approximately 1 mile southeast of the Luther Forest housing development, 1 1/2 miles south of Saratoga Lake, and 2 miles north of Round Lake. The population within a 2-mile radius of the MRFA Test Station is approximately 10,000 (1).

2.1 PROPERTY BOUNDARIES AND OWNERSHIP

The site is currently owned by the New York State Energy Research and Development Authority (NYSERDA) and Wright-Malta Corporation. Wright-Malta owns 81 acres of the MRFA Test Station, including most of the original buildings, test areas, rocket gantries, and the water-supply system. NYSERDA owns the remainder of the site including all of the 280-acre portion of the safety easement, Building 25 and the former GE/Exxon-Nuclear building (1). The MRFA Test Station is currently occupied by GE, Wright-Malta and Mechanical Technologies, Inc. (MTI). MTI leases the former Building 20 complex from NYSERDA. The former GE/Exxon Nuclear building is currently occupied by ALPS Corporation, a company producing silicon products for medical use, under lease from NYSERDA.

Maps showing the 1990 property boundaries on and adjacent to the site were obtained from the Saratoga County offices in Ballston Spa, New York and were compiled into Figure 2. Property owners with land on or bordering the site were determined based on these maps. The name and current address of each property owner is listed in Table 1. Some section numbers on Figure 2 include many properties (private residences) and it is not

possible to distinguish those adjacent to the MRFA site (e.g., Section 230.54). For these section numbers, we have included all of the property owners, whether or not they are actually adjacent to the MFRA site.

2.2 UTILITIES

Figures 3 and 4 show the locations of all known underground and overhead utilities (electric, water, steam, gas, and sewer) at the MRFA Test Station and the Power Technology, Inc. (PTI) building. Septic tanks and dry wells are also shown on these figures. Figure 5 is a utility location map for the former GE/Exxon-Nuclear building area. At the site, the locations of gas lines, such as oxygen and nitrogen lines, are designated by stone markers and concrete pylons bearing colored stripes. Plain rectangular stone tablets in the wooded easement of the site are old property boundary markers.

2.3 PUBLIC WATER SUPPLY WELLS

A review of available NYSDEC and NYSDOH files was conducted and a location map of all public water supply wells within a 3-mile radius of the site was prepared (Figure 6). A table listing the concentrations of volatile organic compounds detected in public water supply wells was prepared (Table 2). A table listing the concentrations of metals detected in the public supply wells was also prepared (Table 3). Tables 2 and 3 also note any concentrations which exceed federal and New York State maximum ground-water contamination levels (the USEPA MCL, Revised lONYCRR Subpart 5-1, lONYCRR Part 170, or 6NYCRR Part 703.5). Available well construction details were tabulated and are presented in Table C-1 (Appendix C). Available water-quality data for the identical wells are provided in Tables C-2 through C-11 (Appendix C). Additional data for the MFRA site water supply has been summarized by O'Brien & Gere Engineers and the NYSDOH and it is provided as Attachments C-A and C-B in Appendix C.

3.0 BACKGROUND

The information contained in this section presents the historical background of the MRFA Test Station in roughly chronological order. Because of the nature of the work involved at the Test Station and the years of its operation, documentation is sketchy. Much of the information contained here was gleaned from documents in the Government's possession that had to be declassified before they could be reviewed. This declassification process continues and it is possible that additional documentation may yet be obtained, although it is not known when that will occur because the process takes a great deal of time. As additional relevant historical information becomes available, however, it will be provided to EPA. In addition, it is known that some potentially pertinent documents were destroyed many years ago. For instance, as part of the declassification process, GE obtained a list of classified documents that dealt with Project Hermes which were destroyed by burning in 1952 by the Government. Apparently because the documents were classified at the time of destruction, the descriptions of the documents do not offer much enlightenment as to their substance. It is not known how many other classified and possibly unclassified documents were likewise routinely destroyed by the Government over the years. It is known, however, that documents at the MRFA Test Station were shredded and burned by GE on a routine basis.

Despite this, it is believed that this history presents a reasonably complete picture of activities over the years. Because many of the documents that were obtained do not go into great detail about the mechanics or location of certain activities, it often is difficult to be precise or as complete as would be desirable. Where information existed, however, that allowed a determination to be made as to chemicals used or locations of activities, that information is included. Where the precise location or other details appear to be missing, however, it is because documentation containing such detailed information does not appear to exist.

Initial Development of the Test Station

The MRFA Test Station was established by the U.S. Government in 1945 for rocket development and testing. The U.S. Government leased an 85 acre parcel of land from Thomas F., Margaret G. and Alice T. Luther in March 1945 and another 75 acres in September 1947.(1) In October 1953, the U.S. Government, by declaration, took a lease-hold interest in the MRFA Test Station.(2) In March 1955, the U.S. Government filed a declaration of taking, condemning the property for military use.(3) Human habitation was prohibited within the 1-mile safety easement and the main activity on the easement area since has been a commercial forestry operated by the Luther Forest Corporation.(4)

Project Hermes (1945 to 1954)

Construction at the MRFA Test Station began in early 1945 and, by August 1945, Test Pit 1, a laboratory and office building were completed and turned over to Project Hermes.(5) Project Hermes was a U.S. Army and Navy project designed to, among other things, develop a United States counterpart to the German V-2 rocket. The portion of the Hermes program performed at the MRFA Test Station was carried out primarily by GE, and to a lesser extent by Olin, under contract to the Departments of the Army and Navy. Project Hermes continued until mid-1954. From 1945 to 1954, construction at the MRFA Test Station continued and various types of test activities were conducted. During the Project Hermes period, the following activities were reportedly conducted by GE for the Army and Navy:

- Test Pit 1 -- first complete static "hot" test of a rocket motor was conducted (Dec. 1945).(6)
- Test Pit 1 -- water-cooled 40-lb. and 100-lb. motors tested (Dec. 1945).(7)
- Test Pit 2 -- static testing of larger rocket motors (late 1946).(8)
- Test Pit 1A -- chemical-research rocket motors tested (late 1946).(9)

- Experiments conducted with fuel additives to improve efficiency (e.g., adding ethyl silicate to alcohol) (June 1947).(10)
- Funds requested by the Department of the Army, including funds for "unconventional" fuel storage tanks (June 1947).(11)
- Test Structure 6 -- development testing of rocket fuel feed systems (July 1947).(12)
- Rocket motor test using diborane fuel (July 1947).(13)
- Test Pit 3 -- first static rocket test in Test Pit 3 (March 1948).(14)
- Gaseous diborane-gaseous oxygen rocket motor test program ends (April 1948).(15)
- First high-thrust (16,000 lb.) rocket motor static test for later use in Hermes A-1 rocket (July 1948).(16)
- Test Pit 4 prepared to test Hermes A-1 rocket, including measurements of alcohol, oxygen, and helium temperatures and pressures and the time of carbon jet vane burnoff (Aug. 1948).(17)
- Pit 3 -- used for testing of a 6-inch regeneratively cooled motor until it burned out after 16 runs, causing the motor body and throat to melt. Burnout attributed to jelling of the tetraethyl orthosilicate-alcohol mixture (May to Aug. 1948).(18)
- Pit 5 -- pressure testing of Hermes A-1 fuel expulsion system using a K-Monel midsection and alcohol and liquid nitrogen (Sept. 1948).(19)
- Pit 5 -- Initial tests of Packard engine and control panel (Sept. 1948).(20)
- Tetramer #81082, a silicon, and ethyl silicate tested in a motor (Sept. 1948).(21)
- Pit 4 -- Outfitted with K-Monel midsection for static tests of complete Hermes A-1 missile with 10-inch motor (Sept. 1948).(22)
- Pit 5 -- Midsection collapses several times during static tests of Hermes A-1 (Oct., Nov. 1948).(23)
- Drains installed next to Pit 5 as a result of the test failures, to collect leaking alcohol and determine rate of leakage (Nov. 1948).(24)

- Pit 1-B -- Hermes A-3 hydrogen peroxide-catalyst steam generator tested (Nov. to Dec. 1948).(25)
- Pit 4 -- "Experimental" missile propulsion system tested (Oct. 1948).(26)
- Army requested funds to, among other things, construct at least three gas manholes and lay 800 feet of double line 3/8" I.D. pipe or tubing in a trench to supply high pressure oxygen and nitrogen to Test Pits 1, 2, and the "chemical pit" (Dec. 1948) (contract awarded 1951).(27)
- Test with gasoline-oxygen propellants in rockets designed for alcohol-oxygen (March 1949).(28)
- Hermes A-3 experimental power plant components were tested (Sept. 1949).(29)
- Hydrazine-hydrogen peroxide system test program using a 500-lb. thrust rocket motor (Nov. 1949 to July 1950).(30)
- Ramjet testing began (1950).(31)
- Hermes test using solid polyethylene as fuel and liquid hydrogen peroxide as oxidizer began (July 1950).(32)
- Tests were completed using liquid hydrogen peroxide, pressurized with gaseous hydrogen peroxide (Sept. 1951).(33)
- Tests of Hermes A-3AE1 Missile 1 began (mid-1952).(34)
- Rocket motor tests using pentaborane and hydrogen peroxide began (Sept. 1952).(35)
- "Hot" test of Hermes A-31E1 Missile 2 successfully completed (Dec. 1952).(36)
- Pit 25 -- First used for testing complete missile and rocket engines (Dec. 1952).(37)
- Testing of Hermes A-3B Missile 1 ends (Oct. 1953).(38)
- "Hot" testing of Hermes A-3B Missile 2 tailsection (Nov. 1953).(39)
- First successful "hot" test of liquid oxygen-gasoline mixture in a missile-size turbo-pump propulsion system (Dec. 1953).(40)

- By June 1954, two underground fuel tanks (5,000 and 10,000 gallon capacity) were installed next to the ramjet laboratory to store hydrocarbon fuel, "such as JP-1 jet fuel" for the air preheater and main test burner. (Special fuels were stored in a special covered area outside Room R of the ramjet facility. Noncorrosive fuels or mixtures were pumped from there to a test cell by pumps located in Room R. Other fuels were placed in pressure containers in the special fuel area and sent by nitrogen gas pressure to the test cell (June 1954)).(41) It is possible that these fuels included pentaborane and boron-hydrocarbon slurries, in addition to JP-1 jet fuel.(42)

Other Activities (1947 to 1960)

In addition to these activities which occurred in the late 1940s and early 1950s, a boron hydride pilot plant (Building 20) was constructed at the MRFA Test Station as part of Project Hermes. Construction occurred from July 1947 until October 1948.(43) The plant, which was operated by GE and later by Olin for the Army and Navy, was used to produce diborane and to convert it to pentaborane.(44) Preliminary operating tests began in August 1949, and the first production of diborane occurred in November 1949.(45) The first work on conversion of diborane to pentaborane occurred in May 1950.(46) The pilot plant exploded on June 21, 1955, when acetone contacted a solid pentaborane product as the plant was being cleaned for shutdown.(47)

Beginning in January 1955, GE began research at Malta for the U.S. Air Force involving the combustion properties of boron-hydrocarbon slurries and other fuels with boron to be used in ramjet engines. This continued through at least June 1955.(48) On October 15, 1955, the U.S. Department of the Army granted a permit to the Air Force covering the entire MRFA Test Station.(49) This permit was replaced on July 1, 1960 by a permit to NASA, although the Air Force still utilized the Test Station after that, at least until 1964. From January 1955 through June 1960, GE continued to operate the Test Station performing research and development programs under contract to the Air Force similar to those it had been performing for the U.S. Army and U.S. Navy.

- Construction of automation equipment, including heating ovens and conveyor belts.(93)
- Fabrication and heat recovery system work.(94)
- Research on a process development unit for steam gasification of biomass for the Department of Energy (Pit 4).(95)

On December 20, 1984, Wright-Malta purchased 81.13 acres of the MRFA Test Station from NYSERDA. This section of the Test Station contains most of the original Federal Government facilities (with the exception of Test Site Complex 25, formerly leased to PTI and Test Site Complex 20, presently leased to MTI).(96) Wright-Malta has continued similar activities, and its current research primarily involves liquid propellant artillery testing for the Watervliet Arsenal in Building 2 and the Building 6 artillery range, and biomass gasification.

GE Operations - (1976 to Present)

Beginning in mid-1976, GE subleased from Wright-Malta Test Site 1 for a liquid propellant gun test program.(97) It is believed that the fuel used by GE, along with fuel utilized by Wright-Malta for its testing of artillery weapons systems, was called Otto Fuel II and HAN 1845 and was stored in 55-gallon containers in Building 27. GE still is conducting liquid propellant artillery testing in Building 24 and Test Site 1 for the Arsenal.

PTI

In 1968, NYSASDA's focus shifted from nuclear and aerospace activities to energy-related research. In September 1972, NYSASDA recaptured a 58-acre tract from the Wright-Malta leasehold. This land, together with all facilities and equipment, was leased to PTI, which performed research on high density power transmission, increasing pipe cable section lengths, evaluation of glass insulated cable, EPRI leak location research, high phase order research, research on lightning characteristics for distribution systems and other

smaller projects.(98) In May 1985, it was discovered that seven transformers at the PTI facility contained PCBs at levels in excess of those allowed by TSCA.(99) In February 1987, PTI shipped those transformers away for off-site disposal.(100) Additional discussion of the PTI facility is found in Chapter 8.

SUNY

On October 10, 1972, NYSASDA entered into an agreement with the Research Foundation of the State University of New York (SUNY), then acting on behalf of the Atmospheric Science Center at SUNY-Albany, to conduct research on the atmospheric effects of spray cooling water vapor. The purpose of the project was to optimize the recycling of discharged cooling-water from electric power plants by increasing the cooling rate of the water.(101) The research was conducted at a clearing in the woods called the "ice pond." Additional discussion of the "ice pond" is found in Chapter 8.

MTI

After recapturing an additional parcel from Wright-Malta's leasehold in 1975, NYSERDA entered into a lease in 1976 with MTI.(102) In 1978, MTI's facilities expanded to include building 20 and warehouse 11.(103) Since 1979, MTI has renovated and expanded its facilities. The activities at MTI have involved design, manufacture and testing of high efficiency and other types of streamdriven turbines and turbo machinery.(104) Additional discussion of the MTI facility is found in Chapter 8.

History of Environmental Investigations

In 1980, NYSERDA found drums containing 200 pounds of CAVEA-B (an amine nitrate), and 10 rusting 55-gallon drums of hydrazine fuels and rainwater on a concrete storage pad.(105) A permit for restricted burning of some of that waste was issued on July 16, 1980 by the New York State Department of Environmental Conservation

(NYSDEC).(106) From July 18 through 21, 1980, the contents of the drums were transferred by NYSERDA's contractor, Emergency Technical Services (ETS), to 14 new poly-lined 55-gallon drums. The combustible matter was burned in metal pans in newly excavated pits dug about 200 feet west of the storage pad area. The drums were cleaned and ETS personnel then crushed them and placed them in an adjacent metal disposal area. The other 14 poly-lined drums remained on the storage pad until they could be sent off-site for disposal in July 1981.(107)

In the Spring of 1985, the New York State Department of Health (NYSDOH) detected carbon tetrachloride, trichloroethylene and chloroform in the Wright-Malta water supply.(108) Tests in April 1985 of the tap water in Building 17 revealed the presence of boron, carbon tetrachloride, chloroform, trichloroethylene and possibly PCBs.(109) NYSERDA notified NYSDEC and NYSDOH, and, in May 1985, NYSDOH advised the site occupants not to use the water supply for drinking or cooking.(110) An air stripper subsequently was installed to treat the water.

On June 10, 1986, the Site was proposed for listing on the National Priorities List as a result of the substances found in groundwater at the site.(111) That listing was finalized by EPA on July 22, 1987.(112) On June 30, 1989, the Agency for Toxic Substances and Disease Registry prepared a preliminary Health Assessment of the Site.(113) On September 28, 1989, EPA issued a unilateral order requiring GE, PTI, MTI, Curtiss-Wright, NYSERDA, Wright-Malta, Olin, and Advanced Nuclear Fuels (the successor to Exxon Nuclear) to perform an RI/FS at the site. (114)

4.0 SUMMARY OF PREVIOUS REPORTS

Section 4.0 summarizes previous reports in chronological order. Reports with references numbered 1 through 12 described research activities at the MRFA site until 1975. Beginning in 1977, reports concerning the MRFA site (references numbered 13 through 37) emphasize activities that were primarily environmental in nature.

The NYSERDA annual reports contain information concerning all of NYSERDA's research activities and were not specifically prepared for the MRFA site. The original reports contain brief discussions of MRFA activities and the excerpts provided in this section are essentially complete.

General Electric Company, 1964, "MRFA Test Station." (1)

GE published this report as a summary of the MRFA Test Station's achievements and capabilities. The report stated that the site provided unique facilities for the following investigations:

- Complete propulsion systems up to 250,000 lbs of thrust.
- Materials and shapes in rocket exhausts.
- Propellants to determine performance, compatibility, handling, and storage.
- Cryogenics under laboratory conditions.
- High speed burst tests in conjunction with materials research.
- Data acquisition, instrumentation, and support equipment.
- Heat transfer phenomena.
- Injectors and thrust chambers.

According to this report, GE's research included testing of gasoline/oxygen propellant missile systems, and Building 20 was the first pilot.production facility for pentaborane. The MRFA was the site of the first combustion test of a combination of pentaborane and hydrogen peroxide and the first large-scale, full-duration, solid-liquid propellant rocket motor

New York State Atomic and Space Development Authority, Annual Report, April 1966 to March 1967. (7)

This NYSASDA report indicates that GE leased the MRFA Test Station during this period. Projects included the development of rocket fuels and rocket components, the full-scale model testing of missile nose cones, and the development of ballistic firing mechanisms and drive mechanisms on military vehicles.

New York State Atomic and Space Development Authority, Annual Report, April 1970 to March 1971. (8)

According to this report, in October 1970, Gamma Processing Company, owned by Iso-Nuclear Corp., received an initial load of 400,000 curies of radioactive cobalt at the radioisotope utilization facility (later the GE/Exxon Nuclear Building).

New York State Atomic and Space Development Authority, 1972, Annual Report, April 1971 to March 1972. (9)

In this report, NYSASDA stated that it acquired the radioisotope utilization facility in October 1971 after Gamma Processing Company, owned by Iso-Nuclear Corporation, defaulted on its lease.

New York State Atomic and Space Development Authority, 1973, "New York State Research on Electric Power and the Environment," January, 1973. (10)

In this report the NYSASDA stated that it had constructed a 5O-ft long and 30-ft wide prototype spray-cooling test pond at the MRFA site. At the test pond, referred to as the Ice Pond, water-cooling experiments were performed by the Atmospheric Sciences Research Center of the SUNY at Albany, under contract to NYSASDA. In the experiments, heated water was cooled with spray nozzles of various configuration and droplet size. The tests were

performed over various climatological conditions, and measurements were made of spray performance and pertinent environmental characteristics such as icing, fogging, and cooling water drift. The pond also operated as a cooling pond. Heated water was added directly to it, elevating the surface temperature. The effectiveness of the pond in transferring heat to the atmosphere was measured over a range of climatic conditions. Environmental effects, such as fogging or icing, were observed.

New York State Energy Research and Development Authority, 1975, Annual Report, April 1974 to March 1975. (11)

NYSASDA was restructured into NYSERDA in 1975. This report described projects at the MRFA Test Station, which included PTI's aboveground electrical power transmission research funded by the Electrical Power Research Institute, a research arm of the Federal Energy Research and Development Administration. According to the report, Exxon-Nuclear occupied the former Gamma Processing Company facility and performed uranium-enrichment research. NYSERDA also reported continued funding of the spray cooling research in the section called the Ice Pond. The research was conducted by the State University of New York Research Foundation, under contract to NYSERDA, and involved the cooling water in a 135-ft diameter bubble-shaped structure and containing a heated 8-ft deep test pond.

Wright-Malta Corporation, 1975, "Wright-Malta Capabilities: Liquid Propellant and Solid Propellant Ordnance Activities," November, 1975. (12)

This report was a promotional summary of Wright-Malta Corporation's facilities and capabilities at the MRFA site. Wright-Malta was active in weapon and liquid propellant testing. GE had begun weapon development at the MRFA site for the U.S. Army Watervliet Arsenal in 1965. Wright-Malta continued testing 20-mm rapid-fire, dual-feed machine guns; 60-mm, 90-mm, and 150-mm recoilless rifles; 305-mm and 152-mm tank guns; and 105-mm and 155-mm Howitzers.

Dunn concluded that the Knapp Road aquifer consists of clean sand ranging from fine- to coarse-grained texture and averaging approximately 30 ft in thickness. At favorable well sites, the available drawdown ranges from 13 to 23 ft. Recharge to the well field is primarily from the north as infiltrated precipitation moves downgradient to the flatter topography that is drained by surface streams. Some local recharge occurs from the surface stream that flows adjacent to the southernmost well sites.

Dunn stated that the fineness of the aquifer sand restricts the volume of water that will move through it at a given elevation gradient. Test data from the two constant-rate aquifer tests suggested that some formational loss result in a specific capacity (yield in gallons per minute per foot [gpm/ft] of drawdown) of approximately 7 to 9 gpm/ft. Dunn also stated that a transmissivity (T) of approximately 40,000 gallons per day per foot (gpd/ft) represents a maximum for the aquifer unless additional drawdown generated by future wells decreases this value. The effective T around the wells may be low as 10,000 gpd/ft due to possible formation losses.

Test data showed that a well spacing of approximately 300 ft was sufficient for minimum well interference and maximum well field yield. Based on the data from the two aquifer tests, the long-term safe capacity of Well No. 1 was 100 gpm. This value was based on 16 ft of available drawdown, the pump intake set at 25 ft below land surface (1.0 ft above the top of the screen), and a static water level of 6 ft below land surface. The long-term safe capacity of Well No. 2 was 125 gpm. This value was based on 17 ft of available drawdown, the pump intake set at 26 ft below land surface, and a static water level of 6 ft below land surface.

NYSERDA, 1979, Drum Sampling in S-4 Storage Area, March. (14)

This memorandum states that in March 1979, NYSERDA had Coastal Pollution Control Services collect samples from drums stored in the S-4 Storage Area and sent them

to Century Environmental Testing Laboratory for analysis. The samples contained predominantly hydrazine rocket fuel, and the results are provided in Attachment C-C (Appendix C).

C.T. Male Associates, P.C., 1979, "Engineering Planning Study, Storage Research and Development Center, Malta, New York," July. (15)

C.T. Male Associates, P.C. prepared a site assessment of the MRFA Test Station for NYSERDA in July 1979. This report describes the conditions of the natural site environment, existing buildings, roads, traffic patterns, utilities (water supply, fire protection, sanitary sewage disposal, storm-water drainage, electrical, gas, and telephone services), the existing landfill and incinerator sites, metal reclamation locations, and waste disposal areas.

The following former disposal areas are discussed in the report. The areas are shown on Figure 7.

D-1 Open-pit incineration area (25 ft in diameter and 15 ft deep). The area was used to burn office papers, cardboard boxes and trash.

D-2 Waste disposal area (75 ft by 150 ft area). The area was used for disposal of non-salvageable, non-burnable material such as concrete and scrap metal.

D-3 Earth and tree disposal area (160 ft by 160 ft area). The area, located in a ravine, was filled with construction waste and concrete highway slabs.

D-4 Container burial area (160 ft by 180 ft in area).

D-5 Container burial area (100 ft by 160 ft area).

According to this report, areas D-4 and D-5 were both used to bury 5-gallon and 50-gallon empty steel drums to a depth of approximately 10 ft. In the 1950s and 1960s, drums containing chemicals were punctured, ignited, and then buried. In the 1950s, drums containing pentaborane residual and hydrazine were reportedly disposed of in area D-5. In the 1960s, drums containing sodium and potassium were reportedly brought on-site by GE and disposed in D-4 and D-5. Holes for burial were reportedly dug and backfilled as needed.

The C.T. Male report states that a pungent odor was apparent in area D-5, which was marked with several small deteriorated metal warning signs which are no longer present.

Four former storage areas are described in the C.T. Male report. The areas are shown on Figure 7.

S-1 Metal storage area (70 ft by 150 ft area). The area was used to store scrap metal, drums, pipes, paint cans and other scrap.

S-2 All-purpose storage (100 ft by 100 ft area). The area was used to store miscellaneous metals, steel drums, tanks, and bulldozer tracks.

S-3 Metal scrap pile (60 ft by 270 ft area). The area was used to store scrap metal from anywhere on the site. The scrap metal included pipes, tanks, drums and wires.

S-4 Chemical storage pad (20 ft by 30 ft area). The pad was used to store 5-gallon and 50-gallon drums and metal containers with residual propellants such as hydrazine and arozene.

Exxon Nuclear Company, 1979, "Malta Operations Incident Report," August 10. (16)

According to this report, during a routine maintenance operation on July 23, 1979, approximately eight grams of uranium hexafluoride were released into the Minifuge Test Room in the northeast corner of the former GE/Exxon Nuclear building. The gaseous uranium hexafluoride reacted with atmospheric moisture to form hydrogen fluoride gas which vented through a room exhaust fan. The remaining reaction product was a particulate, uranium dioxide difluoride (UO1F2). The site was decontaminated twice until a maximum disintegration rate of 1,265 counts per minute was attained. According to the report, the rate was well below the maximum allowable disintegration rate of 2,000 counts per minute. The basis for the standard was unspecified.

Emergency Technical Services Corporation, 1980, "Summary Report of Work Performed - Malta Test Site," May 29. (17)

This report summarized the sampling and safety screening of propellant drums in Storage Area S-4 from May 12 to May 16, 1980. Prior to disposal of the drummed material, Emergency Technical Services (ETS) Corporation sampled all containers and tested for shock sensitivity, flammability, and thermal sensitivity. A comparison of old site inventories to the existing material identified the drummed liquid as CAVEA-B (amine nitrate) and monomethyl hydrazine.

C.T. Male Associates, P.C., 1980, "Engineers Report, Rehabilitation of Existing Water Distribution System, Saratoga Research and Development Center, Town of Malta, Saratoga County, New York," December. (18)

This three-page report summarized the rehabilitation of the water distribution system by a subcontractor of C.T. Male Associates, P.C. The work included draining, cleaning, and disinfecting the concrete storage reservoir, installation of a new chlorination system for supply Wells 1 and 2, and flushing the existing water mains at the test station.

Advanced Environmental Technology Corporation, 1981, letter Report to New York State Energy Research and Development Authority Regarding Disposal of Water-Hydrazine Mixture, September 1. (19)

This letter described work performed by Emergency Technical Services Corp. (ETS) in May, 1980 at the S-4 Storage Area. The report discussed the disposal of several drums of waste hydrazine, which was contaminated with water and would not readily combust during burning of rocket fuels.

The water-hydrazine mixture was solidified in twenty-six, 55-gallon drums. Each drum was containerized and labeled according to DOT specifications. The material was transported to CECOS International in Niagara Falls, New York, a licensed hazardous waste landfill.

Thomsen Associates, 1983, letter report to C.T. Male Associates, P.C. Regarding Ground-Water Movement. (20)

According to this letter report, Thomsen Associates evaluated ground-water movement at the site based on C.T. Male reports and published information concerning regional ground-water flow and water-level elevations in four on-site wells. The report concluded that although the direction of ground-water movement could not be definitely determined based on data from four wells, flow in a southwestern direction was indicated. Potential influences were believed to include a possible ground-water divide and a cone of depression caused by pumping at Well Nos. 1 and 2.

C.T. Male Associates, P.C., 1985, letter Describing Sampling of Drinking Water at MRFA Test Station, April. (21)

C.T. Male Associates sampled the tap water at the NYSERDA MRFA office and Well Nos. 1, 2, 3, and 4 at the MRFA Test Station and described the results in a letter to the

President of the Saratoga Economic Development Corporation. The results indicated that PCBs (0.37 micrograms per liter), boron (99 ug/L), chloroform (31 ug/L), carbon tetrachloride (630 ug/L), and trichloroethylene (100 ug/L) were present in the potable water supply (Refer to Attachment C-B in Appendix C).

New York State Department of Health, 1985, Sampling of Drinking Water at the MRFA Test Station, April. (22)

Upon receiving the C.T. Male Associates drinking water sampling results for the MRFA Test Station which indicated contamination, the New York State Department of Health (NYSDOH) resampled supply Wells 1 and 2, and the potable distribution system. The NYSDOH results, as reported in this document, indicated the presence of carbon tetrachloride (220 ug/L), trichloroethylene (120 ug/L), chloroform (25 ug/L), and dibromochloromethane (3 ug/L). In January 1987, an air stripper was installed on Wright-Malta property to remove volatile organic compounds (VOCs) from the water supply system.

Geraghty & Miller, 1985, "Investigation of Ground-Water Conditions at the Wright-Malta Test Station, Malta, New York," June. (23)

Geraghty & Miller, Inc. conducted an investigation of air, ground water, and soil quality conditions at the Berth 24 test pad at the Wright-Malta test station on behalf of GE (Pittsfield, Massachussetts) in 1985. The purpose of the investigation was to determine background data on soil and ground-water quality and to determine if the soil at the site was suitable for building a new test station. Water samples were also collected from potable supply Wells 1 and 2 and monitoring well (MW-9), installed during this investigation. Well MW-9 was destroyed during the renovation activities conducted in this area.

Base/neutral and acid extractable organic compounds and pesticide/PCBs were not detected. Cyanide and phenols were reported below the detection limit. Arsenic, chromium, and lead concentrations were all below the drinking water standards.

VOC results indicated the presence of carbon tetrachloride and TCE at low levels (<10 ug/L). Methylene chloride was not detected in any of the samples and the field and trip blanks indicated that external contamination had not occurred. Elevated levels of TCE (240 ug/L) and carbon tetrachloride (1,100 ug/L) were detected in potable water supply Well 2 with lower concentrations detected in Well l. Chloroform was also detected, but it may have been introduced during chlorination of the water supply. Dissolved metals concentrations in the sample from Well 1 were below the USEPA drinking water standards.

To characterize the quality of the shallow soil in the vicinity of the Berth 24 test site, soil samples were collected from the upper 4 ft at two locations in February 1985. Results from the USEPA priority pollutant analyses indicated that methylene chloride was the only organic compound found above detection limits. These results were believed to be due to laboratory contamination. The metals concentrations in the soil samples did not indicate contamination from the earlier testing at Berth 24.

Air samples were collected at the Berth 24 Test Pad from the basement, the main level, the pipe bay, and the outside cell (Bay 6). The samples were collected over a 3.5 to 4-hour period by pumping air through activated charcoal filters. Contaminants were not detected in the samples.

Environmental One Corporation, 1985, "Report of Sampling and Analysis of Transformer Oils at Power Technologies, Inc.," July 10. (24)

Environmental One Corporation sampled transformer oils at Building 25 for PTI on June 3, 1985. Oil samples were analyzed for PCB content. Samples from drums and tanks

were also analyzed for chlorine and sulfur content. The data indicated that most of the transformer oils contained PCB Aroclor 1242, 1254, and 1260, and the results are provided in Attachment C-D (Appendix C).

Geraghty & Miller, Inc. January 20, 1986, letter report to General Electric Company (Pittsfield) Regarding Soil Testing at Berth 24, Malta, New York. (25)

The purpose of this study was to determine the chemical quality of backfill material excavated from Disposal Area D-6 and placed near Berth 24 during site recontouring. On October 31, 1985, ten soil borings (7 to 10 feet deep) were hand cored in the Building 24 area of the MRFA site. The composite soil samples were analyzed for volatile organic compounds and acid and base/neutral extractable organic compounds. Nitrosoamines were also analyzed, as they are degradation products of hydrazine. Benzene and toluene were found at the detection limit of 5 micrograms per kilogram (ug/kg) in a sample from one location and bis(2-ethylhexyl)phthalate was detected in seven of the ten borings at concentrations ranging from 250 to 2,700 ug/kg. Neither nitrosoamines nor any extractable organic compounds were detected.

Bis(2-ethylhexyl)phthalate is relatively insoluble and is readily adsorbed to suspended particulates. The source of bis(2-ethylhexyl)phthalate was not known; however, it is commonly associated with paints, plasticizers, and the organic fluid in vacuum pumps and could also have been a laboratory artifact.

O'Brien & Gere Engineers, Inc., 1986, "Preliminary Site Evaluation: Saratoga Research and Development Center and Wright-Malta Corporation, Malta, New York," January. (26)

O'Brien & Gere Engineers, Inc. evaluated the MRFA Test Station for NYSERDA in 1986 to determine the source of VOCs in ground water at the site and to identify areas of possible concern. In this report, they described the visit and their results.

A site visit was conducted on May 22, 1985 by NYSERDA, O'Brien & Gere, NYSDOH, and NYSDEC personnel. Disposal sites identified by C.T. Male in 1979 were visited. O'Brien & Gere collected a sample of surface water and sediment at NYSDOT disposal site D-3. The surface-water samples contained iron, manganese and lead at 148 milligrams per liter (mg/L), 27.8 mg/L, and 1.06 mg/L, respectively. The sediment sample contained iron, manganese, and lead at 28,000 mg/kg, 395 mg/kg, and 5.9 mg/kg, respectively

The report included a review of previous studies, a description of the site visit and field reconnaissance, a summary of hydrogeological conditions, an evaluation of historical aerial photographs and conclusions.

O'Brien & Gere Engineers reported the following observations from the site visit:

- A machine shop (Building 13) was located on Wright-Malta property.
- Drums containing liquid were found near Supply Well No. 2. Empty drums were also found in the same area, and some were labeled "mineral spirits" (naptha) and "freon."
- One of the gantry test areas (building number not reported) was used to store containers labeled "GE Silicones."
- Several areas where vegetation characteristics changed abruptly and/or the ground was unexpectedly level were observed in the vicinity of disposal areas D-2, D-4 and D-5.
- General trash had been placed in the burning pit (D-1) used for disposal by Wright-Malta.
- A small mound, which may have been naturally occurring or due to earth-moving activities, was present along the access road to PTI.

O'Brien & Gere summarized the site hydrogeologic conditions previously described by C.T. Male (1979). A brief description of the water-supply system and a summary of previous ground-water data from samples collected by NYSDOH and C.T. Male in 1985 were also provided. Carbon tetrachloride, trichloroethylene, chloroform and PCBs had been detected in the supply wells and distribution system at maximum concentrations of 840 ug/L, 230 ug/L,

58 ug/L, and 1.3 ug/L, respectively. Mercury (0.085 mg/L), chromium (0.018 mg/L), lead (0.025 mg/L), copper (0.09 mg/L), and boron (0.099 mg/L) were also detected in the supply wells and/or distribution system.

O'Brien & Gere reviewed aerial photographs from 1952, 1961, 1968, 1978, and 1982, and estimated the approximate time periods during which disposal activities occurred at sites D-1 through D-5. They concluded the following:

- D-1 had been an active disposal site since prior to 1952.
- There was little activity in D-2 from 1952 to 1961, but it was an active area by 1968.
- D-3 was a clearing in 1952, 1961, and 1968 photographs, and was actively used for disposal on 1978 and 1982 photographs.
- D-4 and D-5 disposal sites were active prior to and since 1952.

During a field reconnaissance of the NYSERDA property on August 7 and 8, 1985, O'Brien & Gere observed the following:

- Iron-stained water was discharging from the base of the NYSDOT disposal area D-3.
- Standing water was present in the PTI impoundment, and was partially covered with a liner.
- Trash was observed on a logging trail.
- Brush and cut logs were noted in several cleared areas south of the main access road.
- No other cleared potential waste disposal areas were apparent from either the field reconnaissance or aerial photograph analysis.

O'Brien & Gere concluded that the most likely sources of VOCs in ground water were the area northeast of Supply Well No. 2, where drums had been stored, and/or disposal sites D-2, D-4, and D-5. Other potential sources may have included disposal area D-3, the PTI impoundment, a small mound located adjacent to PTI, and disposal site D-6.

Based on a time-drawdown plot of the data, the aquifer transmissivity was calculated at 35,000 gpd/ft. The aquifer storage coefficient was calculated at 0.003. As indicated by the storage coefficient, the Knapp Road aquifer was determined to be an unconfined aquifer.

The computed cone of depression around each well was calculated to be approximately 0.5 ft of drawdown at 350 ft from the test well. The interference among wells was calculated to be approximately 0.5 ft per well using a 350-ft well spacing. The interference among wells was not expected to reduce individual well yields since additional available drawdown had been designed into the wells. An extended dry period with loss of recharge could result in reduction in the total yield from the well field. Dunn determined that an estimated seven 110 gpm wells could be installed in the well field, with a theoretical long-term yield of approximately 600 to 700 gpm for the well field.

A water-quality sample collected at the end of the pumping test indicated the presence of good quality ground water which met all NYSDOH drinking-water standards.

Power Technologies, Inc., 1986, letter Summary of the Transformers to be Disposed or Refilled, July 17. (28)

In a letter to Westinghouse Electric Corporation, PTI identified 12 transformers of concern. Seven of these transformers were owned by NYSERDA and five were owned by PTI. Three of the NYSERDA transformers were to be retrofitted. The transformers were subsequently disposed by Westinghouse Electric Corporation in March and April, 1987. An inventory of the 12 transformers including gallons of oil per transformer and concentration of PCBs is provided in Attachment C-E (Appendix C).

Geraghty & Miller, Inc., 1986, "Environmental Assessment for the Proposed General Electric Company Test Station, Malta, New York," August. (29)

At the request of GE, Geraghty & Miller prepared a preconstruction environmental assessment for the "triangular parcel" located on Wright-Malta property southeast of the Magazine Area and outside the fenced site boundary of the MRFA Test Station on Wright-Malta property. The objectives of the study were to provide an assessment of ground-water and soil quality, identify areas that may have been used for waste disposal, and define the direction of ground-water flow. Geraghty & Miller described this investigation in this report.

Four 2-inch diameter PVC monitoring wells (MW-1 through MW-4) were installed along the perimeter of the study area. The well depths ranged from 39.5 to 55 ft, and each well was installed to a depth of 8 ft below the water table. As one of the purposes of the well installation program was to determine the horizontal direction of ground-water flow, water levels were measured on May 8 and 9, 1986. The water-level data within the study showed that ground water flows southwesterly toward several brooks that discharge into Round Lake.

Samples from the four monitoring wells were analyzed for the Hazardous Substances List of compounds by Cambridge Analytical Associates Boston, Massachusetts. Chemical constituents were not detected in Wells MW-3 and MW-4. The following compounds were detected in MW-1: bis(2-ethylhexyl)phthalate (5 ug/L), butyl benzyl phthalate (12 ug/L), diethyl phthalate (5 ug/L), benzyl alcohol (3 ug/L), and Aroclor 1254 (2.5 ug/L). Bis(2-ethylhexyl)phthalate (270 ug/L), butyl benzyl phthalate (12 ug/L), and trichloroethylene (6 ug/L) were detected in Well MW-2.

Although phthalates are common laboratory contaminants, Cambridge Analytical Associates believed that they were not a problem when these samples were analyzed and that the reported values were not attributable to laboratory artifacts. However, resampling was recommended.

Blasland & Bouck Engineers, P.C., 1986, "Hydrogeologic and Water Quality Investigation at the Saratoga Research and Development Center," December. (30)

Blasland & Bouck Engineers, P.C. conducted a hydrogeologic investigation at the MRFA Test Station on behalf of NYSERDA in 1986. The purpose of the study was to determine the ground-water flow directions and hydraulic gradients at the site, and to determine if contaminated ground water had migrated or could potentially migrate from the testing areas into the 1-mile non-habitation easement area.

As described in this report, Blasland & Bouck installed 11 monitoring wells (2S, 3S, 4S, 4D, 10S, 10D, 11S, 11D, 13S, 13D, and 14D) to determine ground-water flow directions and ground-water quality. Water-level data collected from these wells and several previously existing wells were used to determine the ground-water flow directions. Two temporary well points were also installed in Ravine No. 2 to compare ground-water and surface-water relationships.

Blasland & Bouck conducted a pumping test to determine aquifer characteristics. Supply Well No.1 was pumped for 22.5 hours at 20 gpm and a radius of influence of at least 1,050 ft was calculated. A transmissivity coefficient of 17,800 gpd/ft, a hydraulic conductivity coefficient of 24 ft/day, and a flow velocity between 70 and 166 ft/yr were also calculated.

A water-quality investigation was designed to sample Supply Well No. 2 for VOCs, semivolatile organic compounds, PCBs, aluminum, boron, and nitrogen. Based on the results and consultation with NYSDEC, the parameters selected for subsequent ground-water sampling rounds were VOCs, aluminum, and boron. Ravine well points and surface-water samples from Ravine No. 2 were also analyzed for VOCs, aluminum, and boron. The NYSDEC and NYSDOH also sampled the headwaters of Ravine Nos. lb, 2a, and 2c in June 1986 and analyzed each sample for VOCs, semivolatile organic compounds, and pesticides. In July 1986, the NYSDOH sampled Ravine Nos. 3, 4, 5, 6a, 6b, 7, and 8 for VOCs (see Figure 5 in RI Work Plan).

from the site. Surface-water samples within the easement area indicated that, while some compounds appeared to have entered the surface water at one point in the easement area, they did not appear to be leaving the easement area in the surface water. The findings of the NYSDOH and NYSDEC sampling program were not compiled into reports by these agencies, but have been included in Appendix E of the RI Work Plan.

Wright-Malta Corporation Sampling of Air Stripper Influent and Effluent, January 1987 through June 1987. (31)

On January 21, 1987, Wright-Malta Corporation contracted Groundwater Technologies, Inc. (GTI) to sample influent and effluent water from an air stripper unit installed at the site to remove VOCs, such as carbon tetrachloride, trichloroethylene, and chloroform, from the drinking water. The air stripper was permitted by NYSDEC and approved bye NYSDOH in January 1987. The air stripper was effective in reducing all VOC concentrations below New York State drinking water standards.

NYSERDA, 1987, Septic Tank Sampling and Analysis Program, January. (32)

NYSERDA sampled the tap water and the septic system at the GE/Exxon-Nuclear building located on Plains Road, approximately 3,500 ft northwest of the MRFA Test Station. Similar sampling was carried out for the tap water and septic systems at the facilities leased by PTI (Building 25) and MTI (Building 20) located on NYSERDA property. The septic system for the NYSERDA office at Building 14 was also sampled. The results for each of these programs are provided in Section 8.2 for each appropriate facility.

NYSERDA, 1987 to Present, Water Monitoring Program. (33)

In October 1987, NYSERDA began a monthly water monitoring program at the MRFA Test Station for VOCs. The program included the sampling of tap water from Wright-Malta, PTI, and MTI facilities. Influent and effluent samples from the Wright-Malta

5.0 SUMMARY OF OTHER DOCUMENTS

Section 5.0 summarizes letters, memoranda, site-specific publications, specifications concerning chemical composition and equipment cleaning, permits, hazardous material report forms, material safety data sheets, and purchase orders which contributed new information about the history of the MRFA site. These documents also contain information concerning chemical handling and use at the MRFA site, and are the basis for including the chemicals discussed in this section on the list in Section 7.0, Chemicals Used and Detected at the site. This section consists of approximately 10 percent of the hundreds of documents obtained during the literature search. A complete list of documents reviewed by Geraghty & Miller is presented in Appendix B.

U.S. Army, 1952, letter to Commanding Officer of the Redstone Arsenal Regarding Boron Hydride Production by General Electric Company, April 25. (1)

This letter was written "by command of Major General Ford" to the commander at Redstone Arsenal in Huntsville, Alabama. It addressed the production of boron hydrides by GE as a subtask of the Hermes Project. In this letter, the U.S. Army Command ordered the Rochester Ordnance District to inform GE to cease its boron hydride production at its pilot plant (believed to be Malta) as of September 30, 1952. The decision was the result of difficulties encountered during the use of boron hydride with guided missiles.

General Electric Company, Inc., 1954, "A Brief History of Activities and Accomplishments from November 1944 to January 1954," January. (2)

This declassified summary report of the Hermes Project, the first U.S. rocket program, outlines the importance of the MRFA site to the endeavor. It functioned as the primary test facility for rocket motors, rocket fuels and complete rocket systems, and contained the first pentaborane production plant of its kind. Specific areas are provided only where identified in the report.

Early in 1945, construction of the MRFA station was begun by the U.S. Army Corps of Engineers. On August 24, 1945, the Malta Test Station was officially turned over to Project Hermes, and on December 21, 1945 the first static "hot" tests of rocket motors had begun in Building 1.

In June 1946, optical studies of rocket-motor flame structures began at MRFA. In November 1946, Building 2 became operational for the testing of larger rocket motors. In December of the same year, Building 1A became operational as the chemical research rocket motor test facility.

In July 1947, four successful diborane-oxygen rocket motor tests were made at MRFA. Work commenced for the construction of a borane hydride production plant at the site.

On March 24, 1948, the first static test in the new missile-size motor facility (Building 3) was completed without incident. The following July, the Hermes A-1 high-thrust (16,000 pound) rocket motor was static tested. Tests were completed on gaseous diborane-oxygen rocket motors.

By October 1948, the construction of the diborane plant (Building 20) at the MRFA was complete, except for revisions due to personnel safety requirements. During the same month, Building 4 test structure was finished and it was used for static tests of complete guided missiles.

In September 1949, the testing of the A-3 missile propulsion system commenced at MRFA. The system was powered by alcohol and oxygen. By November 1949, a test program on a hydrazine-hydrogen peroxide propellant system started.

hydrogen peroxide propellants were produced and tested on a practical scale at the MRFA site. By December 31, the on-site pentaborane plant (Building 20) had produced 177 pounds of 99.9-percent pure pentaborane, and the fuel was being tested in large rocket motors at Building 25.

On August 7, 1953, tests were made with a 1,000-pound thrust rocket motor using the propellant combination of anhydrous liquid ammonia and red, fuming nitric acid. By December 1953, various "hot" tests were conducted, on Hermes missiles using propellants such as liquid oxygen and alcohol, liquid oxygen and gasoline, hydrazine and hydrogen peroxide, pentaborane and hydrogen peroxide, solid polyethylene and hydrogen peroxide, liquid ammonia and nitric acid, kerosene and liquid oxygen, and diborane and oxygen.

Olin Mathieson Chemical Corporation (1955), letter to the U.S. Navy Bureau of Aeronautics, Re: Explosion 21 June 1955 Malta Pilot Plant, July 20. (3)

According to this letter, an explosion in Building 20, the pentaborane pilot plant, occurred at approximately 13:12 on June 21, 1955. The plant was being shut down to meet the effective termination date of June 30. All materials had been processed, except for a final load of crude pentaborane, which was undergoing purification and distillation.

The production of diborane had ceased the previous week and the equipment was being cleaned on the morning of the accident. The conversion of diborane to pentaborane had been completed that morning and the four conversion units were in various stages of cleaning. One unit was completely clean. Solids had been removed from two other units that had been steamed and washed with acetone, and partially drained. The fourth unit had been evacuated of all process gas and repressurized with nitrogen that morning. It was prepared for the removal of accumulated solids by slurring with carbon tetrachloride. The four units were separated by a set of critical valves. The final cleaning stages of the fourth unit called

for the three clean units to be pressurized with nitrogen to prevent recontamination and to be sealed off from the fourth unit containing the solids. Two engineers were assigned the task.

Examination of the building remains indicated that, upon filling the three clean units with nitrogen at 50 psi, the engineers forgot to close one of the valves. This prevented the complete isolation of the fourth unit. The 50 psi pressure was sufficient to force acetone from one of the clean units into contact with the solid material in the fourth unit. The resulting explosion fatally injured both engineers. There was no evidence that carbon tetrachloride, water, or air caused the explosion by being introduced into the clean units.

Olin Mathieson Chemical Corporation, 1961, "Properties of Monomethyl Hydrazine." (4)

This booklet was published by Olin Mathieson Chemical Corporation to provide information concerning the chemical and physical properties of monomethyl hydrazine (MMH) and to outline safe operating procedures to users. The publication provided directions for unloading MMH and information on toxicity, flammability, chemical reactions, and other properties. The MMH fuel was described as very explosive and toxic. Highly reactive in the presence of oxygen, MMH was unloaded via a pressurized nitrogen system.

U.S. Department of Defense, 1961, "Military Specifications: Trichloroethylene, Oxygen Propellant Compatible," May 1. (5)

These military specifications included requirements for the physical and chemical composition of a low-residue TCE used in propellant oxygen handling systems during rocket engine tests. Quality assurance requirements were also discussed. The low-residue TCE was shipped in 55-gallon drums or 5-gallon containers.

U.S. Department of Defense, 1962, "Military Specifications: Missile Components; Liquid Oxygen, Liquid Nitrogen, Gaseous Oxygen, Gaseous Nitrogen, Instrument Air, Helium end Fuel Handling Systems; Cleaning and Packaging for Delivery," May 3. (6)

These military specifications concerned the cleaning and handling of missile components including liquid and gaseous fuel systems. Missile components were to be rinsed in carbon tetrachloride or TCE to remove particulate and hydrocarbon contamination. The final cleanliness inspection of the missile components included a final solvent rinse with filtered TCE, demineralized water or equivalent, using 200 milliliters of rinse fluid per square foot of component inner surface. Procedures for the disposal of carbon tetrachloride and TCE reinstate were not discussed.

General Electric Company, Inc., 1962, Malta Test Station Annual Operations Report, November 28. (7)

According to this summary report, by 1962, the MRFA site was used as a testing facility by GE, the U.S. Defense Department, and various other companies including Curtiss-Wright, Lockheed, Chrysler, AATD (Centaur), and Burlington. The site shops were producing hardware from materials such as 90 percent Tantalum/10 percent Tungsten motors for Curtiss-Wright and Melamine motors for Burlington. The MRFA had two large test facilities at Building 25 set up for GE, Building 24 geared for Curtiss-Wright, and Building 4 fitted for GE, Lockheed, Chrysler, and Burlington. Building 21 was primarily used for testing of booster pumps for AATD (Centaur) involving vibration and acceleration.

According to this document, projects of major importance in 1962 were established with Curtiss-Wright on a full-time liaison, and with Lockheed for the manufacturing and testing of complete thrust chambers to be used by them at Lockheed test sites. Tests on rocket propellants continued (chlorine-trifluoride was mentioned).

General Electric Company, 1963, letter to Astrosystems International, Inc. regarding Utilization of Malta Test Station by Astrosystems, May 24. (8)

In this letter, GE provided a cost estimate to Astrosystems International, Inc. (AII) for testing a 200 lb thrust liquid rocket engine using nitrogen tetroxide and monomethyl hydrazine at the Malta Test Station. GE provided Astrosystems with a choice of test areas, Berth 24 or Pit 2. Berth 24 was "committed to another customer" but was available on a part-time basis. Pit 2 was available on a full-time basis. Building 27A was recommended for the storage of up to 40,000 lbs of nitrogen tetroxide. Building 27D was recommended for the storage of up to 10,000 lbs of monomethyl hydrazine.

General Electric Company, 1963, "Engineering Cleaning Requirements for Nitrogen Gas, Propellant Components and Systems," June 11. (9)

GE developed cleaning requirements for propellant loading and handling systems at the MRFA Test Station. All systems handling nitrogen, hydrazine - monomethyl hydrazine mixture and nitrogen tetroxide had to be disassembled periodically and all parts cleaned according to the military specifications (see Item 4). Solvents used in cleaning included filtered TCE and isopropyl alcohol. Procedures for disposal of spent solvents were not included in the cleaning requirements.

New York State Department of Environmental Conservation, 1980, Permit for Restricted Burning and Cover letter to New York State Energy Research and Development Authority, July 16. (10)

On July 16, 1980, the New York State Department of Environmental Conservation (NYSDEC) issued a restricted burning permit to the NYSERDA for disposal of hydrazinebased material in Storage Area S-4 of the Malta Rocket Fuel Site. Emergency Technical Services (ETS) was responsible for disposal of the following:

- Twelve 5-gallon pails - hydrazine.
- One 55-gallon drum - hydrazine.
- One 20-gallon drum - monoethyl hydrazine.
- One 30-gallon drum - monoethyl hydrazine.
- Four 55-gallon drums - monoethyl hydrazine.
- Five 2-gallon bottles - osym-dimethyl hydrazine.
- Four 50-lb containers - CAVEA-B (amine nitrate).

The permit contained a restriction on burning when the wind direction was from the 120° azimuth sector. The burning was to be observed by the NYSDEC.

New York State Energy Research and Development Authority, 1980, Memorandum Regarding Chemical Waste Disposal at the Saratoga Research and Development Center, July 22. (11)

This memorandum summarized NYSERDA's efforts to dispose of drums of hydrazine-based material and containers of amine nitrate in Storage Area S-4 of the Malta Rocket Fuel Site. On July 20, 1980, ETS burned the drummed waste. Inflammable water hydrazine solution was packed in 14 new poly-lined drums and left temporarily on-site.

New York State Department of Environmental Conservation, 1980, Memorandum Regarding the Malta Test Site Hydrazine Burn, August 12. (12)

This memorandum was intended as a brief synopsis of activities surrounding the controlled burning of hydrazine-based fuels by ETS at the Malta Test Site from July 17 to July 21, 1980. The burning was conducted in six burn pits excavated approximately 200 ft west of Storage Area S-4. Air monitoring was conducted prior to and during the burning. Air contamination was not detected from hydrazine-sensitive Draeger tubes beyond 100 ft during the procedure. The characteristics of the burn of one 55-gallon drum led ETS personnel to believe that the drum contained JP4 Jet Fuel (a fine grade of kerosene). The

remaining drums and cans contained hydrazine based fuels. The last material to be burned was the CAVEA-B, amine nitrate. The 200 pounds of material were burned in 50-lb increments. The procedure was carefully controlled. Any hydrazine-water mixture considered to be non-combustible was transferred to new poly-lined, 55-gallon drums.

Mechanical Technology, Inc. (1981), Hazardous Material Report, July 15, 1981. (13)

MTI submitted a New York State Department of State "Hazardous Material Report" to the Malta Ridge Volunteer Fire Company on July 15, 1981 as required by Section 209-U of the General Municipal law. In the report, MTI claimed to have received 9,000 gallons of No. 2 fuel oil and 250 gallons of diesel fuel.

General Electric Company (1982), Hazardous Material Report, January 1, 1982. (14)

GE submitted a New York State Department of State "Hazardous Material Report" to the Malta Ridge Volunteer Company on January 1, 1982. The report stated that GE received 55 gallons of methanol, 10 gallons of isopropyl alcohol, 5 gallons of acetone, and 55 gallons of amyl alcohol at the MRFA Test Station.

Mechanical Technology, Inc. (1982), Hazardous Material Report, July 12, 1982. (15)

MTI submitted a New York State Department of State "Hazardous Material Report" to the Malta Ridge Volunteer Fire Company on July 12, 1982. The report stated that MTI received 9,000 gallons of No. 2 fuel oil and 250 gallons of diesel fuel.

General Electric Company (1984), Hazardous Material Report Form, January 24, 1984. (16)

GE submitted a New York State Department of State "Hazardous Material Report" to the Malta Ridge Volunteer Fire Company on January 24, 1984. The report stated that GE received 25 tons of coal and an unspecified amount of propane, nitrogen, oxygen, air, and carbon dioxide at the MRFA Test Station.

Wright-Malta Corporation (1985), Purchase Order from Albany laboratories, Albany, New York, April 29, 1985. (17)

On April 29, 1985, Wright-Malta Corporation purchased 4 gallons of Freon TF Degreaser, 10 gallons of acetone, and 5 gallons of distilled water from Albany laboratories.

New York State Department of Environmental Conservation, 1985, Memorandum Regarding an April 18, 1985 Site Inspection of MRFA Test Station, May 14. (18)

On April 18, 1985, NYSDEC and NYSDOH representatives inspected the Malta Rocket Fuel site in response to contamination identified by C.T. Male Associates while performing the ground-water study for NYSERDA. According to the memorandum, Mr. Kazyaka of Wright-Malta Corporation accompanied the state representatives on a walking tour of the facility. Muggett's pond, which was excavated to the water table and used for cooling water during rocket engine testing, had a sheen on the water surface. The water supply wells were also inspected. Wells Nos. 1 and 2 were engaged simultaneously on a float-activated signal from a 5,000-gallon concrete storage tank. Well No. 3 served as a backup and was rarely used. During the visit, Disposal Area D-3 was inspected and leachate was visible at the base of the site.

New York State Energy Research and Development Authority, 1985, Memorandum Regarding a Buried Triethyl Aluminum Drum, October 28. (19)

The memorandum summarized a telephone conversation between Steven Lewis of NYSERDA and Ray Kazyaka of Wright-Malta Corporation informing Lewis of an incident that had occurred several days earlier. A GE subcontractor had inadvertently unearthed a stainless-steel drum with his backhoe. The drum contained triethyl aluminum and, upon being punctured, had ignited and exploded. (Note: This area later became known as D-6.)

Mr. Kazyaka stated that the chemical was a waste product associated with previous rocket fuel research at the site. He did not expect any other buried drums since his experience was that all such chemicals were burned off as they were collected.

Wright-Malta Corporation, 1985, letter Response to NYSDEC Direct Inquiry, December 5. (20)

Mr. Kazyaka of the Wright-Malta Corporation wrote this letter to the NYSDEC in a response to their direct inquiry into Wright-Malta's past activities at the MRFA site. In the letter, Mr. Kazyaka stated that Wright-Malta did not engage in chemical operations at the site. However, prior to their purchase of the site in December 1984, boron rocket fuels had been tested in Test Area 25 and pentaboron was manufactured in Building 20. The Iso-Nuclear facility, at the entrance of Hermes Road, held a rated cobalt 60 source licensed by the New York State Atomic and Space Development Authority.

Exxon-Nuclear Company, Inc., 1986, letter Response to NYSDEC Inquiry, April 25. (21)

The Exxon-Nuclear Company wrote this letter in response to a NYSDEC inquiry concerning Exxon-Nuclear's past activities at the GE/Exxon Building leased from NYSERDA and located at the entrance of Hermes Road.

In the letter, Exxon-Nuclear stated that its activities at the MRFA Test Station included research and development on uranium centrifugal enrichment technology. The studies were done for the U.S. Department of Energy (DOE) from December 9, 1974 to December 31, 1979. Exxon-Nuclear had closed operations at the site and dropped the lease by December 31, 1979. The centrifuge rotors were composed of classified materials. To comply with the DOE contract, all classified material at the site was eventually shipped to the DOE facility in Oak Ridge, Tennessee. In December 1979, upon termination of the project, the site was inspected by DOE security to ensure that there was no evidence of any remaining classified material.

According to this document, one spill incident occurred during the uranium enrichment studies. On July 23, 1979, 8 grams of uranium hexafluoride were released into a minifuge test room located in the northeast corner of the building. The shop was sterilized and all radiologically contaminated materials were shipped to the Exxon-Nuclear fuel fabrication facility in Richmond, Washington.

The maximum estimated total quantity of chemicals purchased for the Exxon-Nuclear Malta operation from 1975 to 1979 was as follows:

Freon TA and TES	14,000 pounds
Methyl Ethyl Ketone	600 gallons
Perchloroethylene	300 gallons
Acetone	60 gallons
Isopropanol	180 gallons
Toluene	10 gallons
Sodium Chromate	20 gallons
Magnesium Carbonate	30 pounds
Dexron ATF	1 barrel
Vectra 4	120 gallons
MCS 293 Oil	1 gallon

Perfluoro (N-Ethylmorpholine)	1,300 grams
Isoprep	125 pounds
Gear Grease	50 gallons
Zyglo (ZP-13A)	1,500 pounds
Trim-Sol	25 gallons
Hyku Golden Barrel Oil	3 barrels
Electrotech	5 quarts

Exxon-Nuclear constructed a flammable chemical storage room on the southeast comer of the rear of the building. This concrete block structure was used for drum storage. Typically, the area contained approximately ten 55-gallon drums of material, including trichloroethylene, freon, methyl ethyl ketone, and machine oils. The material was pumped into smaller containers as required for use inside the facility. There were no records to indicate that Exxon-Nuclear disposed of any residual quantities of these chemicals. Exxon Nuclear personnel believed that most of the residuals were lost through evaporation.

Morton Thiokol, Inc. (1986), Material Safety Data Sheet for Liquid Gun Propellant LGP1845, May 12, 1986. (22)

One of the principal gun propellants used by the GE at the MRFA site was liquid gun propellant LGP-1845 produced by Morton Thiokol, Inc. A material safety data sheet (MSDS) indicated that the fuel is composed of 63 percent hydroxyl ammonium nitrate, 20 percent triethanol ammonium nitrate, and 17 percent water.

The propellant is listed as a DOT Class 3 explosive. It is a mild oxidizing solution, capable of reacting with reducing materials. This document reports that "the diluted aqueous solution provides non-hazardous waste."

Wright-Malta Corporation (1987), Letter from R. J. Kazyaka to B.S. Fear, RE: Air Stripper Design, March 4, 1987. (23)

This letter contains the physical specifications and removal efficiency of the air stripper installed at the MRFA Test Station. The equipment includes an Oil Recovery System Air Stripper Model 1109004 with a 2 horsepower, 115 volt blower and a stainless-steel sump tank. Water from the three potable water wells (PW-1, PW-2, and PW-3) is pumped through the stripping tower into the sump tank prior to transfer into the reservoir. The removal efficiency for the stripper is 99 percent for the following VOCs: carbon tetrachloride at concentrations of less than 400 ug/L, trichloroethylene at less than 300 ug/L and chloroform at less than 100 ug/L.

Power Technologies, Inc., 1987, letter Transmitting Hazardous Waste Manifests for Disposal of Transformer Oils by Westinghouse Electric Corporation, April 10. (24)

This letter transmits Hazardous Waste Manifests associated with shipment of PCB transformers and transformer oils by Westinghouse Electric Corporation from PTI to National Electric, Inc. in Coffeyville, Kansas.

New York State Department of Health (1988), letter from B. Fear to S. Shaw of USEPA Regarding Malta Test Site, January 29, 1988. (25)

This letter approved the air stripper treatment of drinking water at the site. The approval was based on samples of influent and effluent water from the air stripper system. Data collected by the NYSDOH in 1987 is provided in Table 13.

General Electric Company (1988), Hazardous Material Report Form, March 23, 1988. (26)

GE submitted a New York State Department of State "Hazardous Material Report" to the Malta Ridge Volunteer Fire Company on March 23, 1988. This report stated that GE received the following explosives:

<u>Smokeless Gun Powder</u>	
DuPont IMR-4350	45 lbs
Herculese HC-25FS	15 lbs
Herculese WC-844	8 lbs
Herculese WC-899	2 lbs
<u>Charges</u>	
Cannon Primers	262 lbs
Bag Charges M26E1	2,085 lbs
Bag Charges M6	1,105 lbs
Base Pads - Black Powder	350 lbs
Bag Charges M26E1	unknown weight
<u>Liquid Propellants</u>	
Thiokol LGP-1846	6,000 lbs
Thiokol NOS-365	605 lbs
Thiokol NOS-283	55 lbs
<u>Electric Primers</u>	
Electric Primer M52A3B1	500 count

The cannon primers were stored in Building 8 and the charges were stored in the magazine area, Bunker 27A. GE also received 55 gallons of mineral spirits, 24 cylinders of nitrogen gas, and one dozen spray paint cans.

Power Technologies, Inc., 1988, letter Transmitting Hazardous Waste Manifests for PCB Transformers Shipped from Malta, May 13. (27)

This letter transmits Hazardous Waste Manifests associated with shipment of PCB transformers and transformer oils by Westinghouse Electric Corporation from PTI to National Electric, Inc. in Coffeyville, Kansas for disposal.

New York State Energy Research and Development Authority, 1989, letter Transmitting Hazardous Waste Manifests for Disposal from S-2 Storage Area, Saratoga Research and Development Center, April 13. (28)

This letter transmits a Hazardous Waste Manifest associated with the removal of one drum of flammable waste from storage area S-2 at the MRFA site. The waste was transported for disposal by Environmental One, Inc. of Schenectady, New York to Frontier Chemical Waste Process in Niagara Falls, New York. The sampling report is provided in Attachment C-F (Appendix C).

New York State Department of Environmental Conservation, 1989, Memorandum Regarding April 18, 1989, USEPA Meeting with Malta Potentially Responsible Parties, April 19. (29)

This memorandum was written to summarize an April 18, 1989 meeting in New York City between USEPA and the Malta Rocket Fuel Site potentially responsible parties. In the memorandum, Alan Grant of NYSDEC stated that Olin Mathieson Chemical Corporation (Olin) was under contract to the U.S. Navy Bureau of Aeronautics. Olin admittedly operated a boron hydride pilot plant (located in Building 20) and produced pentaborane jet fuel until June 21, 1955 when their laboratory blew up (see Olin, 1955 summary above). Also, the SUNY Research Foundation was involved in evaporative cooling of water at a facility located at what is known as the "Ice Pond."

6.0 SUMMARY OF INTERVIEWS WITH SITE PERSONNEL

A number of individuals were interviewed in connection with their historical knowledge of the MRFA and most were former GE employees. A summary of each interview and the interview date (I/D) are presented below. Each interviewee is identified by a letter code and a code key has been provided to EPA.

Initial interviews were conducted on behalf of GE during 1989 and 1990. Additional interviews were conducted in 1991 by Geraghty & Miller.

Due to the confidentiality of many activities and the passage of time, there are inconsistencies in some statements. It appears that the specifics of each project task conducted at the site is known only to the task employees. Thus, many individuals have a limited knowledge of the site history and some of their information may be speculative. Despite these problems, several points are clearly agreed upon:

1. Carbon tetrachloride and trichloroethylene were commonly used solvents and cleaning agents in most on-site buildings (See Section 7.0). They were stored in drums and disposed into discharge drains which emptied into the soil and ground water.

2. Muggett's Pond received all of the coolant water, carbon tetrachloride, and trichloroethylene associated with the rocket testing platforms (Buildings Nos. 1, 2, 3, and 6), and the hydraulics laboratory (Building 15). The pond is hydraulically connected to the shallow aquifer and, therefore, is a potential contaminant source.

3. Most chemical dumping was reported in the Building 24 area. The magazines in the area were used to store chemicals such as propellants and explosives.

4. Ethyl alcohol, oxygen, hydrogen peroxide, kerosene, JP-4 fuel, isopropyl alcohol, paraffin, hydrazine, unsymmetrical dimethyl hydrazine (UDMH), tetraethyl aluminum, triethyl aluminum, nitric acid, JP-1 fuel, and gasoline were used as fuels at the site. A complete list of chemicals is provided in Section 7.0.

5. Triethyl aluminum (TEA) was a pyrophoric material used to ignite the rocket engine and was used everywhere that rocket engines were tested (Building Nos. 1, 2, 3, 4, 6, 24, and 25).

6. Most employees remember the explosion in Building 20, but due to the classified nature of the incident, they do not know the details.

7. Wright-Malta has performed artillery testing for the Watervliet Arsenal at Test Pit 6A and Building 24. The tests were performed on 155-mm to 162-mm guns. The guns were fired into sand piles. A classified liquid propellant was involved.

8. The "Isolde" project was in the Building 24 area. A classified propellant was also involved in this project and consisted of organic salts dissolved in nitric acid. Only 6 gallons of the material were ever made. It was detonated in Test Pit 24.

9. The "nuclear powered airplane" project never took place at the site. It may have occurred in Cincinnati.

The presence of pyrophoric material, especially TEA, is possible anywhere at the MRFA Test Station. Thus, on-site drilling activities should be preceded by a geophysical survey to identify buried stainless-steel drums and should be performed with extreme caution. Ground-water contamination is probably limited to chlorinated hydrocarbons, petroleum products, and some metals such as aluminum and boron. Much of the fuel material used is very unstable and would be expected to volatilize very rapidly. It is unlikely to be encountered unless stored in sealed, buried drums.

The interview summaries listed below are presented in alphabetical order by the individual's last name.

Interviewee A (I/D 3-29-91)

- Interviewee A worked at Malta from the 1950s to 1971 as a computer programmer. He said that many explosions were associated with the rocket tests. Any fires which occurred were extinguished with water. Borane fuels were produced in Building 20 by Olin Corporation until it was destroyed by an explosion.

Interviewee B (I/D 2-22-89)

- Interviewee B was Fire Coordinator in 1962 and recalls numerous grass fires near the site, but no fires or explosions. The site had its own fire department (the Hermes Fire Department).

Interviewee C (I/D 3-28-91)

- Interviewee C worked at the MRFA Test Station for two years in the early 1950s developing photographs in the photo laboratory. He did not provide any information.

Interviewee D (I/D 4-1-91)

- Interviewee D worked at Malta from 1956 to 1969 as a laboratory assistant and test pit operator. The rocket tests involved various liquid propellants such as kerosene-based RP-1 and oxidizers such as liquid oxygen. He claimed that more chemicals were used in and around Building 24 than anywhere else on-site. The magazine area served as a storage facility for propellants such as UDMH, nitric acid and various oxidizers.

- The Building 24 area was the site of the short-lived Isolde project. Building Nos. 1, 3, and 4 were used to store ethyl alcohol and liquid oxygen during rocket engine tests. No "hot tests" were conducted in Buildings No. 4 and 6 during Interviewee D's employ. This area was used to store hydrogen peroxide in the mid-to late 1950s.

- Just prior to 1956, an explosion destroyed Building 20, which had been used by Olin Mathieson to produce pentaborane. Building 21 was used to test turbo pumps using hydrogen peroxide. Building 25 contained several fire cradles. Trichloroethylene was used throughout the site as a solvent/degreaser and carbon tetrachloride was only used for cleaning.

Interviewee E (I/D 4-27-89)

- Interviewee E died sometime between this interview and October 26, 1989, according to the wife of interviewees.

- Interviewee E was with GE at Malta from 1947 until Wright-Malta took over. He worked full time with Wright-Malta until 1984 and later on a part-time basis.

- Initially, Building 1 was used as a test stand for small rocket engines that utilized experimental fuels such as hydrazine, UDMH, tetraethyl aluminum (T), nitric acid (as an oxidizer), and hydrogen peroxide (converted to steam to drive turbine pumps). later, Building 1 was used for liquid propellant work.

- Building 2 was also used for small engine testing and was later used by Wright-Malta for artillery testing. Most of the rocket engine firings at Building Nos. 1 and 2 required only a limited fuel supply of about 50 gallons per firing. Test stands 1 and 2 each had fuel storage tanks mounted on the stand.

said that Exxon was present before 1980 and was involved with a uranium enrichment project. The Exxon laboratories were located near Building 23. A large tank of carbon tetrachloride was stored near Building 28. Nearby wells contained carbon tetrachloride. It is Interviewee F's understanding that carbon tetrachloride was used for cleaning at Areas D-2, D-4, and D-5. He stated that Interviewee H would know about contamination in an area where a new tank gun was installed.

Interviewee G (I/D 3-28-91)

- Interviewee G worked at Malta for 15 years beginning in the 1950s. He recalled the use of liquid oxygen, kerosene and JP-4 as propellants. Rocket propellants were not mixed prior to engine use. Carbon tetrachloride was stored in drums and used for cleaning all mechanical parts. He said that the Hermes Fire Department used carbon tetrachloride and that the magazine area was used for the storage of chemicals. He did not recall the names of the chemicals. During the construction of Test Pit 25, the water table was lowered to eliminate flooding of the pit. The necessary ground-water pumping lowered the water table throughout the site. Interviewee G also mentioned that the nuclear-powered airplane project never took place at Malta.

Interviewee H (Raymond Kazyaka) (I/D 8-26-86)

- The following is a summary of the deposition of Interviewee H taken by David Engel, Esq., Assistant Counsel, New York State Department of Environmental Conservation (1).

- Interviewee H is the current president of the Wright-Malta Corporation located at the MRFA site. He has been employed at the site since 1951, when he was a design engineer for GE.

- Interviewee H recalled the use of alcohol, gasoline, and oxygen as fuels in rocket engine testing. large rockets were fired and tested in Buildings 3 and 4. Smaller rockets were tested in Buildings 1, 2, 24, and 25. Water was stored in quench pits at Buildings 3 and 4. Following each test, the water was pumped into the fields surrounding the buildings. In the 1950s and 1960s, kerosene was stored at the site in underground storage tanks. During this period, carbon tetrachloride and trichloroethylene were used as solvents throughout the site. Methyl ethyl ketone (paint thinner) was used in small quantities at the machine shop (Building 13). In 1985, a triethyl aluminum, stainless-steel drum was uncovered by a backhoe near Building 24. The drum ruptured and ignited. In the 1980s, a "new weapon system" was tested at the site. The system involved a "liquid propellant" stored in drums in a building (the magazine area and Building 18). Acetone and freon were also used at the site.

Interviewee I (I/D 2-13-90)

- Interviewee I was employed by MTI from 1978 through August 19, 1984. He was restricted to Building 20. In 1978, MTI built generator systems powered by vapor power turbines. He said that Freon 11 (sic) and Freon 114 were used "as water" because their boiling points were 78 and 111 degrees, respectively. There was no waste because the freon evaporated after use. PTI was located in Building 25 and stored supplies in Building 29A. When Interviewee I first arrived, the land along the fire lane contained pieces of metal structures and holding tanks. They were removed by someone in 1980. Interviewee I did not know who removed them.

Interviewee J (I/D 3-29-91)

- Interviewee J worked as a maintenance man at Malta for 4 or 5 years in the early 1950s. He claimed that carbon tetrachloride was not used to extinguish fires. He said that water was used. He remembered that Building 20 was destroyed by an explosion. He did not remember burying drums, chemicals, or containers.

Interviewee K (I/D 2-22-89)

- Interviewee K, employed by the Saratoga County Emergency Services Municipal Center, Ballston Spa, New York, stated that no information or reports (including Material Safety Data Sheets, Emergency and Hazardous Chemical Inventory Reports, or Toxic Chemical Release Inventory Reports) pertaining to the Malta site were in his files.

Interviewee L (I/D 3-28-91)

- Interviewee L worked at the Malta site for 6 months in 1946 as an Engineering Assistant. He recalled that liquid oxygen and ethyl alcohol were used. He said that the magazine bunkers were used to store rocket motors which were tested every 2 weeks.

Interviewee M (I/D 3-27-91)

- Interviewee M worked at Malta from 1951 to 1953 as a civil engineer in plant services. He helped construct Test Pit 25. Interviewee M claimed that carbon tetrachloride was only stored in 55-gallon drums and that many such carbon tetrachloride drums were stored in the machine shop (Building 13). He said he

observed the use of liquid oxygen and ethyl alcohol as rocket fuel. He also said that nuclear-powered airplane research was not conducted at Malta although it may have been conducted in Cincinnati.

Interviewee N (I/D 3-29-91)

- Interviewee N worked as an electrical laboratory technician at Malta in the early 1950s. He said that Test Pit 24 exploded and water was used to extinguish it. He could not provide more information about the MRFA Test Station because he spent most of his time at the GE Research and Development Center in Schenectady.

Interviewee O (I/D 2-12-90)

- Interviewee O was employed by GE from 1958 to December 1989 and is now retired. He was at Malta from 1958 until 1971. He began as a Class A Electrician, maintenance worker. Interviewee O stated that from 1958 to 1971, GE tested nose cone re-entry materials for North America and Rocket-Dyne Aircraft Company in Pits 3 and 4 by exposing the cones to rocket engines. GE tested turbines for the X15 wingless aircraft program in Pit 6 and Pit 21. A simulated re-entry chamber was used. Hydrogen peroxide was mixed with an oxidizer and ignited. This process turned the hydrogen peroxide into steam and powered the turbines. The hydrogen peroxide was stored in four quonset huts (27A, 27B, 27D, and 27D). GE also tested a hydraulically operated power generator for Lynn River Works at Pit 6. Wright-Malta performed testing for Watervliet Arsenal at Pit 6A where 155-mm to 162-mm guns were fired into sand pits. Most other test areas were used for rocket systems testing. The engines burned until the fuel evaporated and water from the pond was pumped to cool the engines. The water was then washed into the sand.

- Interviewee O did not know how hazardous waste was disposed of. Paper, lumber, roofing, and construction supplies were stored in S-1. Carbon tetrachloride was used

to wash out stainless-steel parts, put into a scrubber tank and diluted with water, emptied down concrete aprons, and gravity-drained into the sand behind Building 21. A water supply sample was collected weekly from the reservoir and tested by the Saratoga Agricultural Department; however, no data were available.

Interviewee P (I/D 12-12-89)

- Interviewee P worked at the Malta site for GE from about 1959 to August 31, 1961. He began as a day shift maintenance foreman and later worked the second shift. He also acted as Fire Chief and did not recall any fires or explosions. Interviewee P believed that William Krosky of Colonie, New York supplied Shell Oil for heating, and possibly gasoline. He recalled the following buildings: (1) Test Pit 4, which included an outside incinerator for trash burning; (2) Building 23, which was a paint shop with an outside concrete pad used to store drums on a rack (Interviewee P did not know what the drums contained), and (3) Building 25, which was a test structure where he changed meter paper.

- Interviewee P did not know how the water in the test pits was emptied or how solvents and oil were disposed at the site. He recalled that numerous "in-ground" fuel tanks were removed before he left in 1961. To his knowledge, none were leaking. He also recalled representatives of Avco, Lockheed and NASA coming to the site.

Interviewee Q (I/D 2-23-89)

- Interviewee Q became GE's General Manager for the Malta site in the late 1960s. He was based in Pittsfield, Massachusetts. Interviewee CC was the MRFA Test Station Manager reporting to him. Interviewee Q rarely visited the site.

- Interviewee Q stated that, during the late 1960s, GE had a contract with Watervliet Arsenal to test fire large guns. This involved storage of gunpowder. He stated that

the liquid propellant program began in the mid-1970s. The cannon test firings took place in Pits 3 and 4. GE also had a contract with the Army Automotive and Tank Command in Detroit, Michigan to test steering transmissions for tanks. GE personnel drove the tanks around a field. He indicated that the following substances are likely to have been on-site while he was General Manager: gasoline, diesel fuel, hydraulic fluid and some sort of benzene cleaner.

Interviewee R (I/D 4-18-89)

- Interviewee R was with GE and was involved in work at the MRFA Test Station from November 1944 until 1955. He was with Project Hermes under the U.S. Army Air Corps Ordnance Division. He said that research involved development and testing of rocket engines of a 20,000 lb thrust load capacity. Fuels used at the site included ethyl alcohol, isopropyl alcohol; liquid hydrogen; hydrogen peroxide (for experimental hybrid engines); and polyethylene and paraffin (mixed as a solid fuel).

- At some time in the early 1950s, GE performed borane research in Building 20. This research, which ended in 1955, involved conversion of diborane (B2H6) to pentaborane (B5H9) in small (10 to 20 lb) quantities to provide the Hermes project with high energy fuel. Interviewee R said that a Dr. Moore (who Interviewee R believed to be deceased) was the chemist in charge of the laboratory. Olin Mathieson took up the research in 1955 in Building 20.

- Building 21 was the ramjet facility and was used as a supersonic wind tunnel. Diesel fuel and oil were probably used in the diesel engines. Buildings 3 and 4 were test stands for the larger rocket engines. When an engine caught fire, it was flooded with carbon tetrachloride to extinguish the fire. Other flame retardants may have been used. The flame retardant either went into the ground or into the test pit pool. The pool may have been pumped out and dumped in a pond at a location Interviewee R could not identify. Elmer Finger (who Interviewee R believed to be deceased) was

responsible for the test stands and equipment. Building 18 was used to store hydrogen peroxide. Building 13 was a machine shop where engines were disassembled. Interviewee R believed that Malta was used for the USAF CRESS program, which dealt with design of a missile re-entry system and warheads after the Hermes program.

Interviewee S (I/D 10-26-89 [First Interview])

- Interviewee S worked for GE at the MRFA Test Station from 1946 to 1972. He was originally a test stand operator and later a testing supervisor. Test Stands 1 and 2 were used to test small engines and 3 and 4 were used to test larger engines. Interviewee S believes that GE and NASA did experimental work at Test Stand 3 in the late 1960s. The work involved plastics and carbon, but he would not discuss it further because it was confidential. He believed that Olin was on-site for about 2 years in Building 20 where they performed experimental work on pulse jets for the U.S. Air Force. Interviewee S refused to talk about the Olin explosion. He said that Gamma Nuclear was located "off-site" and conducted research involving food processing.

- Interviewee S stated that a liquid fuel additive was shipped to the site in 55-gallon drums from the GE plastics plant in Watervliet. GE used carbon tetrachloride to clean oxidizer lines and as a general cleaner. He said he believed this practice ended in 1948 when GE began using trichloroethylene instead. Carbon tetrachloride and other things were stored in drums in an area near Building 23. Interviewee S believed that the drums remained there when GE left in 1972.

- Buildings 1 and 2 were used for small engine testing. Interviewee S did not believe that any waste was generated at those stands. Buildings 3 and 4 were used for larger

engine tests. There were two troughs on each side of the pit to collect spillage which ran down the troughs into pools. Interviewee S believed that evaporation "took care of" these liquids.

- Building 5 was used as a test area for turbine pumps. Interviewee S believed that Watervliet Arsenal used it for gun testing in 1972. Building 10 may have been used for records storage. Building 11 was definitely used for records storage. There were a number of underground tanks used to store alcohol and gasoline in the area of Buildings 10 and 28. Building 14 was a small chemical laboratory possibly used for fuel testing. Building 15 was used for flow testing and Interviewee S believed that a floor drain emptied into a concrete trough that emptied into "the pond." Peroxide was stored in Building 18. It was used to drive turbine pumps. Building 25 was a test stand for complete rocket engines. Interviewee S refused to talk about "Building 1," although he was asked about the "Isolde" project.

Interviewee S (I/D 12-18-89 Second Interview)

- When Interviewee S arrived in 1946, Buildings 1, lB, 11, 13, 15, and 27 were in place and Building 2 was a concrete shell. Initially, he was involved in tests at Stand l. When no tests were being conducted, he installed equipment in Building 2 which was completed around 1948. Test Stand 3 was built in 1948 and tests began in 1950. Test Stand 1 was used to test 2,500 to 2,000 lb thrust engines using alcohol. The test stand had 20 to 30 gallon capacity fuel tanks that were hand filled. The stand also had floor drains connected to concrete troughs or spillways which terminated in dry wells. There were separate drains for oxidizers and fuels. Interviewee S said that he discovered years later that these drains converged, but no accidents occurred and there was little spillage at Test Stand l. Test Stand 2 was used to test 4,000 to 8,000 lb thrust engines using alcohol, jet propulsion 01 (JP-1); and gasoline as fuels at various times; there was little spillage in this area. Test Stand 3 was used to test engines up to 40,000 lb thrust. The stand had 500-and 1000-gallon capacity fuel tanks.

They were filled both by hand and by an underground line from storage tanks located in Area 28. Both Test Stands 3 and 4 had concrete spillways leading away from the stand to a retaining pond. Interviewee S believed that the pond bottom was unlined. Both UDMH and nitrogen tetroxide were used at Stand 3 for testing. The concrete spillways were lined with limestone to neutralize the tetroxide. Both Test Stands 3 and 4 had "weeping holes" allowing water to seep in; the holes were at the same depth as the water table. The water absorbed the flame and heat generated during the tests and was usually left in the pit after the test. Occasionally, it was pumped out. For instance, if the U.S. Air Force tested an engine and it misfired or exploded, the pit was pumped to recover any parts that might have fallen into it. When a pit was pumped, the water was emptied into the concrete sluice that drained into Muggett's Pond. There was little spillage at Test Stand 3.

- Test Stand 4 was used to test complete systems and Interviewee S recalled the use of both alcohol and JP-1 at Test Stand 4. Test Stands 3 and 4 had identical pits and spillways. Grunnel extinguishing systems that held only water were used at both stands. Interviewee S did not recall the use of chemicals for extinguishing.

- Building 5 was a turbo pump testing facility. Interviewee S believed that no fuels or solvents were used. Building 6 was a turbine pump testing facility where water was used. Interviewee S believed that Building 6 had floor drains under the road, discharging the water to Muggett's Pond.

- Building 7 was the "gas plant" where pressurized bottles of nitrogen and oxygen were kept. Building 9 was used for record storage. Building 14 held offices and the electronic laboratory. Any carbon tetrachloride used in Building 14 was emptied into a drum. Interviewee S did not know how it was disposed. Building 15 had a floor drain emptying into the sluice leading to Muggett's Pond. Carbon tetrachloride and trichloroethylene were used in Building 15 to clean systems and parts.

- Building 20 was used by Olin during the 1950s to perform experimental work involving borane. Interviewee S was involved in fighting the fire that resulted from the explosion which killed two people. Two technicians apparently were cleaning with carbon tetrachloride that came into contact with borane. Interviewee S and a few other GE employees went to the hospital for a short time after the fire. He was not sure where the Building 20 debris was disposed, but said the ball field area (Disposal Areas D-5 and D-6) was used for disposal of other types of debris. He did recall that the remaining borane was taken to the bank area east of Test Pits 2 and 3 and exploded by a sharpshooter. In later years, the U.S. Army used Building 20 for assembling and quality control for their tank projects.

- Building 21 was used by Olin for secret testing of borane. Building 23P was the paint shop and was used to store carbon tetrachloride, trichloroethylene, paint thinner, cutting oils and alcohol. Interviewee S was unfamiliar with the work done in Building 24 with one exception: the "Isolde" fuel program which involved mixing chemical salts and fuming white acids to developmental fuel. The person in charge was an Indian doctor from GE's Cincinnati group. Interviewee S knew of one explosion in Building 24 that caused considerable damage to the building. He also knew of one instance when n-propyl nitrate (NPN) was delivered to Building 24 for use as an experimental fuel. Building 25 was used to test large engines and complete systems. Interviewee S said he believed that JP-1 and peroxides were used there.

- Building 26 was used to store vehicles. Interviewee S recalled the following fuels in use over the years at the site: (1) tetroxide; (2) UDMH; (3) peroxide; and (4) silicone mixed with JP-1 (the silicone was a cooling agent). Tetraethyl aluminum (TEA) was used as an igniter during the mid-1950s. Interviewee S recalled that a 10,000-gallon fuel oil storage tank, located west of Muggett's Pond, was replaced in the 1960s because of leaks.

- During the early 1950s, they began to use trichloroethylene rather than carbon tetrachloride as a solvent. Interviewee S recalled that a container of peroxide developed a leak and exploded in the area between Building 18 and 24. The peroxide was used as part of a test being performed by the U.S. Army. The U.S. Army Corps of Engineers was involved in initial construction of the site and, later, the U.S. Army Tank Command used Building 20. U.S. Army personnel could also be seen on-site for training activities.

- Between 1955 and 1972, GE performed model testing for the military and for companies such as Boeing, lockheed, Douglas and Chrysler. During the early 1960s, GE did work in Pit 4 for lockheed, which was under contract to the U.S. Navy to develop submarine missiles. Most of the work was secret and Malta personnel often did not know who they were working for. Interviewee S recalled research involving firing an artillery round (20-mm) into a rocket and testing the rocket to determine if it was still functional. He also remembered the following incident: At some point between 1965 and 1968, the English government was involved in a secret project that resulted in a laboratory explosion. GE had substances on hand in Schenectady that were similar to those used in that work. At Interviewee H's request, the chemical was driven to Malta in the rear of a pickup truck. The chemical was in various size containers. The containers were taken to D-5 where a hole was dug. The containers were placed in the hole and Interviewee H shot the containers with a 357 magnum. Some exploded and others did not. The station's fire department poured water on the containers and they started to "spit and sputter." Interviewee S left the area, but believes the containers were buried at that location. He does not know what was in the containers or if the substance was liquid or gas. D-1 was a burning pit and, at times in the 1960s, 55-gallon drums of UDMH were burned there. This occurred after completion of the NASA X-405 project at Test Stand 3. There was a burning pit on the ballfield area, but Interviewee S believed that only paper was burned there.

Interviewee T (I/D 12-12 & 12-13-89)

- Interviewee T worked as a site photographer for GE at Malta beginning in 1956. He continued to work for GE until 1983, when he retired. He apparently remained onsite after 1972. He has performed photographic work on occasion since 1983 for Wright-Malta.

- Interviewee T recalled that Curtiss-Wright had exclusive use of Test Stand 24 and used it for rocket engine work. Exxon had office space on the right side of Building 14 and, after 1974, used the laboratory at the rear of the building. Exxon also used a building on the right side of the entrance roadway. During the time Interviewee T was on-site, GE was busiest during the Vanguard era. GE performed material testing of heat shields for various companies (AVCO, New Jersey, Lockheed, Curtiss-Wright, Chrysler and Sandia).

- Interviewee T was generally unaware of projects other than those he was specifically asked to photograph. He photographed most testing, but Sandia supplied their own photographer. The photo laboratory is located in Building 14. Interviewee T implemented a photographic filing system shortly after he arrived in 1956 and used it until 1974. Before he arrived, the photographs were not well indexed. He instituted a system attaching the contact print to a 3 inch by 5 inch index card with the following information: (1) assignment number (chronologically); (2) negative number (sequential and marked with the number of photographs); and (3) the date the photograph was taken. Besides cataloging all photos taken after he arrived, he began to do it for photos taken earlier in his spare time, working backward in time. He did not recall how far back he ultimately went. The contact prints were filed by subject matter (e.g., company, building number, project number, equipment description, tests) and were in index card drawers on top of a four-drawer filing

cabinet in the Building 14 photo laboratory. The negatives were in the filing cabinet. Geraghty & Miller reviewed all available historical photographs and included a number of photographs in Appendix E.

- Thousands of negatives existed, a few of which were aerials of the site. Some photos showed the damage to Building 20 as a result of the 1955 explosion while the building was used by Olin. Some of these negatives were missing and a card indicated that Olin requested copies on July 6, 1955. Interviewee T speculated that they had received the negatives as well. There were also negatives showing disposal of debris from the explosion in an unidentified open field, possibly the baseball field.

Interviewee U (I/D 2-23-89)

- Interviewee U joined the Malta Ridge Fire Department in 1976. He has been to the site for walk-through, occasional fire department drills, and to assist with fighting fires. The fire department's records reflect a number of responses to the site over the years. The department file also contains a number of hazardous material reports for MTI and GE.

- Interviewee U had no hazardous material reports for Wright-Malta and recalls asking Interviewee H during a walk-through a few years ago if any would be submitted. Interviewee H told him none would be submitted because his company did "secret government projects." To the best of Interviewee U's knowledge, Wright-Malta does not submit any reports to state or local agencies.

- Interviewee U has been inside Buildings 15, 23, 25S, and 9. Building 15 was the pump building with two large pumps and wooden water storage tanks of 100,000- to 200,000-gallon capacity for the hydrant supply. Building 23 was a maintenance machine storage building. Building 25A was vacant and looked as though it had been a laboratory. Interviewee U believed that Building 25S was also vacant. Building 9

was an empty underground magazine in 1981 or 1982. The fire department was told to stay out of Building 18 in the event of a fire because it was an underground explosives magazine.

- In 1986, Interviewee U was told that Building 18 was used by GE to store liquid propellant. In either 1985 or 1986, he observed a grading project between Building 5 (N) to Building 2 (S), behind (E) Test Pits 3 and 4. He later heard that a buried drum had been punctured. Exxon Nuclear used the building on the entrance road and stored about 50 55-gallon drums of fine powdered coal inside the building work area. GE later used the building for a gasification program.

Interviewee V (I/D 2-22-89)

- Interviewee V worked for GE at Malta from December 1958 until December 1959. He was a janitor for the first few months. His work area was Building 12 (a machine shop) where he shared space with two draftsmen.

- Interviewee V was only allowed to go into Buildings 13, 14, and 21. He stated that Buildings 14 and 21 were office buildings. He had heard there was an explosion in Building 21 before he arrived, but the building was repaired by the time he saw it. He stated that Building 7 was a laboratory; Buildings 8 and 9 were underground fuel magazines; Building 11 (A, B, C, and D) was warehouses that usually held spare parts; Building 13 was a cafeteria; Building 15 was a pumphouse with two large pumps that he believed were connected to an underground reservoir for water for the hydrant system; Building 23 was a firehouse with an outside fuel pump; Building 25 was a test pit area; and Interviewee V stated that Building 26 was an open storage shed with graders and other machinery.

- After 4 months, Interviewee V was made Document Control Officer. His office was in Building 14. He collected documents and gave them to site security personnel for

destruction. He said he believed that they were shredded and incinerated near Area D-5. There was an incinerator "over the bank" that was about 6 by 10 ft. He also believed that there was a burning pit approximately 5 x 8 ft that was covered with a metal mesh grate at the rear of Building 13. He believed that it was used only for paper.

- From 1968 to 1980, Interviewee V was Malta Ridge Fire Chief. He recalled only one fire at the site in the early 1970s at Building 23. This occurred when welding sparks fell into a bird's nest. Once a year, he walked through the site to stay familiar with it.

- Interviewee V said that Gamma Nuclear operated a sterilization program in the early 1970s and used a Cobalt 60 source to sterilize medical instruments.

Interviewee W (I/D 5-3-89, 12-12-89)

- Interviewee W worked for GE at Malta from 1959 (near the conclusion of the Vanguard program) until 1972, when he went to work for Wright-Malta, from which he retired in 1980. He still does some contract work as a photographer.

- Interviewee W was originally an electronics technician who calibrated instruments in the "calibration lab." He also helped manufacture thermal couplers in Building 14 and installed them on transducers in Building 24. Later, Interviewee W began doing photography at the site. There is a four-drawer file cabinet at Wright-Malta with 4,000 to 5,000 photos of the site.

- Interviewee W stated that the Exxon Nuclear building was first occupied by Gamma Processing which did experimental work in irradiating food. Gamma could not pay

worked for GE at what appears to be the GE/Exxon Nuclear building. He did not known what Exxon did, but heard it involved nuclear experiments that "never got off the ground." The TSD work involved a DOD contract for developing and manufacturing truck transmissions and turret drives in Building 14. Interviewee X also worked in liquid propellant Research and Development.

- Interviewee X said that Buildings 1 and 1A were used as a test firing areas for "guns" using experimental liquid propellant. Building 5 was a test area and laboratory space. Buildings 8, 9, 27, and, possibly, 29 were used to store munitions. Building 27D was used to store liquid propellant.

- Building 18 was a secured hazardous waste area for solids later manifested and hauled away by Clean Harbors or Northeast Solvents for incineration. Buildings 4 and 21 were used by Wright-Malta, under contract to DOE, to experiment with turning garbage into methane gas (bio-mass gasification). Interviewee X believed that MTI was located in Building 20 and conducted research and development for diesel and gas compressors and motors. He believed that PTI was in Building 7 and performed research involving electrical utilities. Wright-Malta occasionally used the area just south of S-1 to burn off excess propellant, but the debris from S-1 was removed by Wright-Malta and the area was reseeded. D-4, which was a general disposal area for old fuel tanks, stainless steel, etc., had also been removed by Wright-Malta. The empty tanks and scrap metal were sorted and stacked along the perimeter of D-4.

Interviewee Y (3-28-91)

- Interviewee Y worked at Malta for 11 years beginning in 1957. He recalled the frequent use of carbon tetrachloride and TCE as degreasers. Both solvents were stored in drums behind the hydraulics laboratory (Building 15). Drums of carbon tetrachloride and TCE were dumped behind Building 15 and in the Test Pit 24 area. Carbon tetrachloride was used throughout the site to clean water and alcohol from

valves and machinery during assembly. Carbon tetrachloride was used during the final flush of the rocket engines and injectors prior to the test fire. Carbon tetrachloride was also used to degrease all parts that came in contact with liquid oxygen.

- In the 1960s, carbon tetrachloride was replaced by drums of TCE. Interviewee Y said that the TCE was used for the same purposes as the carbon tetrachloride. Hydrogen peroxide was also used throughout the site. TEA was used as a pyrophor to ignite rocket engines mounted over the test pits. TEA was used at Test Pits 1, 3, 4, 6, and 24. The Isolde project produced propellants which were disposed in Test Pit 24.

- The Propellant Utilization Program was across the street from Building 21. Liquid oxygen was mixed with JP-4 rocket fuel. Particles of plastic and ethylene gas were generated. The concrete pads with eye bolts which remain in the area were part of this program.

Interviewee Z (I/D 3-27-91, 10-7-91)

- Interviewee Z is Manager of Environmental Health and Safety for General Electric Aerospace, Pittsfield, Massachusetts. He has been supervising Environmental Health and Safety at the MRFA site for the past 5 years. He had no historical knowledge of the site. He said GE currently rents space from Wright-Malta and is working on a liquid propellant project.

- Interviewee Z uses the MRFA facility to test medium range artillery (90mm to 105mm). Hydroxyl ammonium nitrate (HAN) fuel is used, shipped to the site in 55 gallon marked drums. The fuel is consumed during testing and the empty drums are stored in Building 18.

- Interviewee Z believed that the only other chemicals currently used at the Building 24 site are cleaning solvents including small quantities (1 or 2 drums per year) of 1,1,1-trichloroethane, freon, and, possibly, isopropyl alcohol.

Interviewee AA (I/D 10-7-91)

- Interviewee AA is an environmental engineer in charge of waste removal from the GE facility (Building 24) at the MRFA site. He has had this responsibility for approximately one year. He provided the annual maximum volume of certain chemicals disposed each year: 1) waste oil - 4 drums per year; 2) wastewater with freon - 100 drums per year; 3) rags soaked with freon, oil, and 1,1,1-trichloroethane - 1,400 lbs per year. He stated that similar quantities of these waste have been generated for several years. According to Interviewee AA, all waste material is handled and disposed in accordance with RCRA regulations.

Interviewee BB (I/D 3-29-91)

- Interviewee BB worked at Malta for 3 to 4 years in the 1950s as a combustion engineer. He said that the combustion systems that used JP-4 jet fuel, were tested in Building 21. The JP-4 was stored in tanks and propylene oxide and carbon disulfide were added to the JP-4. These additives were also stored in drums. Gasoline and lubricating oil used in aircraft engines in Building 21 were stored in drums. A combustion cell was located south of the building and exhausted to the east.

Interviewee CC (I/D 4-27-89)

- Interviewee CC was with GE and arrived at the Malta site some time before 1955. He later founded Wright-Malta. He said that Building 20 was designed and built by the U.S. Army Corps of Engineers. The building, which was built with "explosion proof' walls containing three cells separated by "explosion proof' walls, was designed

propellant is shipped from GE - Pittsfield in 5-gallon metal containers lined with plastic. After use, the plastic liner is triple rinsed and cut for recycling, and the metal container is returned to Pittsfield to be scrapped. All rinse water is stored in 55-gallon drums which are removed to GE - Pittsfield every 90 days. This practice has continued for the past 5 years.

Interviewee DD said that the only other chemicals used at the site are lubricating oils and greases, and the freon solvent, trichlorofluoroethane. Rags soaked with the solvent are placed in drums and properly disposed by GE - Pittsfield.

7.0 CHEMICALS USED AND DETECTED AT THE SITE

Based on letters, promotional material, engineering specifications, regulatory information, investigative reports, sampling results, and employee interviews, the following substances have been detected in the ground water, surface water or soil at the site, or have been used at the site.

7.1 CHEMICALS USED AT THE SITE

	Place of Use (Bldg #)	Reference
Acetone	13, GE/Exxon Nuclear	1, 2, 3
Alkylamine nitrates	24	4
Amine nitrates (CAVEA-B)	S-4	5
Ammonia	24	4, 6
Amyl alcohol	13	7
Arozene (50 percent hydrazine, 50 percent 1,1-dimethyl hydrazine)	S-4	8
Boron hydride	8,9,20,25,27,D-5	9
Boron trifluoride etherate	20	10
Carbon disulfide	21	11
Carbon tetrachloride	3,4,Muggett's Pond,Site-wide	12
Chlorine trifluoride	3,4,8,9,24,27,S-4	4, 6, 13
Cobalt 60	GE/Exxon Nuclear	14, 15
Cordite	Malta Test Station (exact location unknown)	16
Decaborane	20	17
Diborane	20,25	18, 19
Dichloromethane	Malta Test Station (exact location unknown)	20
Diesel fuel	20, USTs	19, 21
Dipropylene glycol nitrate (Otto Fuel II)	18	1
Ethane	20	10
Ether	20	10
Ethyl alcohol	1,2,24,25,USTS,Site-wide	1, 4, 18, 19
n-Ethylmorphaline	GE/Exxon Nuclear	22
Fluorine	24	4, 19
Freon TA and TES	13,GE/Exxon Nuclear	3, 23
Fuel oil No. 2	USTs, Site-wide	19, 21

	Place of Use (Bldg #)	Reference
Gasoline	USTs,Site-wide	4, 19, 24
Hydrazine	3,4,8,9,24,27,S-4	4, 13, 18, 25
Hydrazine nitrate	2,6,24	6
Hydrides	20	10
Hydrogen (liquid)	Malta Test Station (exact location unknown)	18
Hydrogen peroxide	3,4,8,9,24,27	4, 13, 18, 19
Hydroxyl ammonium nitrate	1,2,6,18,24,27	26
Isolde 120A	24,27	6, 16
Isopropyl alcohol	USTs,GE/Exxon Nuclear, Site-wide	3, 18, 19, 27
Kerosene	1,2,3,4,25,USTs,ASTs	19, 24
Kerosene-based jet fuels (JP-1, JP-4, JP-X, RP-1)	25,USTs	4, 18, 19
Lithium hydride	20	10
Magnesium carbonate	GE/Exxon Nuclear	3
Methanol	Malta Test Station (exact location unknown)	7
Methyl ethyl ketone	13,GE/Exxon Nuclear	2, 3
Mineral spirits	13,Area A	1, 28
Monomethyl hydrazine (MMH)	3,4,8,9,24,27,S-4	4, 5, 13
Naptha	Malta Test Station (exact location unknown)	28
Nitric acid (red fuming)	8,9,24,27, Isolde Project Area	4, 13, 16, 18
Nitric acid (white fuming)	8,9,24,27, Isolde Project Area	4, 13, 16, 18
Nitrogen (liquid)	Site Wide	19
Nitrogen tetroxide	2,8,9,24,27	4, 13, 18
Nitromethane		4
Oxygen (liquid)	ASTs, Site Wide	4, 19
Paraffin (solid fuel)	Malta Test Station (exact location unknown)	18
PCBs	25	29
Pentaborane	8,9,20,25,27,D-5	4, 18, 19, 24
Perchlorates	Malta Test Station (exact location unknown)	16
Perchloroethylene	GE/Exxon Nuclear	3, 20
Perchloryl fluoride	24	4, 16
Polyethylene (solid fuel)	21	16, 18
Polystyrene	Malta Test Station (exact location unknown)	16

	Place of Use (Bldg #)	Reference
Potassium	D-5	16
Propane	Site Wide	30
Propylene oxide	21	11, 16
n-Propylnitrate	24	4, 6, 16
Samarium nitrate	Malta Test Station (exact location unknown)	16
Silicone	Site Wide	18
Silicone grease	Malta Test Station (exact location unknown)	1
Sodium	D-5	16
Sodium chromate	GE/Exxon Nuclear	3
Sulfuric acid	18	2
Tetraethyl aluminum	3,4,24,25	18
Toluene	13,24,GE/Exxon Nuclear	3, 4, 6
1,1,1-Trichloroethane	Malta Test Station (exact location unknown)	13
Trichloroethylene	3,4,13,25,Site Wide	12, 13, 27, 31
Triethanol ammonium nitrate	6,18,24,27	26
Triethyl aluminum	1,2,3,4,24,25,D-6	32
Unsymmetrical dimethyl hydrazine (UDMH)	3,4,8,9,24,27,S-4	4, 13, 18
Uranium hexafluoride	GE/Exxon Nuclear	33, 34
Uranium dioxide difluoride	GE/Exxon Nuclear	33,34
Xylidene dipentene	Malta Test Station (exact location unknown)	16
Xylidene triethylamine	Malta Test Station (exact location unknown)	16

TRADE-NAME CHEMICALS USED AT THE GE/EXXON NUCLEAR BUILDING (3)

	Amounts
Dexron ATF (automatic transmission fluid)	1 barrel
Vectra 4	120 gallons
MCS 293 oil	1 gallon
Perfuoro	1,300 grams
Isoprep	125 pounds
Gear grease	50 gallons
Zyglo (ZP-13A)	1,500 pounds
Trim-Sol	25 gallons
Hyku Golden Barrel Oil	3 barrels
Electroetch	5 quarts

7.2 CHEMICALS DETECTED AT THE SITE

Concentrations in ppm = (milligrams per liter [mg/L]; ppb (micrograms per liter [ug/L].

	Sampling Locations	Maximum Concentration	Medium	Reference
Aluminum	Ravine 2	26 ppm	Surface Water	35
Arsenic	Well 9 (Bldg 24)	8.3 ppm	Soil	37
Benzo(a)anthracene	Well 11D	34 ppb	Ground Water	35
Benzyl alcohol	MW-1	3 ppb	Ground Water	36
Bis(2-ethylhexyl)phthalate	Boring A (Bldg 24)	2,700 ppb	Soil	38
Boron	Ravine 2	3.40 ppm	Surface Water	35
Bromomethane	DGC-3D	6.2 ppb	Ground Water	39
Butyl benzyl phthalate	MW-1,MW-2	12 ppb	Ground Water	36
Cadmium	Well 9A (Bldg 24)	0.287 ppm	Soil	37
Carbon disulfide	Well 13S	60 ppb	Ground Water	45
Carbon tetrachloride	Well #2	840 ppb	Ground Water	40
Chloroform	Well #2	58 ppb	Ground Water	40
Chloromethane	DGC-3D	27 ppb	Ground Water	39
Chromium	Well #2 (Tap Water)	18 ppm	Ground Water	41
Copper	Well #1	0.09 ppm	Ground Water	41
Dibromochloromethane	Well #2 (Tap Water)	3 ppb	Ground Water	42
1,2-Dichloroethane	PTI	6.8 ppb	Septic	43
trans-1,2-Dichloroethene	PTI	170 ppb	Septic	43
Diethyl phthalate	Well 11S	56 ppb	Ground Water	35
Di-n-octyl phthalate	Well 11D	93 ppb	Ground Water	35
Lead	D-3	1.06 ppm	Ground Water	28
Manganese	D-3	27.8 ppm	Ground Water	28
Mercury	Boring 8 (Bldg 24)	0.61 ppm	Soil	37
Pentaborane	(Location not given)	0.15 ppb	Ground Water	44
PCB (Aroclor 1254)	MW-1	2.5 ppb	Ground Water	36
1,1,2-Trichloroethane	Well #2 (Tap Water)	7.7 ppb	Ground Water	43
Trichloroethylene	Well #2	230 ppb	Ground Water	40
Toluene	Bldg 24	96 ppb	Septic	43
Xylene	PTI	12 ppb	Septic	43
Zinc	Well 9 (Bldg 24)	70 ppm	Soil	37

All of the analytical data cited above were obtained using methods that meet the USEPA Criteria for Level III Analysis, i.e., the analyses were performed in an off-site analytical laboratory, were not analyzed by Contract Laboratory Program procedures, and were not validated. Detailed discussion of levels of analysis are provided in "Data Quality Objectives for Remedial Response Activities Development Process," U.S. Environmental Protection Agency, March 1987.

7.3 PHYSICAL AND CHEMICAL PROPERTIES

Many of the chemicals used at the MRFA site are very unstable in the environment. Especially unstable are the propellants such as boron hydrides, hydrazines, and nitrogen-based compounds. Diborane rapidly decomposes to boron in water. Pentaborane hydrolyzes slowly in water to boron. Hydrazine, MMH, and UMDH degrade to nitrosoamines (n-nitrosodimethylamine, n-nitrosodi-n-propylamine, and n-nitrosidiphenylamine), 1,2-diphenylhydrazine and ultimately to nitrites and nitrates. Nitrogen tetroxide is a pressurized gas which at atmospheric pressure degrades instantly to nitrogen dioxide (NO_2). Nitric acid in water readily breaks down to nitrites and nitrates. Chlorine trifluoride, triethyl aluminum, and tetraethyl aluminum react violently with water to form fluoride and aluminum, respectively (45).

Therefore, many of the compounds used at the site (except pentaborane) will not be detected, although elevated levels of nitrate, aluminum, and boron may be detected in on-site media such as water and soil. The danger lies in potentially explosive sealed buried drums such as the one discovered in potential source area D-6.

As specified in Section 4.2 of the RI Work Plan, the literature review should include the chemical and physical properties of any chemicals not listed on the TCL that were detected in historical sample analyses. Three chemicals met these criteria. The properties of these chemicals are listed below.

literature search. These photographs and a 1982 set of USDA photographs were analyzed by USEPA. Geraghty & Miller's observations were substantiated by the USEPA's March 1989 report (1). Because the 1982 photographs reflected present site conditions, the more recent infrared photographs (USDA, 1983; USGS, 1986) were not reviewed. Areas containing disturbed soil, clearings in woods, and previously unidentified buildings or drums were included on the potential source area map (Figures 7 and 8).

April 16, 1952 (Epic # Frame 20834)

This photograph was taken during the early years of rocket engine research at the MRFA. The site appeared very active with a large number of automobiles in the parking lot. All of the test structures and buildings which exist today had been built by 1952, except the GE/Exxon Nuclear building.

Disposal areas D-2 and D-4 (Figure 7) and area D-3 (Figure 8) appear disturbed in the photograph and may be active disposal sites. However, D-3 was not part of the MRFA site until 1955. There is clear evidence of activity and disturbed soil in the S-2 and S-3 storage areas. There is activity in disposal area D-5 and trailers or temporary structures are present. There is evidence of disturbed soil south of Building 25 near the 25G Bunker. A clearing in the woods exists southeast of Building 25 and is designated as storage area S-7 in Figure 7. There is a large storage area west of Building 25. The area, designated as storage area S-8 on Figure 7, contains many small temporary structures, stored material, and possibly drums. Clearings are visible in the "filled-in" pond areas northeast of Building 6 and east of Building 7. A very active dirt road is visible around the "triangular parcel" southeast of the fenceline. Debris and disturbed soil are prevalent throughout the MRFA site.

October 17, 1960 (Epic # Roll 21177, Frame 49)

This photograph was taken during one of the most active rocket testing years. The site appears very active, and storage and disposal areas were more centralized and better defined than in the 1952 photograph.

Charred material is visible at burning pit D-1. No activity or disturbed soil are visible in disposal area D-2. There is disturbed soil and probable activity in areas D-3, D-4, and the southwest portion of D-5. There is a great deal of equipment in storage areas S-1, S-2 and S-3; and S-1 and S-2 contain miscellaneous debris and, possibly, drums. Area S-3 contains a long row of large elongated containers which may be rocket motor shipping containers or liquid gas or fuel cylinders. This area is located behind Building Complex 11 (the warehouses). Other containers or drums line the warehouses and debris is scattered behind the vehicle storage shed, Building 26. There appears to be activity in storage area S-4. Active dirt roads are visible in the "filled-in" ponds near Buildings 6 and 7. A shed is apparent in the clearing southeast of Building 25 (Storage Area S-7 in Figure 7). There is a structure behind Bunker 27C in the Magazine Area with a dirt road leading to it. The structure is designated as the Isolde Project Area on Figure 7 and will be discussed in Section 8.0.

Dirt roads and small clearings are visible in the easement area. Several dirt roads and small clearings are visible within the fenced site. The largest and most active of these is located in the eastern corner of the fenceline. Several dirt roads cross the northern corner of the fenced site, with no apparent destination.

August 15, 1968 (Epic # Roll 21177, Frame 59)

At this time, the activity at the MRFA had changed from predominantly rocket engine testing to predominantly artillery test firing using solid and liquid propellants. The

number of employees at the site had decreased significantly and, presumably, the amount of activity, judging by the small number of automobiles shown in the photograph.

Burning pit D-1 is still active. Disposal site D-2 has been reactivated, as indicated by the exposed soil. There is no activity at sites D-3 and D-4. Some disturbed soil is visible in the southern portion of site D-5. A large amount of material is stored in areas S-1 and S-2, but there is no apparent activity in S-3. There is some disturbed soil between area D-2 and the "filled-in" pond northeast of Building 6. The "filled-in" pond area is very active and the site of a large artillery firing range (Figure 7).

What appears to be debris is stored behind Building 26 (the vehicle shed). Large drums, dumpsters, or tanks are stored along road "F," northwest of storage area S-3. The tank storage site is designated as S-10 in Figure 7. Storage area S-7 which is located southeast of Building 25 (Figure 7), appears to be inactive. The shed in this area has been removed and a new shed has been built in a small clearing near the eastern end of the fire lane (Storage Area S-6 in Figure 7). A dirt road remains around the "triangular parcel," southeast of the fenceline. There is an active gravel road along the northeast fenceline connecting Building 25 and the northern corner of the fence. A small dirt road is visible in the wooded area, in the northern quadrant of the fenced site. The road connects to Building 25 with the northeast fenceline.

<u>April 14, 1973</u> (Epic # Frame 21606)

Between 1968 and 1970, NYSASDA constructed a test facility, the GE/Exxon Nuclear building, at the entrance to the site. In 1972, Wright-Malta Corporation began to lease much of the site. They continued artillery testing and research begun by GE, the previous tenant. That same year, PTI moved into Building 25.

The GE/Exxon Nuclear building is visible on the photograph. There is no disturbed soil or stored material around the building, and there is a large clearing called the "ice pond," in the woods outside the northwest fenceline.

Burning pit D-1 is still active. Disposal area D-2 is active and appears to contain debris. Disposal area D-3, off the access road, appears to have been reactivated. The area is filled with disturbed soil. Disturbed soil is also evident in the southern portion of D-5 and in a large area surrounding D-6. Material is stored in storage areas S-1 and S-2, and behind the vehicle shed Building 26, and near road "F" (Area S-10 in Figure 7). Tanks and/or debris are stored behind Building 6A. Disturbed soil and a shed are visible near the southeast end of the fire lane (Area S-6 in Figure 7). The artillery firing range near Building 6 (Figure 7) appears active. The area contains temporary structures and disturbed soil. Northwest of Building 25 (Area S-8 in Figure 7), there is a large corral-type structure, possibly containing transformers. This area may have been associated with PTI activity.

<u>May 15, 1982</u> (Epic # Frames 22389-22391)

This photograph, analyzed by the USEPA, (1) records numerous changes throughout the site since 1973. The "Ice Pond" facility is visible in the northwestern part of the photograph. Building 26 (the vehicle storage shed) and accompanying scrap material has been removed. An open tank storage area is visible behind Building 7 (Figure 7). Storage area S-8 contains three light-colored square objects. A long strip of forest is cleared north of Building 25 (Figure 7). The Wright-Malta artillery firing range is active, containing crates and cases. The S-4 drum storage area is clear of all drums. Building 4 is modified and contains a structure above the former pit area. The burning pit (Area D-1) has been filled and is no longer visible. The S-1 debris has been removed. The former GE/Exxon Nuclear building has been expanded to the south since 1973. A eastern mound, probably the result of regrading, exists southeast of the building.

8.2 SUMMARY OF ACTIVITIES BY BUILDING/AREA

The chemical and functional history of various MRFA buildings, test pits, storage areas, and disposal sites are reviewed in this section (For their locations, see Figures 7 and 8). The information presented has been obtained from site surveys, interviews with former employees, and from referenced documents.

8.2.1 Buildings

Building 1: Test Structure

In the 1940s, 1950s, and 1960s, Building 1 was used as a test stand for small rocket engines using experimental fuels such as hydrazine, UDMH, tetraethyl aluminum, nitric acid (as an oxidizer), and hydrogen peroxide (converted to steam to drive turbine pumps). Most of the small engines tested required 50 gallons of fuel per firing. The fuel storage tanks were mounted on the test station (2). Many of the 2,500- to 3,000-lb thrust engines were tested initially using alcohol. The test stand had 20- to 30- gallon capacity fuel tanks, which were hand filled with the fuel (3).

Building 1 was also used in the late 1950s and early 1960s for the Isolde project, which involved a sensitive fuel. Building 1 was selected for this project because it was relatively remote.

In the 1960s, Building 1 was used to test rocket thrust chambers, materials and aerodynamic shapes in rocket exhaust. Ethyl alcohol and liquid oxygen were used in these tests (4). Triethyl aluminum was used as a pyrophor to ignite the rocket engines (5). The stands had floor drains connected to underground spillways with separate drains for oxidizers and fuels (3).

storage tanks were mounted to the stands. Each fuel and oxidizer tank was mounted on opposite ends so that, if a fire occurred, the oxidizer and fuel would not mix but would be dumped to separate concrete troughs leading to dry wells (2, 12).

During the 1950s and 1960s, Test Stand 3 was used to test engines up to 40,000-lb thrust. The stand had 500- and 1,000-gallon capacity fuel tanks, which were filled both by hand and by an underground line from storage tanks located near Building 28 (Area A on Figure 7) (3). The stand was used to test, among other things, the NASA X-405 project in the early 1960s (2). Stand 3 was used to test UDMH and nitrogen/hydrogen fueled engines. Ethyl alcohol and liquid oxygen were also used and stored (14). Triethyl aluminum was used as a pyrophor to ignite the rocket engines at the beginning of the test (5). During these tests, the concrete troughs were lined with limestone to neutralize the tetroxide (3).

Test Stand 3 was also used in the early 1960s by GE to test overspeed engines (15). In the mid-1960s, GE tested nose cones under re-entry conditions in Test Pits 3 and 4. The cones were exposed to rocket exhaust (15) and sometimes utilized radioactive isotopes to assist in measurements of ablation rates (16) or disintegration rates. The nose cone tests were conducted for North American and Rocket Dyne Aircraft Company (16). GE and NASA conducted other tests involving plastics and carbon at Test Stand 3 in the 1960s (3).

In the 1950s and 1960s, Test Pit 4 was used for large rocket engine testing by GE for Lockheed, which was under contract to the Navy to develop submarine missiles. One test required the firing of a 20-mm artillery round into a rocket and the rocket was tested to observe any effects (3). Complete rocket systems were tested utilizing ethyl alcohol and JP-1, kerosene-based fuel. The stand had a fuel storage capacity of 200 cubic feet (cu ft) at pressures up to 1,500 psi. Three hundred cu ft of liquid oxygen were also stored (4). Test Pit 4B was used for cold tests (propulsion and valve tests) (6).

By the mid-1960s, most missile and rocket work had ended except work done for the Watervliet Arsenal (2). In the mid-1970s, Test Pit 4 was used by Wright-Malta Corporation for liquid propellant testing (10). The pit contained a 250,000-lb. thrust, bipropellant pressurized feeder system (10).

Test pits held water to absorb the flame and heat from the rocket engine exhaust. The pits were constructed below the water table with holes ("weeping holes") in the sides to allow the inflow of water. Usually, the water was left in the pit after the test; occasionally, it was pumped into a concrete sluice that drained to dry wells. For example, the water was pumped if the U.S. Air Force tested an engine and it misfired or exploded (3). Because the water table was high, water in the pits was usually at the same elevation as the pond. (12)

If an engine caught fire during the 1950s and early 1960s, apparently it was flooded with carbon tetrachloride to extinguish it although it is not clear that this really occurred (12, 13). Hundreds of gallons were probably used for this purpose (12). Carbon tetrachloride went into the ground or into the test pit and was then pumped out into the sluice (13). Later, both stands were equipped with Grunnell extinguishing systems that held only water (2, 3).

In the 1950s and 1960s, carbon tetrachloride was also used to flush rocket engine lines and injectors prior to test firing (2, 5, 12). During the 1960s, carbon tetrachloride was replaced by trichloroethylene (12). These solvents also flowed into the test pits, which were emptied by pumping the contents into Muggett's Pond (2). The pumps were stored in the station's fire truck (2).

Test Pit 4 was later modified with an outside incinerator for trash burning (18). It was used by Wright-Malta, under contract to DOE, to experiment with converting garbage into methane gas via biomass gasification (8).

Building 5: MRFA Test Station and Laboratory

In the 1950s and 1960s, Building 5 was used for fuel feed testing and as laboratory space (2, 6). It included a turbine pump testing facility in Building 5P (3, 6). It may have been used by Watervliet Arsenal for gun testing in 1972 (3).

An aboveground storage tank was located near Building 5 and has been reported to contain only liquid oxygen (15). No fuels or solvents are believed to have been used in this area. (3)

Building 6: MRFA Test Station

Building 6 was constructed as a large test station capable of testing up to 100,000-lb thrust rocket engines (6). In the 1950s and 1960s, this facility was primarily used for hazardous testing of pneumatic, hydraulic, and high-speed rotating equipment (4). During this time, GE tested turbines for the X-15 wingless aircraft program, which used hydrogen peroxide mixed with an oxidizer. Upon ignition, the peroxide turned to steam and powered the turbine (16). GE also tested hydraulic-powered generators for Lynn River Works (16). The building was also used to test valves and component systems using liquid nitrogen (2). The building was used by Wright-Malta to test fire guns. Wright-Malta's current research primarily involves liquid propellant artillery testing for the Watervliet Arsenal in Building 2 and the Building 6 artillery range. (19)

In the late 1950s, drums of hydrogen peroxide were stored at the building. In the 1950s and 1960s, carbon tetrachloride, and, later trichloroethylene were flushed through much of the test equipment prior to use (2, 5). The floor drains of the building reportedly extend under the road and into Muggett's Pond (2).

Building 7: Gas Plant

Building 7 (Figure 7), the "gas plant", served primarily as a warehouse for the storage of pressurized bottles of liquid nitrogen and oxygen (2, 3). The tanks were taken to the rocket test pits at Buildings 3 and 4 (2). Building 7 may also have been a laboratory (20) and PTI may also have used it to perform research involving electrical utilities. (8). Based on the aerial photographs, an open tank storage area was present behind Building 7 in 1982. The purpose of a large mount observed by Geraghty & Miller northwest of the building is unknown.

Buildings 8 and 9: Fuel Magazine Areas

In the 1950s, Buildings 8 and 9 served as underground fuel magazines (20). Various munitions were stored there (8), including cannon primers. Later, they contained drums of fuels for rocket propellant testing; however, it is suspected that Building 8 only contained munitions and not rocket fuel. The fuels included hydrazine, nitrogen tetroxide, pentaborane, and UDMH (21). In 1988, Building 8 was used to store 262 lbs of cannon primers (22). In recent years, Building 9 was used for recordkeeping (3). An updated inventory of the material stored in Building 8 is provided in Table 8.

Building 12:

The only available information concerning Building 12 is that it was a records storage building (Figure 2).

Building 13: Machine Shop

Building 13 once served as the machine shop where engines were disassembled, and was also used as a cafeteria (13). During the early 1950s, 55-gallon drums of carbon tetrachloride were stored there (23). Methyl ethyl ketone (paint thinner) may have been

stored in this building (24). Most of the regenerative chambers and pistons used in the GE 25-mm Regenerative Liquid Propellant Gun Program were fabricated in this shop in the early 1970s by Wright-Malta Corporation (10). The propellant was liquid hydroxyl ammonium nitrate (19).

Building 14: Laboratory

From the late 1940s to the 1960s, Building 14 was a chemical laboratory which may have been used for fuel testing, an electrical laboratory, an office (3), and a calibration laboratory used for manufacturing thermal couplers (15). The photo laboratory is also located in Building 14.

Any carbon tetrachloride used in the facility was emptied into drums (3). In later years, it functioned as a U.S. Army Tank Command office. The Army used the outside perimeter dirt roads to perform endurance tests on their tanks (2). In the early 1970s, Exxon had office space in the building. After 1974, they used the laboratory at the rear of the building (25). In the late 1980s, GE's Tactical Systems Department (TSD) was housed in this building. The TSD work involved a DOD contract to develop and manufacture truck transmissions and turret drives, as well as to perform confidential liquid propellant research and development (8).

NYSERDA sampled the septic system at Building 14 in 1989. Toluene was the only VOC detected at 37 ug/L. A summary of the data is provided in Table C-14 (Appendix C).

Building 15: Hydraulics Laboratory

During the 1950s and 1960s, Building 15 served as the hydraulics laboratory or "pump house" (2, 15). The building housed the site's emergency water pumps, which supplied water to the test pits for cooling the cone stands (2, 15) Two large pumps and wooden water storage tanks of 100,000- to 200,000-gallon capacity for the hydrant supply were in Building

NYSERDA instituted a monthly sampling program for the potable water supply at this facility in October 1987 after the air stripper was installed. Available data show that carbon tetrachloride and TCE are detected occasionally at 1 to 2 ug/L. Compounds associated with the chlorination of the water supply are also present at concentrations of 1 to 2 ug/L (Table C-12 in Appendix C), (33).

In 1987, NYSERDA sampled the septic system at Building 20. Toluene was the only VOC detected, 457 ug/L was reported in the wastewater sample, and 120 ug/kg was reported in the sludge sample (33).

Building 21: Ram Jet Laboratory

In the 1950s, Building 21 was the ram jet facility in which a 12-cylinder diesel engine was used to power compressors to test the ram jets in a supersonic wind tunnel (2, 13). Diesel fuel and oil were probably used in the diesel engines. Combustion systems were tested using JP-4 kerosene-based jet fuel stored in tanks. Propylene oxide and carbon disulfide were added to the JP-4 fuel. These additives, plus gasoline and lubricating oils, were stored in drums at the building. A combustion cell was located south of the building and vented to the east (34).

The Building 21 area was also the site of the Propellant Utilization Program. In this program, liquid oxygen was mixed with JP-4 rocket fuel and particles of polyethene and ethylene gas were generated. The concrete pads with eye bolts, which remain at the site, were used in this program (4). This area was probably used to produce liquid hydrogen peroxide and solid polyethylene propellant for use in rocket engines (35).

Later, the building was used to test turbine pumps for the X-15 wingless aircraft program (2, 16). The turbines were tested with hydrogen peroxide. (14, 16). Carbon

tetrachloride was used to wash the stainless steel. The spent solvent was poured into scrubber tanks, diluted with water, and emptied into concrete aprons and gravity drains to the area behind the building (probably the southwest side of the building) (16).

The building was also used for the AM-10 projects and was used by Olin for confidential testing of borane. At some point, there may have been an explosion in Building 21 (20).

Buildings 23 and 23P: Maintenance Building and Paint Shop

Building 23 was the maintenance building and may have been a firehouse with an outside fuel pump (20). A fire is believed to have occurred in the early 1970s at Building 23, when welding sparks fell into a bird's nest. The Exxon laboratories were located near Building 23, as was Building 23P, the paint shop.

Carbon tetrachloride was stored in drums in an area near Building 23 until about 1972 (3). Northeast of Building 23P was an outdoor drum storage rack for waste oil and miscellaneous liquids. The drums and rack were removed in the late 1960s (2, 18). The building was used to store carbon tetrachloride, trichloroethylene, paint thinner, cutting oils, and ethyl alcohol (3). It is possible that the waste oil was spread on the site's dirt roads (2).

Building 24: Test Structure

Building 24 was constructed as a small rocket test stand for use with various fuels (2, 12). Curtiss-Wright used the site in the 1950s and early 1960s to test hydrazine propellants (2, 12). In the mid-1960s, the facility was used by GE to test nose cone re-entry conditions. The cones were placed in rocket exhausts and sometimes utilized radioactive isotopes to assist in measurement of ablation (melting or vaporization) rates (17). Nearly 2,000 liquid propellant tests covering all phases of ignition, performance, combustion stability, component

operation, and material compatibility were conducted in this facility. There was an outside lower collection tray that collected fuels running off the stand. The fuels were burned in the tray.

The "Isolde" project was located east of the Building 24 area. A classified propellant was also involved in this project and used organic salts dissolved in nitric acid. Only 6 gallons of the material were ever made and it was detonated in Test Pit 24 (14). The propellant was disposed in Test Pit 24.

The building was renovated in the mid-1980s and is leased by GE for firing of large artillery guns (12). The guns are fired into sand piles, using hydroxyl ammonium nitrate liquid propellant, which is stored in Buildings 24 and 27 (19).

Most chemical disposal was reported in the Building 24 area. (14). The magazines in the area were used to store chemicals such as propellants and explosives. Propellants and monopropellants tested in Pit 24 included the following:

Oxidizers - Oxygen, fluorine, nitric acid, nitrogen tetroxide, hydrogen peroxide, perchloryl fluoride, and chlorine trifluoride.

Fuels - Hydrazine, UDMH, mixed hydrazines, ammonia, gasoline, toluene, alcohol, JP-4, RP-1, pentaborane, and n-propyl nitrate.

Monopropellants - Hydrogen peroxide (90 percent and 98 percent), nitromethane, normal propyl nitrate, hydrazine and alkylamine nitrates in nitric acid (3, 4, 10).

Many of these substances were stored in Buildings 18 and 27 (2). TEA was used as a pyrophor in the rocket tests (5). There may also have been an instance when normal propyl nitrate (NPN) was delivered to Building 24 for use as an experimental fuel. (3)

During the late 1950s and early 1960s, drums of carbon tetrachloride and trichloroethylene were flushed through the rocket engines and ignitors, prior to firing, to remove all water, oil and debris. Drums of solvent entered the test pit (5). In October 1985, a drum of TEA was unearthed in disposal area D-6 northeast of the building (36). The drum ruptured and ignited. There was reportedly one explosion in Building 24 that caused considerable damage to the building (3).

Geraghty & Miller collected ground-water, soil and air samples in the Building 24 (Berth 24) area. The samples did not indicate contamination from the testing at Berth 24.

In 1985, Geraghty & Miller collected ground-water soil and air samples at Building 24 as part of a site assessment. Well 9S was installed at the base of the rocket testing platforms (Figure 7). Analyses of ground-water samples collected in February and March 1985 indicate that carbon tetrachloride ranged from 7 to 12 ug/L, and TCE ranged from 1 to less than 10 ug/L. Methylene chloride was also detected, however, it was also reported in the field and trip blanks. No other organics on the priority pollutant list were reported.

Two soil samples were composited from soil collected from 0 to 4 feet below grade from this area. The only organic compound detected was methylene chloride at 72 and 140 ppm. This compound is a common laboratory artifact and may not be present in the soil. A background soil sample for metals was not collected, therefore, a comparison to background cannot be made at this time.

Air-quality samples were collected at four locations at Building 24 to determine if prior use of the building had impacted the facility. Samples were collected over a 3.5- to 4-hour period from the basement, the main level, the pipe bay, and an outside cell (Bay 6). No chemicals were detected in any of the samples.

On October 31, 1985, ten soil borings were completed at the GE test site (Berth 24) in the Wright-Malta test facility, New York. The purpose of the study was to determine the

chemical quality of backfill material that was excavated from Disposal Area D-6 and placed near Berth 24 during recontouring activities. At the time of the excavation, it was not known that this area had been used for disposal. At the request of GE, Geraghty & Miller, Inc. collected samples of fill material used for backfill during the construction of a new facility. The boring locations were selected using information supplied to Geraghty & Miller by the GE site manager, and were arranged to provide data describing the area of concern.

The borings were installed with hand augers to depths of 7 to 10 feet and samples were composited over the entire depth of the boring. An organic vapor analyzer (OVA) was used in the field to determine if volatile organic compounds were present during sampling; however, none were detected.

The samples were analyzed for volatile organic compounds and acid and base/neutral extractable organic compounds. In addition, nitrosoamines were also analyzed for as they are degradation products of hydrazine. Benezene and toluene were found at the detection limits of 5 ug/kg at one location and bis(2-ethylhexyl) phthalate was detected in seven of the ten borings at concentrations that ranged from 250 to 2,700 ug/kg. Neither nitrosoamines nor any extractable organic compounds were found. Bis(2-ethylhexyl) phthalate is a common laboratory artifact and the reported results may not be representative of site conditions.

Building 25: Test Structure/PTI Facility

Building 25 was constructed for large rocket engine testing with thrusts up to 150,000 lbs (6). The facility had a fuel storage capacity of 13,000 gallons (4). In the late 1950s and early 1960s, it was used to test complete missile systems (2). Borane fuels such as pentaborane, diborane, and boron hydride were tested in rocket engines at the facility (12, 27). Pentaborane and pressurized diborane were stored as liquids in quantities of 100 lbs or less in the fuel bunkers at the site (27). Building 25 was also used to test large engines and complete rocket systems fueled by JP-1 and hydrogen peroxide (3). Carbon tetrachloride was used to flush the oxygen, fuel, and pressure lines in the test stand. The

solvent ran into the test pit and was later pumped out on the ground (2). The pumps used for this procedure were stored in the station's fire truck. Building 25 contained several fire cradles.

PTI arrived in 1964 and did experimental work involving the distribution of electrical power. They installed electrical wires from the building complex westward toward the perimeter fence. PTI leased the site in 1972 and did experimental work on high-voltage power lines. In an attempt to find a remedy for ice on wires, PTI hung weights bearing explosives from the wires and detonated them to simulate the sway and weight of ice (2). PTI and NYSERDA had transformers containing PCBs in Building 25A (37). The transformers were cleaned and decontaminated by a contractor in August 1987 (38).

Environmental One Corporation sampled transformer oils at Building 25 for PTI on June 3, 1985. Oil samples were analyzed for PCB content. Samples from drums and tanks were also analyzed for chlorine and sulfur content. The data indicated that most of the transformer oils contained PCB Aroclor 1260 (39). The sampling results are provided in Attachment C-D (Appendix C).

Based on aerial photographs (Section 8.1), there was activity in this area between at least 1952 and 1982. The area was cleared and a shed was built and, later, a long strip of forest is cleared (see Section 8.1).

In 1987, NYSERDA sampled the tap water and the septic system at Building 25. Three VOCs were reported in the tap water; 1,2-dichloroethane (1.2 ug/L), carbon tetrachloride (2.9 ug/L), and 1,1,2-trichloroethane (5.5 ug/L). In the septic system wastewater, trans-1,2-dichloroethene was detected at 1,500 ug/L and toluene was found at 1,300 ug/L. In a septic sludge sample, trans-1,2-dichloroethene was reported at 25,000 ug/kg and toluene was detected at 3,060 ug/kg (33).

In 1989, NYSERDA sampled the Building 25 septic system again. Four compounds were detected: cis-1,2-dichloroethene (1,140 ug/L), toluene (2,213 ug/L), 1,3,5-trimethyl benzene (28 ug/L), and 1,2,4-trimethyl benzene (45 ug/L) (33).

The tap water was sampled seven times by NYSERDA between October 1987 and December 1988, as part of their monthly monitoring program after the air stripper was installed. Chloroform was the only VOC detected at 7 ug/L in February 1988. It is believed that chloroform is associated with the chlorination of the water supply (33). The sampling data are summarized in Table C-12 (Appendix C).

Building 26: Vehicle Shed

From the early 1950s to the late 1970s, Building 26 was a vehicle storage area for the MRFA site and contained graders and other machinery (19). Aerial photographs of the site from 1960 through 1973 (Section 8.1) indicate a debris storage area west of the building (Figure 7). The debris consisted of old automobiles and automotive parts (19). The vehicle storage area and all associated debris were removed in the early 1980s as scrap metal (19). The 1982 aerial photograph verifies their absence.

Building 27 Area: Magazine Area

In the 1950s and early 1960s, the magazine area was used to store various propellants such as UDMH, nitric acid and various oxidizers (2, 14). Hydrogen peroxide was also stored there (16). Up to 40,000 lbs of nitrogen tetroxide were stored in Building 27A and up to 10,000 lbs of monomethyl hydrazine were stored in Building 27D (9). Hydrazine and pentaborane may have been stored at the site (21). In 1967, the area was use to store a large number of small missiles (36) (Maxon Birds). Since the late 1960s, the magazine area has housed powder magazines, charges, and liquid propellants (8, 40). The magazine bunkers were also used to store rocket motors which were tested every 2 weeks.

During the 1980s, GE and Wright-Malta tested artillery weapon systems that involved the use of hydroxyl ammonium nitrate liquid propellant stored in 55-gallon containers in Building 27 (19).

In 1988, GE brought the following munitions to the site, most of which were stored in the magazine area (22):

Smokeless Gunpowder

DuPont IMR-4350	45 lbs
Herculese HC-25FS	15 lbs
Herculese WC-844	8 lbs
Herculese WC-899	2 lbs

Charges (Building 27A)

Bag charges M26E1	2,085 lbs
Bag charges M6	1,105 lbs
Black powder	350 lbs
Bag charges M26E1	unknown quantity

Liquid Gun Propellant

Thiokol LGP-1846	6,000 lbs
Thiokol Nos-365	605 lbs
Thiokol Nos-283	55 lbs

Electric Primer

Electric primer M52A3B1	500 counts

The Thiokol LGP-1846 liquid gun propellant is composed of the following (41):

63 percent hydroxyl ammonium nitrate
20 percent triethanol ammonium nitrate
17 percent water

The munitions and propellants stored in the magazine area were used to test large guns in Building 24 (18). Building 27 was also used to store propellants such as UMDH. Building 27 may also contain a flush floor drain system similar to that in Building 18 (2). An updated inventory of the material stored in Buildings 27A through 27D is provided in Table 8.

Building 28: Fuel Additives Building

The Building 28 area (Area A in Figure 7) had been used to store many fuel tanks (3) and large tanks of carbon tetrachloride (42). An underground line from the storage tanks in this area fed fuel to the rocket stand in Building 3 (3). Many aboveground and underground storage tanks existed in this area (19).

Building 29: Igniter/Power Storage

Historically, the Building 29 area was used to store munitions (8). A 1952 map of the region listed Building 29 as igniter storage, Building 29A as black powder storage, and Building 29B as squib (small igniter) storage.

8.2.2 Other Test Areas

Wright-Malta Artillery Firing Range

Since the late 1960s, Building 6 and the "filled-in" pond northeast of it (Figure 7) have been used by GE, and later by Wright-Malta, for artillery testing (10). The weapons testing was conducted for the Watervliet Arsenal (15). Large weapons such as 105-mm to 152-mm tank guns, 105-mm to 155-mm Howitzers, and 60-mm, 90-mm, and 150-mm recoiler rifles have been tested by firing into a large sand pit. There were approximately 35,000 firings of

the large caliber weapons from 1972 to 1975 (10). The rapid firing tests utilized hydrazine/hydrazine nitrate liquid monopropellants. Liquid propellant testing is still being performed in this area of the MRFA site (19).

Based on aerial photographs, the artillery firing range near Building 6 was active at least from 1968 through 1982 and contained crates, cases and temporary structures. Disturbed soil is also visible.

Isolde Project Area

The area behind Buildings 27C and 27D (Figure 7) was the site of the Isolde project (3, 12, 14). The site was selected for its remoteness (12). The project involved the production of an experimental, sensitive fuel called Isolde 120A (14). The project, which originated in the GE Cincinnati, Ohio office, occurred in the late 1950s and early 1960s (12). Only 6 gallons of the fuel had been produced (13) by mixing chemical salts with white fuming nitric acid (3)(14). The propellant was disposed in the Test Pit of Building 24 (5).

Existing Pond (Muggett's Pond)

The existing on-site pond, known as Muggett's Pond, is located at the center of the site (Figure 7). In the 1950s and 1960s, water from the pond was used to cool rocket engines during testing (16). The pond was excavated to ground water for this purpose (43). The pond is the surface expression of the shallow water-table aquifer.

The pond is located at the base of a ravine with a concrete drainage sluice. Most of the test pits and their floor drains are located along this ravine (Figure 7). Muggett's Pond received all of the coolant water, carbon tetrachloride, and trichloroethylene associated with the rocket testing platforms (Buildings Nos. 1, 2, 3, and 6). Cooling water, solvents and residual fuel from the test facilities ran into the sluice and dry wells in the ravine, or were pumped into the sluice. The ultimate destination of this material was the pond. There were

interior floor drains in Building 15 that emptied into Muggett's Pond (2,3,15). Based on the literature review, this drainage scenario appears to have been the principal pathway for carbon tetrachloride and TCE to enter the pond.

Quench pits from Buildings 1, 2, 3, 4, 6, and 24 all drained water or solvents into the pond drainage system or the liquids were actively pumped (2). Prior to firing the rocket engines, carbon tetrachloride and, later, trichloroethylene were flushed routinely through much of the test equipment (2, 5). The solvents entered the cooling water in the test pit or ran into floor drains, ultimately reaching the pond, or the liquid was directly pumped from the pits into the pond (2, 13). The pump used to evacuate the test pit pools was stored in the station's fire truck in Building 25 (2).

During the 1950s and early 1960s, Buildings 3 and 4 were test stands for the larger rocket engines and complete rocket systems. When an engine caught fire, it was apparently flooded with carbon tetrachloride to extinguish it, although it is not clear that this really occurred (12, 13). Interviewee A has stated that any fires which occurred were extinguished with water. It is possible that hundreds of gallons of chemicals were used during such "shut downs" (12). The carbon tetrachloride entered the test pit pool or spilled on the ground (13). If it went into the pool, the pool was pumped out into the pond (2, 13).

Filled-In Ponds

There are four filled-in ponds on the MRFA site (Figure 7). The function of the PTI and Magazine Area ponds is unclear. These two ponds may not have been used for testing or disposal. The filled-in pond near Building 7 was labeled hydrogen peroxide area on a 1952 map and may have been used to store peroxide in the early 1950s (44). Since the late 1960s, the filled-in pond near Building 6 (Figure 7) was used by GE and later Wright-Malta as a large artillery firing ground for the Watervliet Arsenal (10). In the early to mid-1970s, it was used for rapid firing tests utilizing hydrazine/hydrazine nitrate liquid monopropellants

(10). Liquid propellant testing is still being conducted at MRFA (19) and, possibly, at this site.

"Ice Pond" Clearing: Water Cooling Research Facility

In October 1972, the Research Foundation of the SUNY in Albany entered into an agreement with NYSASDA to conduct research on spray cooling of water vapor. The 2-year project evaluated atmospheric discharge due to spray cooling of water, studying the local meteorological effects of drift, icing, and fogging (45).

An inflatable building was constructed for the project in the clearing called the "Ice Pond" (Figure 7). This structure erected by NYSASDA was approximately 50 ft long, 30 ft wide, and 15 ft high (45, 46). A spray pond was constructed inside. Heated water was cooled with spray nozzles of various configurations and droplet sizes during different seasons of the year (45, 46). Only water was used during the project (45).

The pond was also used as a cooling pond. Heated water was added directly to it, elevating the surface temperature. The effectiveness of the pond in transferring heat to the atmosphere was measured over a range of climatic conditions. Environmental effects, such as fogging or icing, were observed.

GE/Exxon Nuclear Building

In the early 1970s, the GE/Exxon Nuclear Building was built by NYSERDA and leased to Iso-Nuclear Corporation which operated a sterilization program using a 400,000 curie cobalt 60 radioactive source to sterilize medical instruments (20, 47). In October 1971, due to financial problems, Iso-Nuclear defaulted on its lease (48). Afterward, NYSERDA removed the cobalt 60 irradiation source and leased the facility to GE for use in a gas centrifuge, uranium enrichment technology research project. In 1974, GE terminated its involvement in the project and Exxon Nuclear Company, a co-sponsor, continued its research

until the end of 1979 (48). Exxon-Nuclear closed operations at the site and dropped the lease by December 31, 1979. All classified material at the site was eventually shipped to the DOE facility in Oak Ridge, Tennessee.

The GE/Exxon Nuclear building is visible on the 1973 aerial photograph (Section 8.1). There is no visible disturbed soil or stored material around the building.

During its occupancy of the building, Exxon Nuclear used the following chemicals:

Total Estimated Chemicals Purchased 1975-1979

Freon TA and TES	14,000 pounds
Methyl ethyl ketone	600 gallons
Perchloroethylene	300 gallons
Acetone	60 gallons
Isopropanol	180 gallons
Toluene	10 gallons
Sodium chromate	20 gallons
Magnesium carbonate	30 pounds
Dexron ATF	1 barrel
Vectra 4	120 gallons
MCS 293 Oil	1 gallon
Perfluoro (N-ethylmorpholine)	1,300 grams
Isoprep	125 pounds
Gear grease	50 gallons
Zyglo (ZP-13A)	1,500 pounds
Trim-Sol	25 gallons
Hyku golden barrel oil	3 barrels
Electroetch	5 quarts

Components were reportedly cleaned using Freon TA and TES (49).

On July 23, 1979, approximately 8 grams of uranium hexafluoride (gaseous) were accidently released in an enclosed room within the building. This resulted in a thin layer of UO_2F_2 depositing on the floor of the room (50). The area was cleaned and contaminated material was sent to licensed disposal facilities (51). A radiation survey of the building was

conducted on December 20, 1979 with an Eberline geiger counter. All beta and gamma readings taken were within the limits of unrestricted use (52).

NYSERDA sampled the tap water and the septic system at the GE/Exxon-Nuclear Building in 1987. Only one VOC was detected in the septic tank wastewater; toluene at 96 ug/L; however, 47,000 ug/L of toluene was reported in a sludge sample. Four VOCs were detected in the tap water sample; 1,2-dichloroethane (2.4 ug/L), carbon tetrachloride (5.8 ug/L), 1,1,2-trichloroethane (7.7 ug/L), and toluene (13 ug/L).

In 1989, NYSERDA sampled the GE/Exxon Nuclear septic system again, and toluene was found at 103 ug/L in a wastewater sample.

NYSERDA instituted a monthly sampling program for the potable water supply at this facility in October 1987 after the air stripper was installed (33). Available data show that carbon tetrachloride and TCE are detected occasionally at 1 to 3 ug/L. Compounds associated with the chlorinization of the water supply are also present at concentrations of 1 to 2 ug/L (Table C-12 in Appendix C).

8.2.3 Storage Areas

Storage Area S-1: Metal Storage Area

Storage area S-1, approximately 70 ft by 150 ft, served primarily as a metal storage area. Scrap metal, garbage, lumber, roofing, pipes, spray cans, and drums were stored at this location (2, 16, 53). Wright-Malta occasionally used the area just south of S-1 to burn off excess propellants, but later cleaned up the site (8). It is not clear whether this area is within the boundary designated as S-1.

Based on aerial photographs, equipment was present in storage area S-1 at least from 1960 through 1973 and had been removed by 1982.

Storage Area S-2: All Purpose Storage

Storage area S-2, approximately 100 ft by 100 ft, was used to store metal tanks, steel drums, metal framework, bulldozers, trucks, lumber, wood partitions, and miscellaneous scrap (2, 53). Based on aerial photographs (Section 8.1), S-2 was in use from at least 1952 through 1973. In 1988, a drum of chemicals was discovered and sampled. Analysis of the drum content indicated 4,270 ppm lead, 235 ppm zinc, and 93 ppm copper dissolved in the liquid (54). The drum was disposed in April 1989 in accordance with RCRA regulations (55).

Storage Area S-3: Metal Scrap Pile

Storage area S-3, approximately 60 ft by 270 ft, was used to store metal scrap including piping, tanks, wiring, and drums (53). The area was used to store scrap metal from anywhere on the site.

Based on aerial photographs (Section 8.1), there is evidence of activity and disturbed soil in the S-3 storage area from at least 1952 through 1973. In 1960, there was equipment in storage areas S-3 as well as a row of large elongated containers which may be rocket motor shipment containers, or liquid gas or fuel cylinders. Large drums, dumpsters, or tanks are stored along road "F," northwest of storage area S-3. In the 1982 aerial photograph, there is no apparent activity in S-3.

Storage Area S-4: Chemical Storage

Storage area S-4, approximately 20 ft by 30 ft, was used to store chemical drums and propellants (2, 53). The 5-gallon and 50-gallon drums and metal containers were filled with residual hydrazine-based and arozene propellants (53).

O'Brien & Gere Engineers reported that vegetation characteristics changed abruptly and/or the ground was unexpectedly level in the vicinity of disposal area D-2, D-4 and D-5. In their review of aerial photographs, O'Brien & Gere estimated that disposal activities occurred at D-4 prior to and since 1952. Based on Geraghty & Miller's review of aerial photographs, disposal area D-4 appears disturbed in 1952 and 1960 and may have been an active disposal site. However, no activity is apparent from 1968 to 1982.

Disposal Area D-5: Container Burial Area

Disposal area D-5, approximately 100 ft by 160 ft, was known as "the ball field." It was used to bury 5-gallon and 55-gallon empty tanks to a depth of 10 ft (53). As in the case of disposal area D-4, in the 1950s and 1960s, various chemical drums were punctured, ignited and buried there. In the 1950s, drums containing residuals of pentaborane and other chemicals were disposed of in D-5 (53). Hydrazine, UDMH, and acids also may have been disposed at this site (2). In the 1960s, GE disposed of drums containing sodium and potassium were disposed in D-4 and D-5 (53).

In the mid-1960s, the English government was involved in a secret project that resulted in a laboratory explosion. GE had similar substances in Schenectady and reportedly disposed them in D-5 (3). These substances may have been sodium and potassium.

A GE photographer recalls negatives showing the aftermath of the June 1955 Building 20 explosion, and the disposal of debris from it on an open field. He believes it may have been "the ball field" or area D-5 (24). The negatives were retained by Olin-Mathieson shortly after the event (25).

The C.T. Male report states that a pungent odor was apparent in area D-5, which was marked with several small deteriorated metal warning signs. O'Brien & Gere reported that vegetation characteristics changed abruptly and/or the ground was unexpectedly level in the vicinity of D-2, D-4 and D-5. In their review of aerial photographs, O'Brien & Gere

site. This conclusion was substantiated by chemical analyses for USEPA priority pollutant VOCs of two samples with the highest TIP readings (20.5 ppm and 22 ppm). Priority pollutant VOCs were not detected in the samples.

Soil samples collected during the well installation program were screened in the field for VOCs using the TIP meter. The highest value (57 ppm) was observed in the 4- to 5-ft deep sample at boring location B-2. This sample was also analyzed for USEPA priority pollutant VOCs and none was detected. Because VOC concentrations in ambient air within the study area were detected at levels up to 0.6 ppm, it is possible that the TIP meter measured naturally occurring VOCs.

A magnetometer survey was conducted over the area where construction activities had been proposed. Magnetic intensity was measured at approximately 586 stations spaced approximately 20 ft apart, to identify objects the size of a 55-gallon drum. The magnetic intensity data were within background levels for the surveyed area. Therefore, buried ferromagnetic metal was not believed to be present.

Also in 1986, O'Brien & Gere Engineers conducted a site-wide investigation of the MFRA site for NYSERDA, as previously described. As part of that study, they installed a deep well on the triangular parcel of property (Well 14D). The well was sampled and neither VOCs nor metals (boron and aluminum) were detected.

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(4) Olin Mathieson Chemical Corporation, 1961, Properties of Monomethyl Hydrazine.

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(12) New York State Department of Environmental Conservation, 1980, memorandum regarding the Malta Test Site Hydrazine Burns, August 12, 1980.

(13) Mechanical Technologies, Inc., 1981, Hazardous Material Report, July 15, 1981.

(14) General Electric Company, 1982, Hazardous Material Report, January 1, 1982.

(15) Mechanical Technology, Inc., 1982, Hazardous Material Report, July 12, 1982.

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(20) Wright-Malta Corporation, 1985, letter response to NYSDEC direct inquiry, December 5, 1985.

(21) Exxon Nuclear Company, Inc., 1986, letter response to NYSDEC direct inquiry, April 25, 1986.

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(23) Wright-Malta Corporation, 1987, letter from Interviewee H to B.S. Fear, Re: Air Stripper Design, March 4, 1987.

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(26) General Electric Company, 1988, Hazardous Material Report Form, March 23, 1988.

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(1) General Electric Company, 1981, Internal letter on Applicability of Hazardous Waste Regulations to Wright-Malta by E. Lewis, January 20, 1991.

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(3) Exxon Nuclear Company, Inc., 1986, letter to D.A. Engel of NYSDEC from G.S. Welch, April 25, 1986.

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(16) New York State Department of Health, 1979, Internal letter from D. Machell to B. Fear regarding Malta Test Station visit, June 28, 1979.

(17) Olin Mathieson Chemical Corporation, 1955, letter to Bureau of Aeronautics of the U.S. Navy, Re: Explosion at Malta Test Station, August 4, 1955.

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(3) Interviewee S, 1989, Personal Interview, December 18, 1989.

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Table 1. Property Owners Adjacent to the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

SEC/BLK/LOT	Names	Addresses
230.13-2-14	Koshar, James F. & Elizabeth A.	115 Plum Poppy N, Ballston Spa. 899-6545
230.13-2-15	Gibson, Albert R. JR & Wendy M.	114 Plum Poppy N, Ballston Spa. 899-6914
230.13-2-16	Leonard, Daniel J.	117 Plum Poppy N, Ballston Spa. 899-6906
230.13-2-17	Bennet, Kenneth L. & Christine	116 Plum Poppy N, Ballston Spa. 899-6995
230.13-2-18	Brown, Richard J. & Evelyn R.	119 Plum Poppy N, Ballston Spa. 899-6949
230.53-1-1	Bouchey, Barbara J.	
230.53-1-2	Kelly, Wayne T.	
230.53-1-3	McDermott, Charles A.	112 Pepperbush Place, Ballston Spa. 899-6208
230.53-1-4	Hirsch, Elizabeth	110 Pepperbush Place, Ballston Spa. 899-6320
230.53-1-5	Valiquette, Donald J.	108 Pepperbush Place, Ballston Spa. 899-6603
230.53-1-6	Nevins, Gregory G. & Mary J.	106 Pepperbush Place, Ballston Spa. 899-7167
230.53-1-7	Bogacz, Edward	
230.53-1-8	Law, Barbara M.	
230.53-1-9	Holden, Russell G. & Bessie M.	100 Pepperbush Place, Ballston Spa. 899-5509
230.53-1-10	Wetsel, Debra L.	98 Pepperbush Place, Ballston Spa. 899-2464
230.53-1-11	Farrell, Judith C.	23 Arrow Wood Place, Ballston Spa. 899-4077
230.53-1-12	Lajeunesse, Jeffrey & Sandra	
230.53-1-13	Picarazzi, Mark & Dawn	
230.53-1-14	Ivers, James D. & Mary Lou	
230.53-1-15	Dougherty, Virginia	88 Pepperbush Place, Ballston Spa. 899-6286
230.53-1-16	Rector, Donald M. & Linda M.	86 Pepperbush Place, Ballston Spa. 899-9236
230.53-1-17	Heusner, Harold & Susan B.	
230.53-1-18	Heusner, Harold & Susan	
230.53-1-19	Christopher, Susan M.	
230.53-1-20	Roberson, Nancy L.	78 Pepperbush Place, Ballston Spa. 899-4890
230.53-1-21	Houston, Kathleen A.	
230.53-1-22	Kresley, Carol A.	74 Pepperbush Place, Ballston Spa. 899-5861
230.53-1-23	Margolius, Stanley L. & Joyce	
230.53-1-24	Werner, Keith J. & Mary	70 Pepperbush Place, Ballston Spa. 899-7387
230.53-1-25	Schaefer Richard J.	
230.53-1-26	Schaefer Richard J.	
230.53-1-27	O'Donnell Jane	64 Pepperbush Place, Ballston Spa. 899-4413
230.53-1-28	Brown, Steven F.	62 Pepperbush Place, Ballston Spa. 899-5065
230.53-1-29	Seidel Robert L. & Patricia	
230.53-1-30	Seidel Robert & Patricia	
230.53-1-31	Christopher John F. & Lisa E.	53 Pepperbush Place, Malta. 899-4179
230.53-1-32	Valentino Phillip JR.	
230.53-1-33	Seimers Paul A. & Sharon M.	
230.53-1-34	Seimers Paul A. & Sharon M.	
230.53-1-35	Ohnsmann, Jeffrey & Carol	61 Pepperbush Place, Ballston Spa. 899-7615
230.53-1-36	Adams, Betsy	63 Pepperbush Place, Ballston Spa. 899-2036
230.53-1-37	Prezioso, Micheal A. & Miranda	65 Pepperbush Place, Ballston Spa. 899-7252
230.53-1-38	Neira, David & Lesile	
230.53-1-39	Holmes, Arthur J. & Edna F.	
230.53-1-40	Cowie, David L. & Sheri Lynn	71 Pepperbush Place, Ballston Spa. 899-4716
230.53-1-41	O'Shea, Stephen	
230.53-1-42	O'Shea, Stephen	
230.53-1-43	Gifford, Roger F.	
230.53-1-44	McGloine, James & Constance	
230.53-1-45	Nardin William JR. & Diane R.	81 Pepperbush Place, Ballston Spa. 899-6009
230.53-1-46	Clark, James M.	83 Pepperbush Place, Malta. 899-6191
230.53-1-47	Pompay, John J. JR. & Marie	
230.53-1-48	Weaver, Leonora A.	

Table 1. Property Owners Adjacent to the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

SEC/BLK/LOT	Names	Addresses
230.53-1-49	Farkas, Gary	89 Pepperbush Place, Ballston Spa. 899-5615
230.53-1-50	S&B Realty Co.	
230.53-2-1	Vink, Walter VW. & Katherine	
230.53-2-2	Vink, Walter VW. & Katherine L.	
230.53-2-3	Reale, John L. & Marie N.	
230.53-2-4	Reale, John L. & Marie N.	
230.53-2-5	Giannetti, Thomas P. & Maria	
230.53-2-6	Arcidiacono, Dominic A.	71 Arrow Wood Place, Ballston Spa. 899-6801
230.53-2-7	Ames, Stephen B.	73 Arrow Wood Place, Ballston Spa. 899-2357
230.53-2-8	Platania, Joseph A. JR.	
230.53-2-9	Schenk, Charles & Juanita W.	77 Arrow Wood Place, Ballston Spa. 899-6954
230.53-2-10	McCarthy Elise J. & Darlene	79 Arrow Wood Place, Ballston Spa. 899-4106
230.53-2-11	Wick, Claudia	
230.53-2-12	Deluke, Frank	83 Arrow Wood Place, Ballston Spa. 899-5968
230.53-2-13	Gnoinski, Denis F. & Christina	
230.53-2-14	Straus, William & Joan	87 Arrow Wood Place, Ballston Spa. 899-6048
230.53-2-15	Mitchell, Samuel & Sheila	
230.53-2-16	Casab, George M.	91 Arrow Wood Place, Ballston Spa. 899-5706
230.53-2-17	Falope, Corrine Rose	
230.53-2-18	Giacchetta, Michael	1 Malta Garden Apartments, Mechanicville. 899-5683
230.53-2-19	Quinn, James M.	
230.53-2-20	Quinn, James M.	
230.53-2-21	Murphy, Joan M. & Joanne C.	
230.53-2-22	Rosse, Robert & Patricia	103 Arrow Wood Place, Ballston Spa. 899-2246
230.53-2-23	Renzi, Lisa M.	116 Arrow Wood Place, Ballston Spa. 899-9521
230.53-2-24	Graig, Winfred C. & Miriah H.	114 Arrow Wood Place, Ballston Spa. 899-2530
230.53-2-25	Carping, John J. & Elizabeth J.	
230.53-2-26	Carpino, Gary J.	
230.53-2-27	Blanchard, Stephen C.	
230.53-2-28	Murphy, John M. & Joanne C.	
230.53-2-29	Clark, Mary C.	104 Arrow Wood Place, Ballston Spa. 899-6237
230.53-2-30	Maisel, Martin & Harriet Joy	102 Arrow Wood Place, Ballston Spa. 899-4047
230.53-2-31	Levertt, Ruth	100 Arrow Wood Place, Ballston Spa. 899-6427
230.53-2-32	Levertt, Ruth	
230.53-2-33	Peluso, Daniel J. & Suzanne	
230.53-2-34	Resue, Richard C. & Valerie M.	94 Arrow Wood Place, Ballston Spa. 899-4228
230.53-2-35	Campbell, Neville	92 Arrow Wood Place, Ballston Spa. 899-2071
230.53-2-36	Phillips, Harold D. JR.	90 Arrow Wood Place, Ballston Spa. 899-2247
230.53-2-37	Slingerland, Todd	88 Arrow Wood Place, Ballston Spa. 899-5919
230.53-2-38	Irvin, William M. & Joy R.	86 Arrow Wood Place, Ballston Spa. 899-9181
230.53-2-39	Carpino, John J. & Gary J.	
230.53-2-40	Raozyminski, Irene Frances	82 Arrow Wood Place, Ballston Spa. 899-6034
230.53-2-41	Foley, George & Coleen	80 Arrow Wood Place, Ballston Spa. 899-9928
230.53-2-42	Roberts, Richard J.	
230.53-2-43	Padelford, Carol Ann	76 Arrow Wood Place, Ballston Spa. 899-2143
230.53-2-44	Kane, Christopher S.	74 Arrow Wood Place, Ballston Spa. 899-6169
230.53-2-45	Richards, Scott A. & Annette L.	72 Arrow Wood Place, Ballston Spa. 899-6019
230.53-2-46	Broe, John D. & Kristin D.	
230.53-2-47	Fox Wander West Neighborhood	
230.54-1-1	Angstadt, Dale R.	150 South Street, Ballston Spa. 885-4727
230.54-1-2	Angstadt, Dale R.	
230.54-1-3	Ramamurthy, Kannimbille	
230.54-1-4	Barclay, Allen W.	515 Elk Circle, Ballston Spa. 885-9677

Table 1. Property Owners Adjacent to the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

SEC/BLK/LOT	Names	Addresses
230.54-1-5	Porter, Theresa	145 Thimbleberry Road, Ballston Spa. 899-6941
230.54-1-6	Frank, Richard W.	147 Thimbleberry Road, Ballston Spa. 899-4135
230.54-1-7	Merrill, Hardy	149 Thimbleberry Road, Ballston Spa. 899-4470
230.54-1-8	Dippoliti, Robert	151 Thimbleberry Road, Ballston Spa. 899-5407
230.54-1-9	Kane, Richard J. & Rhonda J.	No Listed (Most Likely 153 Thimbleberry). 899-2519
230.54-1-10	Inco, Carmen J. JR.	155 Thimbleberry Drive, Malta. 899-5427
230.54-1-11	Timmons, Denise	
230.54-1-12	Walsh, Joseph F.	93 Thimbleberry Road, Ballston Spa. 899-6521
230.54-1-13	Brandon, Donald G. & Anne B.	161 Thimbleberry Road, Ballston Spa. 899-9264
230.54-1-14	Johnston, Brian C.	Not Listed(Likely is 163 Thimbleberry)
230.54-1-15	Reale, Rosemary A.	165 Thimbleberry Road, Ballston Spa. 899-5445
230.54-1-16	Lomonaco, Alfred J.	Not Listed (Likely is 167 Thimbleberry)
230.54-1-17	C&L Sales Inc.	Not Listed (Likely is 169 Thimbleberry)
230.54-1-18	Sno, Stanley	171 Thimbleberry Road, Ballston Spa. 899-5365
230.54-1-19	Kennedy, Kathleen	173 Thimbleberry Road, Ballston Spa. 899-5405
230.54-1-20	Lamar, Michelle M.	
230.54-1-21	Drinkwater, Alan F. & Nancy K.	
230.54-1-22	Moore, Kenneth T.	261 Hillside Mobile Home Park, Stillwater. 664-2738
230.54-1-23	Bort, Richard & Virginia	
230.54-1-24	Laiacona, Cathy M.	186 Thimbleberry Road, Ballston Spa. 899-4331
230.54-1-25	Farley, Mark	184 Thimbleberry Road, Ballston Spa. 899-4833
230.54-1-26	Pollock, Ralph A. & Lois N.	64 Thimbleberry Road, Ballston Spa. 899-6486
230.54-1-27	Rossi, Samuel & Michael	180 Thimbleberry Road, Ballston Spa. 899-5373
230.54-1-28	Winig, Jeffrey	178 Thimbleberry Road, Ballston Spa. 899-5397
230.54-1-29	Stoddard, Bruce	176 Thimbleberry Road, Ballston Spa. 899-5395
230.54-1-30	Giacchetta, Michael	Not Listed (Likely is 174 Thimbleberry)
230.54-1-31	MacDonald, Andrew J.	172 Thimbleberry Road, Ballston Spa. 899-6503
230.54-1-32	Trombly, Sharon E.	170 Thimbleberry Road, Ballston Spa. 899-2075
230.54-1-33	Schreiber, Oscar L.	Not Listed (Likely is 168 Thimbleberry)
230.54-1-34	Barnes, Peter W.	166 Thimbleberry Road, Ballston Spa. 899-5392
230.54-1-35	Parvana, Gregory	164 Thimbleberry Road, Ballston Spa. 899-7273
230.54-1-36	Moran, Anne	Not Listed (Likely is 162 Thimbleberry)
230.54-1-37	Sullivan, Kevin	160 Thimbleberry Road, Ballston Spa. 899-9293
230.54-1-38	Wotherspoon, Thomas C.	
230.54-1-39	Guyer Builders Inc.	Parade Ground Village, Malta. 899-9161
230.54-1-40	Colwell, Gene A. & Colleen	154 Thimbleberry Road, Ballston Spa. 899-4448
230.54-1-41	Schoene, Laura A.	152 Thimbleberry Road, Ballston Spa. 899-5667
230.54-1-42	Holmes, Arthur	
230.54-1-43	Brazier, Nigel D.	
230.54-1-44	Lewandowski, Gerard D.	146 Thimbleberry Road, Ballston Spa. 899-5429
230.54-1-45	Ramjeet, Jilal & Seeranie	144 Thimbleberry Road, Ballston Spa. 899-7632
230.54-1-46	Freed, Barbara & Bertram	
230.54-1-47	Smith, Roy L. & Cindy L.	
230.54-1-48	Rockwood, June A.	138 Thimbleberry Road, Ballston Spa. 899-2412
230.-1-16.211	MacKay, William R.	
241.-1-1.1	The Luther Forest Corp.	Stone Break Road, Malta, N.Y. 12020 899-6001

Table 2. Volatile Organic Compound Concentrations in Public Water Supply Wells Within a 3-Mile Radius of the Site, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New york.

LOCATION SAMPLED	SAMPLE COLLECTED BY	ANALYZED BY	PARAMETER	RESULTS	DATE
DCG Development Co. 1A Lakeview Dr. Clifton Park, N.Y. No Sample Location Given	DCG Development Co.	Upstate Laboratories, Inc. Report No. 032591003	Chloroform Bromodichloromethane Dibromochloromethane	0.9 ug/L 0.9 ug/L 0.6 ug/L	3/4/91
DCG Development Co. 1A Lakeview Dr. Clifton Park, N.Y. Malta Gardens Office	J. Crouch	CTM Analytical Labs, Ltd. Sample No. 900924102	Chloroform Bromodichloromethane Dibromochloromethane	1.1 ug/L 0.9 ug/L 0.9 ug/L	9/24/90
DCG Development Co. 1A Lakeview Dr. Clifton Park, N.Y. Malta Gardens Rental	--	CTM Analytical Labs, Ltd. Sample No. 9012050C01	Chloroform Bromodichloromethane	1.3 ug/L 1.3 ug/L	9/24/90
Malta Test Site Luther Forest Supply Wells Well-2, Malta, N.Y.	NYSDOH	NYSDOH Wadsworth Lab Sample I.D. 893606	Chloroform	6 ug/L	8/15/91
Malta Test Site Luther Forest Supply Wells Well-3, Malta, N.Y.	NYDOH	NYSDOH Wadsworth Lab Sample I.D. 893607	Chloroform	4 ug/L	8/15/89

-- Data not available.

* Value exceeds ground-water quantitation limit and potential ARAR for one or more of the following: 1) USEPA MCL; 2) Revised 10NYCRR Subpt 5-1; 3) 10NYCRR Part 170; 4) 6NYCRR Part 703.

Note: Cannot read results of examination, Fay's Mobile Home Park, Stillwater, N.Y., sampling of 12/86.

Table 3. Metals Concentrations in Public Water Supply Wells Within a 3-Mile Radius of the Site, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga, New York.

LOCATION SAMPLED	SAMPLE COLLECTED BY	ANALYZED BY	PARAMETER	RESULTS	DATE
Tall Pines Mobile Home Park Tall Pines MHP Lot #1, Edinburg, N.Y.	--	NYSDOH Wadsworth Lab Sample I.D. 841002694	Zinc Sodium	0.09 mg/L 54 mg/L*	11/16/84
Tall Pines Mobile Home Park Lot #9, Edinburg, N.Y.	--	NYSDOH Wadsworth Lab Sample I.D. 881001922	Barium Copper Iron Manganese Strontium Zinc Sodium	29 ug/L 6 ug/L 17 ug/L 13 ug/L 436 ug/L 178 ug/L 150 mg/L*	6/7/88
Malta Mobile Acres Lot #18, Malta, N.Y.	--	NYSDOH Wadsworth Lab Sample I.D. 881001917	Barium Copper Titanium Sodium	12 ug/L 22 ug/L 351 ug/L 21 ug/L*	6/7/88
Malta Mobile Acres Office Tap, Malta N.Y.	--	NYSDOH Wadsworth Lab Sample I.D. 841000812	Chromium Sodium Zinc	20 ug/L 13 mg/L 0.33 mg/L*	5/8/84
Fay's Mobile Home Park, Stillwater, N.Y., Bar Kitchen	--	NYSDOH, Wadsworth Lab Sample I.D. 891002520	Barium Strontium Zinc Calcium Magnesium Sodium	29 ug/L 202 ug/L 16 ug/L 69.7 mg/L 11.8 mg/L 4.7 mg/L	11/27/89
Pine Crest Trailer Court, Office, Ballston Spa T., N.Y.	--	NYSDOH, Wadsworth Lab Sample I.D. 871001795	Barium Copper Strontium Zinc	8 ug/L 31 ug/L 235 ug/L 30 ug/L	7/8/87
Malta Gardens, Apt. 2B, Malta, N.Y.	--	NYSDOH, Wadsworth Lab Sample I.D. 881001920	Sodium Barium Copper Strontium Zinc	12 mg/L 8 ug/L 9 ug/L 170 ug/L 25 ug/L	6/7/88

-- Data not available.

* Value exceeds ground-water quantitation limit and potential ARAR for one or more of the following: 1) USEPA MCL; 2) Revised 10NYCRR Subpt 5-1; 3) 10NYCRR Part 170; 4) 6NYCRR Part 703.

Note: Cannot read results of examination, Fay's Mobile Home Park, Stillwater, N.Y., sampling of 12/86.

MALTA-3.XLS

Table 4. Revised Table of Potential Ground-Water ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	RAS Quantitation Limits (ppm)	USEPA MCL (ppm)	Revised 10NYCRR Subpt 5-1 (ppm)	10NYCRR Part 170 (ppm)	6NYCRR Part 703 (ppm)	TOGS Values (ppm)	NYS Ambient Water Quality Standards 6NYCRR Part 701 (ppm)	40 CFR 264 (ppm)
Inorganics:								
Aluminum	–	–	–	–	–	–	0.1	–
Antimony	–	–	–	–	–	0.003	–	–
Arsenic	–	0.05	–	0.05	0.025	–	0.05	0.05
Barium	–	1.0	–	1.0	1.0	–	1.0	1.0
Beryllium	–	–	–	–	–	0.003	0.011 (j)	–
Cadmium	–	0.01	–	0.01	0.01	–	0.01	0.01
Calcium	–	–	–	–	–	–	–	–
Chromium	–	0.05	–	–	–	–	0.05	0.05
Chromium (VI)	–	–	–	0.05	0.05	–	0.011	–
Cobalt	–	–	–	–	–	–	0.005	–
Copper	–	–	–	<0.2	1.0	–	0.2	–
Iron	–	–	–	–	0.3 (c)	–	0.3	–
Lead	–	0.05	–	0.05	0.025	–	0.05	0.05
Magnesium	–	–	–	–	–	35	35	–
Manganese	–	–	–	–	0.3 (c)	–	0.3	–
Mercury	–	0.002	–	0.005	0.002	–	0.002	0.002
Nickel	–	–	–	–	–	–	(*)	–
Potassium	–	–	–	–	–	–	–	–
Selenium	–	0.01	–	0.01	0.02	–	0.01	0.01
Silver	–	0.05	–	0.05	0.05	–	0.05	0.05
Sodium	–	–	–	<20	–	–	–	–
Thallium	–	–	–	–	–	0.004	0.008	–
Vanadium	–	–	–	–	–	–	0.014	–
Zinc	–	–	–	<0.3	5	–	0.3	–
Cyanide	–	–	–	<0.1	0.2	–	0.1	–
Boron	–	–	–	1.0	–	–	10.0	–

All ARARs are in Milligrams per Liter unless indicated (mg/L).

ARARs Applicable or Relevant and Appropriate Requirements.
MCL Maximum Contaminant Levels.
TOGS New York State Department of Environmental Conservation Technical and Operational Guidance Series.
PCBs Polychlorinated biphenyls.
SPDES State Pollutant Discharge Elimination System.
ND Not detected.
– No standard available.
(*) Exp (0.76[in (ppm hardness)] + 1.06)
(a) Currently there are no Federal or New York State standards for soil or sediment samples.
(b) Effluent standards provided are those specified in the current Grumman SPDES Permit (effective date July 1, 1989).
(c) Combined concentration of Iron and Manganese shall not exceed 0.5 mg/L.
(d) Total Trihalomethanes shall not exceed 0.1 mg/L.
(e) Total Phenolic Compounds.
(f) Applies to total of Para (i.e., 1,4-) and Ortho (i.e., 1,2-) isomes only.
(g) MCL for Styrene will be set after public comment period.
(h) Flow limit is not applicable to stormwater runoff conditions.
(i) Sum of concentrations of parameters given above.
(j) 1.1 ppm when hardness is greater than 75 ppm.

Standard in bold is less than Routine Analytical Services (RAS) Quantitation Limit.

Table 4. Revised Table of Potential Ground-Water ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	RAS Quantitation Limits (ppm)	USEPA MCL (ppm)	Revised 10NYCRR Subpt 5-1 (ppm)	10NYCRR Part 170 (ppm)	6NYCRR Part 703 (ppm)	TOGS Values (ppm)	NYS Ambient Water Quality Standards 6NYCRR Part 701 (ppm)	40 CFR 264 (ppm)
Volatile Organics:								
Chloromethane	0.01	–	**0.005**	–	–	–	0.05	–
Bromomethane	0.01	–	**0.005**	–	–	–	0.05	–
Vinyl chloride	0.01	**0.002**	**0.002**	–	**0.005**	–	0.05	–
Chloroethane	0.01	–	**0.005**	–	–	–	0.05	–
Methylene chloride	0.005	–	0.005	–	–	0.05	0.05	–
Acetone	0.01	–	0.05	–	–	–	0.05	–
Carbon disulfide	0.005	–	0.05	–	–	–	0.05	–
1,1-Dichloroethene	0.005	0.007	0.005	–	–	**0.00007**	0.05	–
1,1-Dichloroethane	0.005	–	0.005	–	–	0.05	0.05	–
1,2-Dichloroethene	0.005	–	0.005	–	–	–	0.05	–
Chloroform	0.005	0.1 (d)	0.1 (d)	–	0.1	–	**0.0002**	–
1,2-Dichloroethane	0.005	0.005	0.005	–	–	**0.0006**	**0.0006**	–
2-Butanone	0.01	–	0.05	–	–	–	0.05	–
1,1,1-Trichloroethane	0.005	0.2	0.005	–	–	0.05	0.05	–
Carbon tetrachloride	0.005	0.005	0.005	–	0.005	–	0.05	–
Vinyl acetate	0.01	–	0.05	–	–	–	0.05	–
Bromodichloromethane	0.005	0.1 (d)	0.1 (d)	–	–	0.05	0.05	–
1,1,2,2-Tetrachloroethane	0.005	–	0.005	–	–	**0.0002**	0.05	–
1,2-Dichloropropane	0.005	–	0.005	–	–	0.05	0.05	–
trans-1,2-Dichloropropene	0.005	–	0.005	–	–	–	0.05	–
Trichloroethene	0.005	0.005	0.005	–	0.010	–	0.05	–
Dibromochloromethane	0.005	0.1 (d)	0.1 (d)	–	–	0.05	0.05	–

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ARARs Applicable or Relevant and Appropriate Requirements.
MCL Maximum Contaminant Levels.
TOGS New York State Department of Environmental Conservation Technical and Operational Guidance Series.
PCBs Polychlorinated biphenyls.
SPDES State Pollutant Discharge Elimination System.
ND Not detected.
– No standard available.
(*) Exp (0.76[in (ppm hardness)] + 1.06)
(a) Currently there are no Federal or New York State standards for soil or sediment samples.
(b) Effluent standards provided are those specified in the current Grumman SPDES Permit (effective date July 1, 1989).
(c) Combined concentration of Iron and Manganese shall not exceed 0.5 mg/L.
(d) Total Trihalomethanes shall not exceed 0.1 mg/L.
(e) Total Phenolic Compounds.
(f) Applies to total of Para (i.e., 1,4-) and Ortho (i.e., 1,2-) isomes only.
(g) MCL for Styrene will be set after public comment period.
(h) Flow limit is not applicable to stormwater runoff conditions.
(i) Sum of concentrations of parameters given above.
(j) 1.1 ppm when hardness is greater than 75 ppm.

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Table 4. Revised Table of Potential Ground-Water ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	RAS Quantitation Limits (ppm)	USEPA MCL (ppm)	Revised 10NYCRR Subpt 5-1 (ppm)	10NYCRR Part 170 (ppm)	6NYCRR Part 703 (ppm)	TOGS Values (ppm)	NYS Ambient Water Quality Standards 6NYCRR Part 701 (ppm)	40 CFR 264 (ppm)
Volatile Organics: (cont'd)								
1,1,2-Trichloroethane	0.005	–	0.005	–	–	**0.0006**	**0.0006**	–
Benzene	0.005	0.005	0.005	–	ND	–	0.05	–
cis-1,3-Dichloropropene	0.005	–	0.005	–	–	–	0.05	–
Bromoform	0.005	0.1 (d)	0.1 (d)	–	–	0.05	0.05	–
2-Hexanone	0.01	–	0.05	–	–	0.05	0.05	–
4-Methyl-2-pentanone	0.01	–	0.05	–	–	–	0.05	–
Tetrachloroethene	0.005	–	0.005	–	–	**0.0007**	0.05	–
Toluene	0.005	–	0.005	–	–	0.05	0.05	–
Chlorobenzene	0.005	–	0.005	–	–	0.02	0.02	–
Ethylbenzene	–	–	0.005	–	–	0.05	0.05	–
Styrene (g)	–	–	0.005	–	0.931	–	0.05	–
Total Xylenes	0.005	–	0.005	–	–	0.05	0.05	–
Pesticides/PCBs:								
alpha-BHC	0.00005	–	0.005	–	ND	–	–	–
beta-BHC	0.00005	–	0.005	–	ND	–	–	–
delta-BHC	0.00005	–	0.005	–	ND	–	–	–
gamma-BHC (lindane)	0.00005	0.004	0.004	0.056	ND	–	–	0.004
Heptachlor	0.00005	–	0.005	0.018	ND	–	**0.000009**	–
Aldrin	0.00005	–	0.005	0.017	ND	–	**0.000001 (i)**	–
Heptachlor Epoxide	0.00005	–	0.005	0.018	ND	–	**0.000009**	–
Endosulfan I	0.00005	–	0.005	–	–	–	**0.000009**	–
Dieldrin	0.0001	–	0.005	0.017	ND	–	**0.000001 (i)**	–
4,4'-DDE	0.0001	–	0.005	–	ND	–	**0.00001**	–

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Pesticides/PCBs: (cont'd)								
Endrin	0.0001	0.0002	0.0002	0.001	ND	–	0.0002	0.0002
Endosulfan II	0.0001	–	0.005	–	–	–	**0.000009**	–
4,4'-DDD	0.0001	–	0.005	–	ND	–	**0.00001**	–
Endosulfan Sulfate	0.0001	–	0.005	0.042	–	–	–	–
4,4'-DDT	0.0001	–	0.005	0.065	ND	–	**0.00001**	0.1
Methoxyclor	0.0005	0.1	0.05	0.006	0.035	–	0.035	–
Chlordane (alpha and/or gamma)	0.0005	–	0.005	0.005	**0.0001**	–	–	0.005
Toxaphene	0.001	0.005	0.005	–	ND	–	**0.000005**	–
Arochlor-1016	0.0005	–	0.001	–	**0.0001**	–	**0.00001**	–
Arochlor-1221	0.0005	–	0.001	–	**0.0001**	–	**0.00001**	–
Arochlor-1232	0.0005	–	0.001	–	**0.0001**	–	**0.00001**	–
Arochlor-1242	0.0005	–	0.001	–	**0.0001**	–	**0.00001**	–
Arochlor-1248	0.0005	–	0.001	–	**0.0001**	–	**0.00001**	–
Arochlor-1254	0.001	–	0.001	–	**0.0001**	–	**0.00001**	–
Arochlor-1260	0.001	–	0.001	–	**0.0001**	–	**0.00001**	–
Endrin Ketone	0.0001	–	0.005	–	–	–	0.05	–
PCBs		–	0.001	–	0.0001	–	0.00001	–

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PCBs Polychlorinated biphenyls.
SPDES State Pollutant Discharge Elimination System.
ND Not detected.
– No standard available.
(*) Exp (0.76[in (ppm hardness)] + 1.06)
(a) Currently there are no Federal or New York State standards for soil or sediment samples.
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Semivolatiles:								
Phenol(s)	0.01	–	0.05	0.001	0.001 (e)	–	0.001	–
bis(-2-Chloroethyl)ether	0.01	–	0.005	–	0.001	–	0.05	–
2-Chlorophenol	0.01	–	0.005	–	0.001 (e)	–	0.05	–
1,3-Dichlorobenzene	0.01	–	0.005	–	–	–	0.02	–
1,4-Dichlorobenzene	0.01	0.075	0.005	–	4.7 (f)	–	0.03	–
Benzyl Alcohol	0.01	–	0.05	–	–	–	0.05	–
1,2-Dichlorobenzene	0.01	–	0.005	–	4.7 (f)	–	0.05	–
2-Methylphenol	0.01	–	0.05	–	0.001 (e)	–	0.05	–
bis(2-Chloroisopropyl) ether	0.01	–	0.005	–	–	–	0.05	–
4-Methylphenol	0.01	–	0.05	–	0.001 (e)	–	0.05	–
n-Nitroso-di-propylamine	0.01	–	0.05	–	–	–	0.05	–
Hexachloroethane	0.01	–	0.005	–	–	–	0.05	–
Nitrobenzene	0.01	–	0.005	–	–	0.03	0.03	–
Isophorone	0.01	–	0.05	–	–	0.05	0.05	–
2-Nitrophenol	0.01	–	0.005	–	0.001 (e)	–	0.05	–
2,4-Dimethylphenol	0.01	–	0.05	–	0.001 (e)	–	0.05	–
Benzoic Acid	0.05	–	0.05	–	–	–	0.05	–
bis(-2-Chloroethoxy)methane	0.01	–	0.005	–	–	–	0.05	–
2,4-Dichlorophenol	0.01	–	0.005	–	0.001 (e)	0.0003	0.0003	–
1,2,4-Trichlorobenzene	0.01	–	0.005	–	–	0.01	0.01	–
Naphthalene	0.01	–	0.05	–	–	0.01	0.01	–
4-Chloroaniline	0.01	–	0.005	–	–	–	0.05	–

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Semivolatiles (cont'd):								
Hexachlorobutadiene	0.01	–	**0.005**	–	–	**0.0005**	**0.0005**	–
4-Chloro-3-methylphenol	0.01	–	**0.005**	–	**0.001 (e)**	–	0.05	–
2-Methylnaphalene	0.01	–	0.05	–	–	–	–	–
Hexachlorocyclopentadiene	0.01	–	**0.005**	–	–	**0.001**	**0.001**	–
2,4,6-Trichlorophenol	0.01	–	**0.005**	–	**0.001 (e)**	–	0.05	–
2,4,5-Trichlorophenol	0.05	–	**0.005**	–	**0.001 (e)**	–	0.05	–
2-Chloronaphthalene	0.01	–	**0.005**	–	–	0.01	0.01	–
2-Nitroaniline	0.05	–	**0.005**	–	–	–	0.05	–
Dimethylphthalate	0.01	–	0.05	–	–	0.05	–	–
Acenaphthylene	0.01	–	0.05	–	–	–	–	–
3-Nitroaniline	0.05	–	**0.005**	–	–	–	0.05	–
Acenaphthene	0.01	–	0.05	–	–	0.02	0.02	–
2,4-Dinitrophenol	0.05	–	**0.005**	–	**0.001 (e)**	–	0.05	–
4-Nitrophenol	0.05	–	**0.005**	–	**0.001 (e)**	–	0.05	–
Dibenzofuran	0.01	–	0.05	–		–	0.05	–
2,4-Dinitrotoluene	0.01	–	**0.005**	–	–	–	0.05	–
2,6-Dinitrotoluene	0.01	–	**0.005**	–	–	**0.00007**	0.05	–
Diethylphthalate	0.01	–	0.05	–	–	0.05	–	–
4-Chlorophenyl-phenylether	0.01	–	**0.005**	–	–	–	0.05	–
Fluorene	0.01	–	0.05	–	–	0.05	–	–
4-Nitroaniline	0.05	–	**0.005**	–	–	–	0.05	–
4,6-Dinitro-2-methylphenol	0.05	–	**0.005**	–	**0.001 (e)**	–	0.05	–

All ARARs are in Milligrams per Liter unless indicated (mg/L).

ARARs Applicable or Relevant and Appropriate Requirements.
MCL Maximum Contaminant Levels.
TOGS New York State Department of Environmental Conservation Technical and Operational Guidance Series.
PCBs Polychlorinated biphenyls.
SPDES State Pollutant Discharge Elimination System.
ND Not detected.
– No standard available.
(*) Exp (0.76[in (ppm hardness)] + 1.06)
(a) Currently there are no Federal or New York State standards for soil or sediment samples.
(b) Effluent standards provided are those specified in the current Grumman SPDES Permit (effective date July 1, 1989).
(c) Combined concentration of Iron and Manganese shall not exceed 0.5 mg/L.
(d) Total Trihalomethanes shall not exceed 0.1 mg/L.
(e) Total Phenolic Compounds.
(f) Applies to total of Para (i.e., 1,4-) and Ortho (i.e., 1,2-) isomes only.
(g) MCL for Styrene will be set after public comment period.
(h) Flow limit is not applicable to stormwater runoff conditions.
(i) Sum of concentrations of parameters given above.
(j) 1.1 ppm when hardness is greater than 75 ppm.

Standard in bold is less than Routine Analytical Services (RAS) Quantitation Limit.

Table 4. Revised Table of Potential Ground-Water ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	RAS Quantitation Limits (ppm)	USEPA MCL (ppm)	Revised 10NYCRR Subpt 5-1 (ppm)	10NYCRR Part 170 (ppm)	6NYCRR Part 703 (ppm)	TOGS Values (ppm)	NYS Ambient Water Quality Standards 6NYCRR Part 701 (ppm)	40 CFR 264 (ppm)
Semivolatiles (cont'd):								
N-Nitrosodiphenylamine	0.01	–	**0.005**	–	–	0.05	0.05	–
4-Bromophenyl-phenylether	0.01	–	**0.005**	–	–	–	0.05	–
Hexachlorobenzene	0.01	–	**0.005**	–	**0.00035**	–	0.05	–
Penta-chlorophenol	0.05	–	**0.005**	–	**0.021**	–	**0.001**	–
Phenanthrene	0.01	–	0.05	–	–	0.05	–	–
Anthracene	0.01	–	0.05	–	–	0.05	–	–
Di-n-butylphthalate	0.01	–	0.05	–	0.77	–	–	–
Fluoranthene	0.01	–	0.05	–	–	0.05	–	–
Pyrene	0.01	–	0.05	–	–	0.05	–	–
Butylbenzylphthalate	0.01	–	0.05	–	–	0.05	–	–
3,3'-Dichlorobenzidine	0.02	–	**0.005**	–	–	–	0.05	–
Benzo(a)anthracene	0.01	–	0.05	–	–	**0.000002**	–	–
bis(2-Ethylhexyl)phthalate	0.01	–	0.05	–	4.2	–	–	–
Chrysene	0.01	–	0.05	–	–	**0.000002**	–	–
Di-n-octyl phthalate	0.01	–	0.05	–	–	0.05	–	–
Benzo(k)fluoranthene	0.01	–	0.05	–	–	**0.000002**	–	–
Benzo(b)fluoranthene	0.01	–	0.05	–	–	**0.000002**	–	–
Benzo(a)pyrene	0.01	–	0.05	–	ND	–	–	–
Indeno(1,2,3-c d)pyrene	0.01	–	0.05	–	–	**0.000002**	–	–
Dibenz(g,h)anthracene	0.01	–	0.05	–	–	–	–	–
Benzo(g,h,i)perylene	0.01	–	0.05	–	–	–	–	–

All ARARs are in Milligrams per Liter unless indicated (mg/L).

ARARs Applicable or Relevant and Appropriate Requirements.
MCL Maximum Contaminant Levels.
TOGS New York State Department of Environmental Conservation Technical and Operational Guidance Series.
PCBs Polychlorinated biphenyls.
SPDES State Pollutant Discharge Elimination System.
ND Not detected.
– No standard available.
(*) Exp (0.76[in (ppm hardness)] + 1.06)
(a) Currently there are no Federal or New York State standards for soil or sediment samples.
(b) Effluent standards provided are those specified in the current Grumman SPDES Permit (effective date July 1, 1989).
(c) Combined concentration of Iron and Manganese shall not exceed 0.5 mg/L.
(d) Total Trihalomethanes shall not exceed 0.1 mg/L.
(e) Total Phenolic Compounds.
(f) Applies to total of Para (i.e., 1,4-) and Ortho (i.e., 1,2-) isomes only.
(g) MCL for Styrene will be set after public comment period.
(h) Flow limit is not applicable to stormwater runoff conditions.
(i) Sum of concentrations of parameters given above.
(j) 1.1 ppm when hardness is greater than 75 ppm.

Standard in bold is less than Routine Analytical Services (RAS) Quantitation Limit.

Table 5. Revised Table of Potential Soil ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	RAS Quantitation Limits (ppm)	NYS Sediment Criteria (12/89) (ppm)	Reportable Quantities of Hazardous Substances 6NYCRR Part 597 (pounds)
Inorganics:			
Aluminum	–	–	–
Antimony	–	–	1
Arsenic	–	5	1
Barium	–	–	–
Beryllium	–	–	1
Cadmium	–	0.8	1
Calcium	–	–	–
Chromium	–	26	1
Chromium (VI)	–	–	–
Cobalt	–	–	1
Copper	–	19	1
Iron	–	–	–
Lead	–	55	1
Magnesium	–	–	–
Manganese	–	1200	–
Mercury	–	0.6	1
Nickel	–	75	1
Potassium	–	–	–
Selenium	–	–	1
Silver	–	–	100
Sodium	–	–	10
Thallium	–	–	–
Vanadium	–	–	–
Zinc	–	145	1
Cyanide	–	–	10
Boron	–	–	–

Standard in bold is less than Routine Analytical Services (RAS) Quantitation Limit.

Table 6. Revised Table of Potential Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50 [mg/m(3)]	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 [mg/m(3)]
Inorganics:				
Aluminum	–	–	–	15 (a)
Antimony	–	–	1	0.5 (a)
Arsenic	–	–	1	0.01 (a)
Barium	–	–	–	0.5 (a)
Beryllium	0.01 ug/m(3)	–	1	0.002 (a)
Cadmium	–	–	1	0.2 (a)
Calcium	–	–	1	–
Chromium	–	–	–	1 (a)
Chromium (VI)	–	–	1	–
Cobalt	–	–	1	0.05 (a)
Copper	–	–	–	1 (a)
Iron	–	–	–	–
Lead	–	1.5	1	0.05 (a)
Magnesium	–	–	–	–
Manganese	–	–	–	1 (a)
Mercury	–	–	1	0.1 (b)
Nickel	–	–	1	1 (a)
Potassium	–	–	–	–
Selenium	–	–	1	0.2 (a)
Silver	–	–	1000	0.01 (a)
Sodium	–	–	10	–
Thallium	–	–	–	0.1 (a)
Vanadium	–	–	–	0.05 (a)
Zinc	–	–	1	–
Cyanide	–	–	10	5 (a)
Boron	–	–	–	–

(a) 8-hour time weighted average (TWA).
(b) Acceptable ceiling concentrations (Ceiling).
(c) 15-minute short-term exposure limit (STEL).

Table 6. Revised Table of Potential Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 (ppm)
Volatile Organics:				
Chloromethane	–	–	1	50 (a)
Bromomethane	–	–	1000	5 (a)
Vinyl chloride	–	–	1	1 (a)
Chloroethane	–	–	1	1000 (a)
Methylene chloride	–	–	1	500 (a)
Acetone	–	–	5000	750 (a)
Carbon disulfide	–	–	100	4 (a)
1,1-Dichloroethene	–	–	5000	–
1,1-Dichloroethane	–	–	1000	100 (a)
1,2-Dichloroethene	–	–	1000	200 (a)
Chloroform	–	–	5000	2 (a)
1,2-Dichloroethane	–	–	5000	–
2-Butanone	–	–	1000	200 (a)
1,1,1-Trichloroethane	–	–	1000	350 (a)
Carbon tetrachloride	–	–	5000	2 (a)
Vinyl acetate	–	–	5000	10 (a)
Bromodichloromethane	–	–	–	–
1,1,2,2-Tetrachloroethane	–	–	1	1 (a)
1,2-Dichloropropane	–	–	1000	75 (a)
trans-1,2-Dichloropropene	–	–	–	–
Trichloroethene	–	–	1000	50 (a)
Dibromochloromethane	–	–	–	–

(a) 8-hour time weighted average (TWA).
(b) Acceptable ceiling concentrations (Ceiling).
(c) 15-minute short-term exposure limit (STEL).

Table 6. Revised Table of Potential Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 (ppm)
Volatile Organics (cont'd):				
1,1,2-Trichloroethane	–	–	1	10 (a)
Benzene	–	–	1000	10 (a)
cis-1,3-Dichloropropene	–	–	5000	1 (a)
Bromoform	–	–	100	0.5 (a)
2-Hexanone	–	–	–	5 (a)
4-Methyl-2-pentanone	–	–	–	–
Tetrachloroethene	–	–	1	25 (a)
Toluene	–	–	1000	100 (a)
Chlorobenzene	–	–	100	75 (a)
Ethylbenzene	–	–	1000	100 (a)
Styrene (g)	–	–	1000	50 (a)
Total Xylenes	–	–	1000	100 (a)
Pesticides/PCBs:				
alpha-BHC	–	–	1	–
beta-BHC	–	–	1	–
delta-BHC	–	–	1	–
gamma-BHC (Lindane)	–	–	1	0.5 mg/m(3) (a)
Heptachlor	–	–	1	0.5 mg/m(3) (a)
Aldrin	–	–	1	0.25 mg/m(3) (a)
Heptachlor Epoxide	–	–	1	–
Endosulfan I	–	–	1	0.1 mg/m(3) (a)
Dieldrin	–	–	1	0.25 mg/m(3) (a)
4,4'-DDE	–	–	1	–

(a) 8-hour time weighted average (TWA).
(b) Acceptable ceiling concentrations (Ceiling).
(c) 15-minute short-term exposure limit (STEL).

Table 6. Revised Table of Potential Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 [mg/m(3)]
Pesticides/PCBs (cont'd):				
Endrin	–	–	1	0.1 (a)
Endosulfan II	–	–	1	0.1 (a)
4,4'-DDD	–	–	1	–
Endosulfan Sulfate	–	–	1	–
4,4'-DDT	–	–	1	1 (a)
Methoxychlor	–	–	1	10 (a)
Chlordane(alpha and/or gamma)	–	–	1	0.5 (a)
Toxaphene	–	–	1	0.5 (a)
Arochlor-1016	–	–	10	–
Arochlor-1221	–	–	10	–
Arochlor-1232	–	–	10	–
Arochlor-1242	–	–	10	–
Arochlor-1248	–	–	10	–
Arochlor-1254	–	–	10	–
Arochlor-1260	–	–	10	–
Endrin Ketone	–	–	–	–
PCBs	–	–	10	–

(a) 8-hour time weighted average (TWA).
(b) Acceptable ceiling concentrations (Ceiling).
(c) 15-minute short-term exposure limit (STEL).

Table 6. Revised Table of Potential Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 (ppm)
Semivolatiles:				
Phenol(s)	–	–	1000	5 (a)
bis(-2-Chloroethyl)ether	–	–	1	–
2-Chlorophenol	–	–	100	–
1,3-Dichlorobenzene	–	–	100	–
1,4-Dichlorobenzene	–	–	100	75 (a)
Benzyl Alcohol	–	–	–	–
1,2-Dichlorobenzene	–	–	100	50 (b)
2-Methylphenol	–	–	–	–
bis(2-Chloroisopropyl)ether	–	–	1000	–
4-Methylphenol	–	–	–	–
n-Nitroso-di-proylamine	–	–	–	–
Hexachloroethane	–	–	1	1 (a)
Nitrobenzene	–	–	1000	1 (a)
Isophorone	–	–	5000	4 (a)
2-Nitrophenol	–	–	100	–
2,4-Dimethylphenol	–	–	100	–
Benzoic Acid	–	–	5000	–
bis(-2-Chloroethoxy)methane	–	–	1000	–
2,4-Dichlorophenol	–	–	100	–
1,2,4-Trichlorobenzene	–	–	100	5 (b)
Naphthalene	–	–	100	10 (a)
4-Chloroaniline	–	–	1000	–

(a) 8-hour time weighted average (TWA).
(b) Acceptable ceiling concentrations (Ceiling).
(c) 15-minute short-term exposure limit (STEL).

Table 6. Revised Table of Potential Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 (ppm)
Semivolatiles (cont'd):				
Hexachlorobutadine	–	–	1	0.02 (a)
4-Chloro-3-methylphenol	–	–	–	–
2-Methylnaphthalene	–	–	–	–
Hexachlorocyclopentadiene	–	–	1	0.01 (a)
2,4,6-Trichlorophenol	–	–	10	–
2,4,5-Trichlorophenol	–	–	10	–
2-Chloronaphthalene	–	–	5000	–
2-Nitroaniline	–	–	5000	3 mg/m3 (a)
Dimethylphthalate	–	–	–	5 mg/m3 (a)
Acenaphthylene	–	–	1	–
3-Nitroaniline	–	–	5000	3 mg/m3 (a)
Acenaphthene	–	–	1	–
2,4-Dinitrophenol	–	–	10	–
4-Nitrophenol	–	–	100	–
Dibenzofuran	–	–	–	–
2,4-Dinitrotoluene	–	–	1000	1.5 mg/m3 (a)
2,6-Dinitrotoluene	–	–	1000	1.5 mg/m3 (a)
Diethylphthalate	–	–	1000	5 mg/m3 (a)
4-Chlorophenyl-phenylether	–	–	5000	–
Fluorene	–	–	1	–
4-Nitroaniline	–	–	5000	3 mg/m3 (a)
4,6-Dinitro-2-methylphenol	–	–	–	–

(a) 8-hour time weighted average (TWA).
(b) Acceptable ceiling concentrations (Ceiling).
(c) 15-minute short-term exposure limit (STEL).

Table 6. Revised Table of Potential Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 [mg/m(3)]
Semivolatiles (cont'd):				
N-Nitrosodiphenylamine	–	–	100	–
4-Bromophenyl-phenylether	–	–	100	–
Hexachlorobenzene	–	–	1	–
Penta-chlorophenol	–	–	10	0.5 (a)
Phenanthrene	–	–	1	–
Anthracene	–	–	1	–
Di-n-butylphthalate	–	–	10	5 (a)
Fluoranthene	–	–	1	–
Pyrene	–	–	5000	–
Butylbenzylphthalate	–	–	100	–
3,3'-Dichlorobenzidine	–	–	1	–
Benzo(a)anthracene	–	–	–	–
bis(2-Ethylhexyl)phthalate	–	–	1	–
Chrysene	–	–	1	0.2 (a)
Di-n-octyl phthalate	–	–	1	5 (a)
Benzo(b)fluoranthene	–	–	1	–
Benzo(k)fluoranthene	–	–	1	–
Benzo(a)pyrene	–	–	1	0.2 (a)
Indeno(1,2,3-c d)pyrene	–	–	1	–
Dibenz(g,h)anthracene	–	–	1	–
Benzo(g,h,i)perylene	–	–	1	–

(a) 8-hour time weighted average (TWA).
(b) Acceptable ceiling concentrations (Ceiling).
(c) 15-minute short-term exposure limit (STEL).

Table 6. Revised Table of Potential Air ARARs (including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 (ppm)
Nitrate (as N)	–	–	–	–
Pentaborane	–	–	1	0.005 (a)
Diborane	–	–	1	0.1 (a)
Hydrazine	–	–	1	0.1 (a)
Monomethyl hydrazine	–	–	10	0.2 (a)
Dimethyl hydrazine	–	–	1	0.5 (a)
Chlorine trifluoride	–	–	–	0.1 (a)
Nitric acid	–	–	1000	2 (a)
Hydrogen peroxide	–	–	1	1 (a)
Ethyl alcohol	–	–	–	1000 (a)
Isopropyl alcohol	–	–	–	400 (a)
Perchloryl fluoride	–	–	–	3 (a)
Ammonia	–	–	100	35 (a)
Nitromethane	–	–	–	100 (a)
n-Propyl nitrate	–	–	–	25 (a)
Amine nitrate	–	–	–	–
Alkylamine nitrate	–	–	–	–
Triethyl aluminum	–	–	–	–
Sodium chromate	–	–	1000	–
Methylethyl ketone	–	–	1000	200
n-Ethylmorphaline	–	–	–	–
Chlorofluorocarbons	–	–	–	–
Perchloroethylene	–	–	–	–

(a) 8-hour time weighted average (TWA).
(b) Acceptable ceiling concentrations (Ceiling).
(c) 15-minute short-term exposure limit (STEL).

Table 6. Revised Table of Potential Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 257	EPA Ambient Air Quality Standards 40CFR 50 [MG/M(3)]	Reportable Quantities Hazardous Substances 6NYCRR Part 597 (pounds)	OSHA 29CFR1910 (ppm)
Nitrogen dioxide (N02-gas)	0.05 ppm (*)	100	10	1 (c)
Kerosene	–	–	–	–
Diesel fuel	–	–	–	–
Fuel oil	–	–	–	–
Gasoline	–	–	–	–
Mineral spirits	–	–	–	–
Oil and grease	–	–	–	–
Total petroleum hydrocarbons	0.24 ppm (**)	–	–	–
Dipropiyene glycol nitrate	–	–	–	–
Jet fuels: JP1	–	–	–	–
JP4	–	–	–	–
JPX	–	–	–	–
RP1	–	–	–	–
Uranium hexafluoride	–	–	–	–
Enriched uranium	–	–	–	–
Cobalt (60)	–	–	–	–
Gross alpha	–	–	–	–
Man-made beta	–	–	–	–
Gross beta	–	–	–	–

(*) During any 12 consecutive months, the annual average of the 24 hour concentrations shall not exceed 0.05 ppm.

(**) The average non-methane hydrocarbon concentration must not exceed 0.24 ppm over a 3-hour period from 6 to 9 AM more than once in any 12 consecutive months.

(a) 8-hour time weighted average (TWA).

(b) Acceptable ceiling concentrations (Ceiling).

(c) 15-minute short-term exposure limit (STEL).

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Inorganics:				
Aluminum	–	–	–	–
Antimony	–	–	–	–
Arsenic	–	5.0	5.0 *	5.0
Barium	–	100	100 *	100
Beryllium	–	–	–	–
Cadmium	10	1.0	1.0 *	1.0
Calcium	–	–	–	–
Chromium	1000	5.0	5.0 *	5.0
Chromium (VI)	–	–	–	–
Cobalt	–	–	–	–
Copper	1000	–	–	–
Iron	–	–	–	–
Lead	250	5.0	5.0 *	5.0
Magnesium	–	–	–	–
Manganese	–	–	–	–
Mercury	10	0.2	0.2 *	0.2
Nickel	200	–	–	–
Potassium	–	–	–	–
Selenium	–	1.0	5.7 *	1.0
Silver	–	5.0	5.0 *	5.0
Sodium	–	–	–	–
Thallium	–	–	–	0.14
Vanadium	–	–	–	–
Zinc	2500	–	–	–
Cyanide	–	–	110	1.9
Boron	–	–	–	–

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Volatile Organics:				
Chloromethane	–	–	33	0.19
Bromomethane	–	–	15	0.11
Vinyl chloride	–	–	33	0.27
Chloroethane	–	–	–	–
Methylene chloride	–	–	0.96 *	0.20
Acetone	–	–	0.59 *	0.05
Carbon disulfide	–	–	4.81 *	1.05
1,1-Dichloroethene	–	–	33	0.025
1,1-Dichloroethane	–	–	7.2	0.059
1,2-Dichloroethene	–	–	33	0.054
Chloroform	–	–	5.6	0.046
1,2-Dichloroethane	–	–	7.2	0.21
2-Butanone	–	–	–	–
1,1,1-Trichloroethane	–	–	0.41 *	1.05
Carbon tetrachloride	–	–	0.96 *	0.05
Vinyl acetate	–	–	–	–
Bromodichloromethane	–	–	–	–
1,1,2,2-Tetrachloroethane	–	–	42	0.057
1,2-Dichloropropane	–	–	18	0.85
trans-1,2-Dichloropropene	–	–	18	0.036
Trichloroethene	–	–	0.091	0.062
Dibromochloromethane	–	–	–	–

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Volatile Organics (cont'd):				
1,1,2-Trichloroethane	–	–	7.6	0.030
Benzene	–	–	3.7	0.070
cis-1,3-Dichloropropene	–	–	18	0.036
Bromoform	–	–	15	0.63
2-Hexanone	–	–	–	–
4-Methyl-2-pentanone	–	–	–	–
Tetrachloroethene	–	–	0.05 *	0.079
Toluene	–	–	0.33 *	1.120
Chlorobenzene	–	–	0.05 *	0.15
Ethylbenzene	–	–	0.053 *	0.05
Styrene (g)	–	–	–	–
Total Xylenes	–	–	0.15 *	0.05
Pesticides/PCBs:				
alpha-BHC	–	–	0.066	0.00014
beta-BHC	–	–	0.066	0.00014
delta-BHC	–	–	0.066	0.023
gamma-BHC (Lindane)	–	0.4	0.066	0.0017
Heptachlor	–	–	0.066	0.0012
Aldrin	–	–	0.066	0.21
Heptachlor Epoxide	–	–	0.066	0.016
Endosulfan I	–	–	0.066	0.023
Dieldrin	–	–	0.13	0.017
4,4'-DDE	–	–	0.087	0.031

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Pesticides/PCBs (cont'd):				
Endrin	–	0.02	0.13	0.0028
Endosulfan II	–	–	0.13	0.029
4,4'-DDD	–	–	0.087	0.023
Endosulfan Sulfate	–	–	0.13	0.029
4,4'-DDT	–	–	0.087	0.0039
Methoxychlor	–	10.0	0.18	0.25
Chlordane(alpha and/or gamma)	–	–	0.13	0.0033
Toxaphene	–	0.5	1.3	0.0095
Arochlor-1016	–	–	–	–
Arochlor-1221	–	–	–	–
Arochlor-1232	–	–	–	–
Arochlor-1242	–	–	–	–
Arochlor-1248	–	–	–	–
Arochlor-1254	–	–	–	–
Arochlor-1260	–	–	–	–
Endrin Ketone	–	–	–	–
PCBs	1.0	–	–	–

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Semivolatiles:				
Phenol(s)	–	–	6.2	0.039
bis(-2-Chloroethyl)ether	–	–	–	–
2-Chlorophenol	–	–	5.7	0.044
1,3-Dichlorobenzene	–	–	6.2	0.088
1,4-Dichlorobenzene	–	–	6.2	0.090
Benzyl Alcohol	–	–	–	–
1,2-Dichlorobenzene	–	–	6.2	0.036
2-Methylphenol	–	–	–	–
bis(2-Chloroisopropyl)ether	–	–	7.2	0.055
4-Methylphenol	–	–	–	–
n-Nitroso-di-proylamine	–	–	–	–
Hexachloroethane	–	–	28	0.055
Nitrobenzene	–	–	14	0.068
Isophorone	–	–	–	–
2-Nitrophenol	–	–	29	0.12
2,4-Dimethylphenol	–	–	14	0.036
Benzoic Acid	–	–	–	–
bis(-2-Chloroethoxy)methane	–	–	7.2	0.036
2,4-Dichlorophenol	–	–	14	0.044
1,2,4-Trichlorobenzene	–	–	–	–
Naphthalene	–	–	3.1	0.059
4-Chloroaniline	–	–	16	0.46

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Semivolatiles (cont'd):				
Hexachlorobutadine	–	–	28	0.055
4-Chloro-3-methylphenol	–	–	–	–
2-Methylnaphthalene	–	–	–	–
Hexachlorocyclopentadiene	–	–	–	–
2,4,6-Trichlorophenol	–	–	–	–
2,4,5-Trichlorophenol	–	–	–	–
2-Chloronaphthalene	–	–	5.6	0.055
2-Nitroaniline	–	–	–	–
Dimethylphthalate	–	–	28	0.54
Acenaphthylene	–	–	–	–
3-Nitroaniline	–	–	–	–
Acenaphthene	–	–	–	–
2,4-Dinitrophenol	–	–	160	0.12
4-Nitrophenol	–	–	29	0.12
Dibenzofuran	–	–	–	–
2,4-Dinitrotoluene	–	–	140	0.32
2,6-Dinitrotoluene	–	–	28	0.55
Diethylphthalate	–	–	28	0.54
4-Chlorophenyl-phenylether	–	–	–	–
Fluorene	–	–	–	–
4-Nitroaniline	–	–	–	–
4,6-Dinitro-2-methylphenol	–	–	–	–

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Semivolatiles (cont'd):				
N-Nitrosodiphenylamine	–	–	–	–
4-Bromophenyl-phenylether	–	–	15	0.055
Hexachlorobenzene	–	–	37	0.055
Penta-chlorophenol	–	–	–	–
Phenanthrene	–	–	–	–
Anthracene	–	–	–	–
Di-n-butylphthalate	–	–	–	–
Fluoranthene	–	–	8.2	0.068
Pyrene	–	–	–	–
Butylbenzylphthalate	–	–	–	–
3,3'-Dichlorobenzidine	–	–	–	–
Benzo(a)anthracene	–	–	–	–
bis(2-Ethylhexyl)phthalate	–	–	28	0.54
Chrysene	–	–	8.2	0.059
Di-n-octyl phthalate	–	–	28	0.54
Benzo(b)fluoranthene	–	–	–	–
Benzo(k)fluoranthene	–	–	–	–
Benzo(a)pyrene	–	–	8.2	0.061
Indeno(1,2,3-c d)pyrene	–	–	8.2	0.0055
Dibenz(g,h)anthracene	–	–	8.2	0.055
Benzo(g,h,i)perylene	–	–	–	–

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Nitrate (as N)	–	–	–	–
Pentaborane	–	–	–	–
Diborane	–	–	–	–
Hydrazine	–	–	–	–
Monomethyl hydrazine	–	–	–	–
Dimethyl hydrazine	–	–	–	–
Chlorine trifluoride	–	–	–	–
Nitric acid	–	–	–	–
Hydrogen peroxide	–	–	–	–
Ethyl alcohol	–	–	–	–
Isopropyl alcohol	–	–	–	–
Perchloryl fluoride	–	–	–	–
Ammonia	–	–	–	–
Nitromethane	–	–	–	–
n-Propyl nitrate	–	–	–	–
Amine nitrate	–	–	–	–
Alkylamine nitrate	–	–	–	–
Triethyl aluminum	–	–	–	–
Sodium chromate	–	–	–	–
Methylethyl ketone	–	–	36	0.28
n-Ethylmorphaline	–	–	–	–
Chlorofluorocarbons	–	–	–	–
Perchloroethylene	–	–	–	–

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 7. Revised Table of Potential Waste and Sludge ARARs for the Malta Rocket Fuel Area, Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Parameters	6NYCRR Part 360 (ppm-dry wgt)	E.P. Toxicity 6NYCRR Parts 370 - 372 (ppm)	RCRA Non-Wastewater 40 CFR 268 (ppm)	RCRA Wastewater 40 CFR 268 (ppm)
Nitrogen dioxide (N02-gas)	–	–	–	–
Kerosene	–	–	–	–
Diesel fuel	–	–	–	–
Fuel oil	–	–	–	–
Gasoline	–	–	–	–
Mineral spirits	–	–	–	–
Oil and grease	–	–	–	–
Total petroleum hydrocarbons	–	–	–	–
Dipropiyene glycol nitrate	–	–	–	–
Jet fuels: JP1	–	–	–	–
JP4	–	–	–	–
JPX	–	–	–	–
RP1	–	–	–	–
Uranium hexafluoride	–	–	–	–
Enriched uranium	–	–	–	–
Cobalt (60)	–	–	–	–
Gross alpha	–	–	–	–
Man-made beta	–	–	–	–
Gross beta	–	–	–	–

* Toxicity Characteristic Leachate Procedure (TCLP)

Table 8. Inventory of Material Stored in Magazine Areas at Buildings 8 and 27, August 19, 1991, Wright - Malta Test Station, Towns of Malta/Stillwater, New York.

BUILDING 8

ITEM	QUANTITY
Primers MK 15-3 Lock Combo Lot: NR-8-4-57	874
Primers MK 15-3 Lock Combo Lot: NR 508-N-9-60	507
Primers Percussion DM191A1	43
Cartridge 90HM Practice M371	60
M36 Stick Propellant RAD81D003-21 (LBS)	38
DM52A381 Lot: LC80M720040 Elec. Primers	48
M82 Primers Lot: LS-259-27	1532
MK15-2 Primers Lot: 579-M-45	73
MK15-4 Primers Lot: 6-M4-58	38
M82 7.62MM Lot: LCL41-5	200
M64 7.62MM Lot: LC-80-9	281

BUILDING 27

ITEM	QUANTITY
Surnham Radiators - ID: EPR-30 200Y Explosion Proof	3
Singer Ex/Proos HRTS- Mod-3 ID: US 47014	1
105MM Cartr. IP-T-M490 without Linter or Tracer	225
AMMO F/Cannon w/Inert Load Proj.-105MM-3MA84K0006988-X490	236
AMMO F/Cannon w/Inert Load Proj.-105MM MAPQ MA82L770H009	329
Black Powder 4 Types [1, 2, 3, & 4F) (LBS)	23
M31E2 Slotted Stick Propellant	1200
90 MM Single (not legible)	135
Prop Charge (155MM-M119A2) IND84H070442	5
M456A1 AMMO Lot: 54-04-10	42

Table 8. Inventory of Material Stored in Magazine Areas at Buidlings 8 and 27 August 19, 1991, Wright - Malta Test Station, Towns of Malta/Stillwater, New York.

BUILDING 27

ITEM	QUANTITY
105MM AMMO H-467-TPT-Lot: MA-78K031-007	13
Combustible Cases (KE) Type -- ARMTEC	10
Case Body Combustible 155MM M203A1 (Assorted 3 Types)	44
Cartridge 90MM Practice M371	60
EXP AMMO, 155MM M3A1-:IND 82E-069299	100
EXP AMMO, 155MM M203 -:IND 79L-069961	19
EXP AMMO, 155MM M119A2 -:IND 82L-070219	84
EXP AMMO, 155MM M4A2, 8AJ-67476	90
105MM Howitzer AMMO XM-76 W/Inert Fuse W/XM-200 Charge	6
M-1 AMMO - Lot NR 8AJ67780	5
M-833 Lot APE 8-1-88	3
Prop Charge (155MM-M3A1) RAD68017-71	485
Fixed Charge (120MM-M831-TPT) I0F85L01D-004	5
Fixed Charge (120MM Special) 7000 :-Sec Imp. ABY8602PS-001	2
Fixed Charge (120MM Special) 8000 :-Sec Imp. ABY8602PS-002	2
Fixed Charge (120MM Special) 9000 :-Sec Imp. ABY8602PS-003	2
Fixed Charge (120MM Special) 10000 :-Sec Imp. ABY8602PS-004	2
Fixed Charge (120MM Special) 11000 :-Sec Imp. ABY8602PS-005	2
Prop Charge (155MM-PXR6297) IND81E570051	1
Combustible Cases (HE) Type - ARMTEC	10
HAG D Liquid Prop. Han 1845 Lot: 291 (LBS)	20
Case Body, Combustible 155MM M203A1 (GFP) Flammable Solid	72
105MM Tank Rounds MA-84K001E011 (Cond. "D" AMMO.)	50
M26E1 Propellant Lot: RAD-RB-67268 (LBS)	149
HAG D Liquid Prop. Han 1845 Lot: 292 (LBS)	6
M-10 Propellant Lot: RAD87A-070831 (Listed as LBS.)	150
Combustible Cases for Test (155MM - No Bottoms)	20

Table 9. Inventory of Underground and Aboveground Storage Tanks at the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Location	Number	Type	Size	Contents	Status	Tanks Requiring Soil Borings (see Figure 9)
Tanks Present on 1952 Location Map						
Building 3	1	AST	500,000 cu.ft.	Liquid Oxygen	Removed (no date)	--
Building 3	1	AST	600,000 cu.ft.	Liquid Oxygen	Removed (no date)	--
Building 5	1	UST	550 gallon	Fuel Oil	Present & Empty	--
Building 6A	1	UST	550 gallon	Fuel Oil	Present & Empty	--
Building 7	1	UST	3,000 gallon	Fuel Oil	Present & Empty	--
Building 7	1	UST	550 gallon	Fuel Oil	Could Not Locate	--
Building 7	1	AST	300,000 cu.ft.	Compressed Air	In Use	--
Building 7	1	AST	300,000 cu.ft.	Nitrogen	Removed (no date)	--
Building 10	1	AST	3,000 gallon	Diesel Fuel	In Use	--
Building 10	1	UST	550 gallon	Diesel Fuel	In Use	--
Building 11	1	UST	3,000 gallon	Fuel Oil	Present & Empty	--
Building 11C	1	UST	550 gallon	Fuel Oil	Present & Empty	--
Building 13	1	UST	10,000 gallon	Fuel Oil	In Use	--
Building 13	1	UST	1,000 gallon	Fuel Oil	Present & Empty	--
Building 14	1	UST	4,000 gallon	Fuel Oil	In Use	--
Building 15	1	UST	3,000 gallon	Gasoline	Removed 4/91	--
Building 15	3	UST	10,000 gallon	Fuel Oil	In Use	--
Building 15	1	UST	550 gallon	Gasoline	Removed 4/91	--
Building 15	1	UST	550 gallon	Fuel Oil	Removed 4/91	--
Building 16	1	UST	1,000 gallon	Fuel Oil	Could Not Locate	--
Building 17	1	UST	550 gallon	Fuel Oil	Could Not Locate	--
Building 18	2	Aluminum AST	500 gallon	Hydrogen Peroxide (90%)	Present & Empty	--
Building 18	1	UST	550 gallon	Fuel Oil	Present & Empty	--
Building 20	1	UST	5,000 gallon	Fuel Oil	Removed 12/90	--
Building 20	1	UST	550 gallon	Gasoline	In Use	--
Building 21	1	UST	5,000 gallon	Fuel Oil	In Use	--
Building 21	1	AST	5,000 gallon	Water (Condensate)	Removed (no date)	--
Building 23	1	UST	4,000 gallon	Fuel Oil	In Use	--
Building 23	1	UST	3,000 gallon	Gasoline	In Use	--
Building 24	1	UST	2,000 gallon	Fuel Oil	Removed 1983	--
Building 25	1	AST	1,500,000 cu.ft.	Liquid Oxygen	Removed (no date)	--
Building 25	1	UST	10,000 gallon	Kerosene	Removed 12/90	--
Building 25	1	UST	10,000 gallon	Fuel Oil	Removed 12/90	--
Building 25	1	UST	550 gallon	Gasoline	Removed 12/90	--
Building 28	2	UST	6,000 gallon	Hydrocarbon	Removed 4/91	--
Building 28	1	UST	3,000 gallon	Alcohol	Removed (no date)	X
Building 28	1	AST	3,000 gallon	Rocket Fuel Mixing	Removed (no date)	X
Building 28	1	AST	650 gallon	Rocket Fuel	Removed (no date)	X
Building 28	1	UST	550 gallon	Fuel Oil	Removed (no date)	--
Building 28	1	AST	3,000 gallon	Rocket Fuel	Removed (no date)	X
Building 29	2	UST	6,000 gallon	Hydrocarbon Fuel	Present & Empty	--
Building 29	2	UST	10,000 gallon	Hydrocarbon Fuel	Present & Empty	--
Building 30	1	UST	10,000 gallon	Fuel Oil	Present & Empty	--
Building 30	1	UST	3,000 gallon	Hydrocarbon Fuel	Present & Empty	--
Building 30	1	UST	550 gallon	Fuel Oil	Present & Empty	--

* Estimated size.

GE-STORE.XLS

Table 9. Inventory of Underground and Aboveground Storage Tanks at the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Location	Number	Type	Size	Contents	Status	Tanks Requiring Soil Borings (see Figure 9)
Tanks Found During 1991 Literature Search						
Building 1	2	AST	30 gallon*	Rocket Fuel	Removed (no date)	X
Building 2	2	AST	30 gallon*	Rocket Fuel	Removed (no date)	X
Building 2	6+	AST	Unknown	Nitrogen Bottles	Present & Empty	--
Building 3	2	AST	5,000-10,000 gallon*	Rocket Fuel	Present & Empty	X
Building 3	17+	AST	Unknown	Gas Bottles	Removed (no date)	--
Building 4	2	AST	1,000 gallon*	Rocket Fuel	Present & Empty	X
Building 4	1	AST	1,000 gallon*	Kerosene	In Use	--
Building 4	1	AST	3,000 gallon*	Kerosene	Present & Empty	--
Building 5	1	UST	6,000 gallon*	Liquid Oxygen	Present & Empty	--
Building 5 (D-4)	10+	AST&UST	Various	Fuels	Present & Empty	--
Building 6A	14+	AST	Unknown	Gas Bottles	Present & Empty	--
Building 7	10+	AST	Various	Gas Bottles	Present & Empty	--
Building 7B	?	AST	230 cu.ft.	Nitrogen	Removed (no date)	--
Building 20	1	AST	550 gallon	Fuel Oil	In Use	--
Building 24	3+	AST	Unknown	Gas Bottles	Removed 1983	--
Building 24	4	AST (Roof)	Unknown	Rocket Fuel	Removed 1983	--
Isolde	1	AST	700 gallon*	Nitric Acid	Present & Empty	X

* Estimated size.

Table 10. Rationale for Proposed Surface Soil Samples, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Sampling Location	Number of Samples	Rationale
Building 1	1	Experimental Fuel Testing.
Building 2	1	Hydrazine Fuels Used.
Building 3	1	Carbon Tetrachloride Used in Cleaning Operations and Extinguishing Fires.
Building 4	1	Carbon Tetrachloride Used in Cleaning Operations and Extinguishing Fires.
Building 5	1	Rocket Fuel Feeding Tests Performed.
Building 6	1	Carbon Tetrachloride and Trichloroethene Used in Cleaning Operations.
Building 8	1	Hydrazine and Pentaborane Storage.
Building 9	1	Hydrazine and Pentaborane Storage.
Building 13	1	Carbon Tetrachloride Storage, Methyl Ethyl Ketone Used.
Building 15	1	Carbon Tetrachloride and Trichloroethene Stored Behind Building.
Building 18	1	Rocket Propellant Storage.
Building 20	2	Pentaborane Production Facility.
Building 20M	1	Pentaborane Storage.
Building 21	1	Carbon Tetrachloride Drained Behind Building.
Building 23P	1	Carbon Tetrachloride and Waste Oil Storage.
Building 24	1	Experimental Fuel Testing, Drums of Carbon Tetrachloride and Trichloroethene Possibly Spilled in Test Pit (Note: Area has been Regraded).
Building 25	1	Pentaborane and Carbon Tetrachloride Used; Carbon Tetrachloride Possibly Spilled into Test Pit.
Building 27	4	Rocket Fuel, Munitions and Liquid Propellant Storage.
Building 28 (Area A)	2	Carbon Tetrachloride Storage Area, Fuel Mixing Area.

Table 10. Rationale for Proposed Surface Soil Samples, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

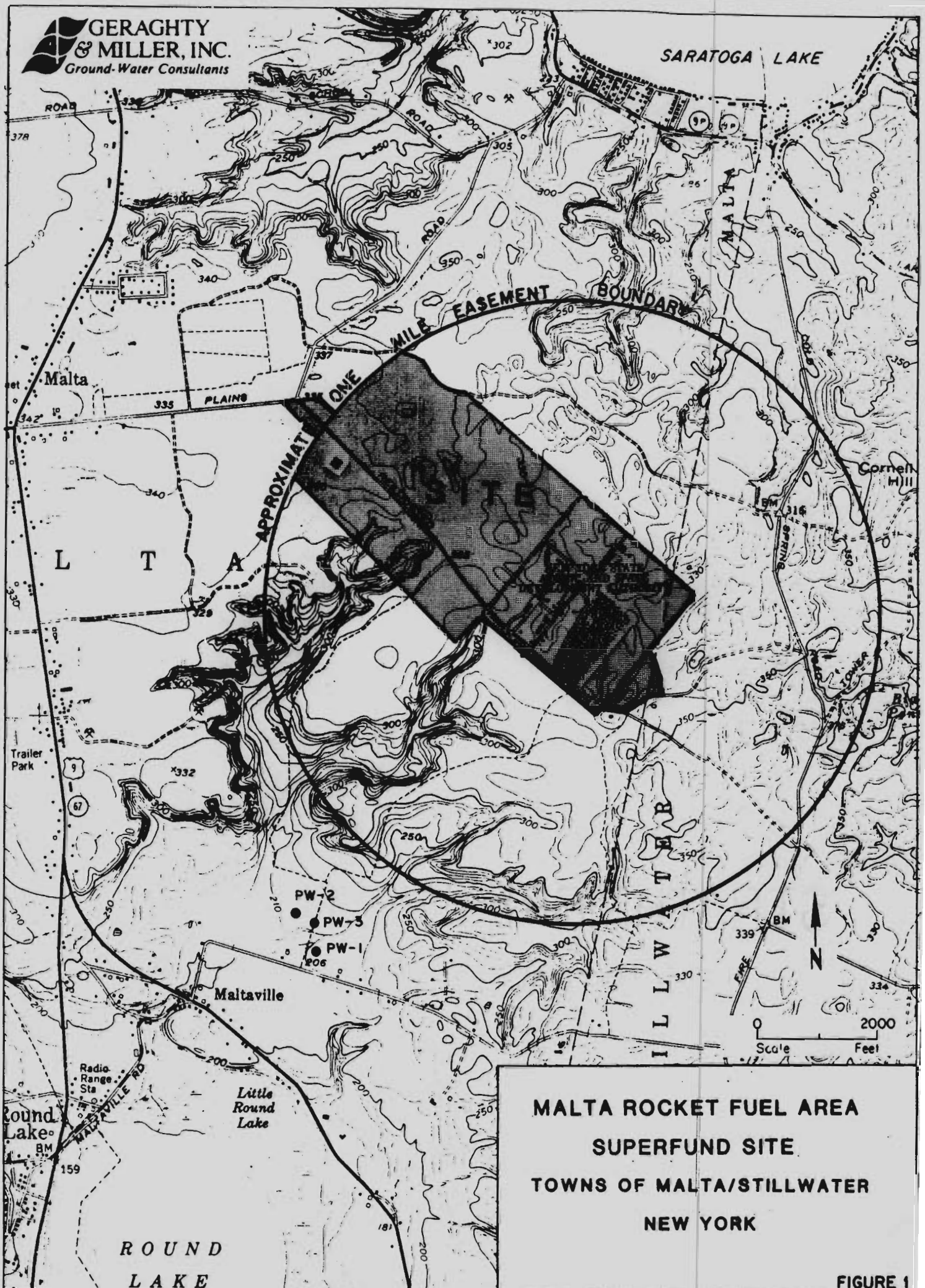
Sampling Location	Number of Samples	Rationale
D-1	1	Former Building Pit.
D-2	1	Former Waste Disposal Area.
D-4	1	Container Burial Area.
D-5	1	Container Burial Area.
D-6	1	Drum Disposal Area.
S-1	1	Metal Storage Area.
S-2	1	All Purpose Storage Area.
S-3	1	Metal Scap Pile.
S-4	1	Chemical Storage Area.
S-5	1	Drum Storage Area.
S-6	1	Former Munitions Storage Area.
S-8	1	Former Transformer Storage Area.
S-9	1	Site of Former Transformers.
S-10	1	Former Tank Storage Area.
Artillery Firing Range	1	Liquid Propellant Testing.
GE/Exxon Nuclear Building	2	Two Mounds will be Sampled to Investigate Storage of Acetone, Perchloroethene, Freon, Methyl Ethyl Ketone and Cobalt 60.
Isolde Project Area	1	Former Rocket Fuel Development.
Muggett's Pond and Drainage Ditch	3	Possible Spill of Carbon Tetrachloride and Trichloroethene; Water Pumped from Test Pits into Ditch.

Table 11. Inventory of Septic Systems (Tanks and Leach Fields) at the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Location (Figure 2 in RI Work Plan)	Use of Building	Wastewater/ Sediment Sampling	Soil - Gas Sampling (See Appendix for Grids)
Building 13	Machine Shop	Yes	Yes
Building 14	Office/Chemical Lab	Yes	Yes
Building 16	Sentry House	No	No
Building 17	Caretakers House	Yes	Yes
Building 20	Chemical Plant	Yes	Yes
Building 25	Rocket Test Station	Yes	Yes
GE/Exxon Nuclear Building	Research Building	Yes	Yes

Table 12. Inventory of Dry Wells and Floor Drains at the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

Location (see Figure 7)	Number	Function	Sampling Recommended
Building 1A	3	Drained Floors	Yes
Building 1B	1	Drained Floors	Yes
Building 2	3	Drained Floors	Yes
Building 3	2	Rocket Fuel Tank Emergency Drainage	Yes
Building 4	2	Rocket Fuel Tank Emergency Drainage	Yes
Building 5	2	Drained Floors	Yes
Building 6	?	Drained Floors	Yes
Building 8	2	Drained Floors	Yes
Building 9	2	Drained Floors	Yes
Building 15	?	Drained Floors	Yes
Building 18	?	Drained Floors	Yes
Building 20 (SW Side)	1	Drained Valve Pit for Potable Water Lines	No
Building 20H	1	Drained Floors	Yes
Building 20E	1	Sewer Dry Well	Yes
Building 27	?	Drained Floors	Yes
GE/Exxon Nuclear Building - Inside (see Figure 8)	5	Drained Floors	Yes
GE/Exxon Nuclear Building - Outside (see Figure 8)	1	Covered Storm Drain (outside building)	No



MALTA ROCKET FUEL AREA
SUPERFUND SITE
TOWNS OF MALTA/STILLWATER
NEW YORK

FIGURE 1