Roy F. Weston, Inc.
Federal Programs Division
217 Middlesex Turnpike
Burlington, Massachusetts 01803-3308
781-229-6430 • Fax 781-272-3619

AUG 13 1999

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
EPA CONTRACT 68-W5-0009

29 July 1999
20098-041-001-7127-70
DC No. A-4136

Mr. Chuck Schwer
VT Agency for Natural Resources
Department for Environmental Conservation
103 South Main Street/West Office
Waterbury, VT 05671-0404

Subject: Final Site Inspection Report
Mardon Industries
Lyndon, VT
CERCLIS No. VTD990800641
TDD No. 99-05-0053

Dear Mr. Schwer:

Enclosed are two copies of the Final Site Inspection (SI) Report for the Mardon Industries property in Lyndon, Vermont. U.S. Environmental Protection Agency Region I (EPA Region I), Office of Site Remediation and Restoration and the Vermont Department of Environmental Conservation comments regarding the contents of the Draft SIP Report have been incorporated. Attachments have been omitted from this final deliverable as no comments or changes to the Attachments were requested during the review process.

Please contact the undersigned at (781) 229-6430 if you have any questions regarding this report.

Very truly yours,

ROY F. WESTON, INC.
Region I START

Joanne Savitski
Site Leader

George Mavris
Project Leader

JS:js
Enclosure
cc: C. Marchant (Site Assessment Project Officer/EPA Task Monitor)

AUG 1 8 1999

FINAL SITE INSPECTION PRIORITIZATION REPORT
FOR
MARDON INDUSTRIES
LYNDON, VERMONT

Prepared For:
U.S. Environmental Protection Agency
Region I
Office of Site Remediation and Restoration
1 Congress Street, Suite 1100
Boston, MA 02114-2023

CONTRACT NO. 68-W5-0009

CERCLIS No. VTD990800641
TDD No. 99-05-0053
PCS NO. 7127
DC NO. A-4136

Submitted By:
Roy F. Weston, Inc. (WESTON®)
Superfund Technical Assessment and Response Team (START)
217 Middlesex Turnpike
Burlington, MA 01803

29 July 1999

Region I START
Reviewed and Approved:

Joanne Savitski
Site Leader

29 July 1999
Date

George Mavris
Project Leader

29 JULY 1999
Date

QA Review

7/29/99
Date

Work Order No.20098-041-001-7127-70

DISCLAIMER

This report was prepared solely for the use and benefit of the U.S. Environmental Protection Agency Region I (EPA Region I), Office of Site Remediation and Restoration for the specific purposes set forth in the contract between the EPA Region I and the Roy F. Weston, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START). Professional services performed and reports generated by START have been prepared for EPA Region I purposes as described in the START contract. The information, statements, and conclusions contained in the report were prepared in accordance with the statement of work, and contract terms and conditions. The report may be subject to differing interpretations or misinterpretation by third parties who did not participate in the planning, research or consultation processes. Any use of this document or the information contained herein by persons or entities other than the EPA Region I shall be at the sole risk and liability of said person or entity. START, therefore, expressly disclaims any liability to persons other than the EPA Region I who may use or rely upon this report in any way or for any purpose.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (Concluded)

Final Site Inspection Prioritization Report
Mardon Industries
Lyndon, Vermont

CERCLIS No. VTD990800641
TDD No. 99-05-0053
Work Order No. 20098-041-7127-70

INTRODUCTION

The Roy F. Weston, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START) was requested by the U.S. Environmental Protection Agency Region I (EPA Region I), Office of Site Remediation and Restoration to perform a Site Inspection (SI) of the Mardon Industries (Mardon) property at Route 122 in Lyndon, Vermont. Tasks were conducted in accordance with the SI scope of work and technical specifications provided by EPA Region I. A Preliminary Assessment (PA) report for Mardon was prepared by the NUS Corporation Field Investigation Team (NUS/FIT) on 29 June 1987. The PA stated that due to surficial waste disposal practices, groundwater sample results documenting metal and chlorinated solvent contamination, and a chlorinated solvent groundwater contamination plume; further sampling activities were recommended. On the basis of the information provided in the PA report, the Mardon SI was initiated.

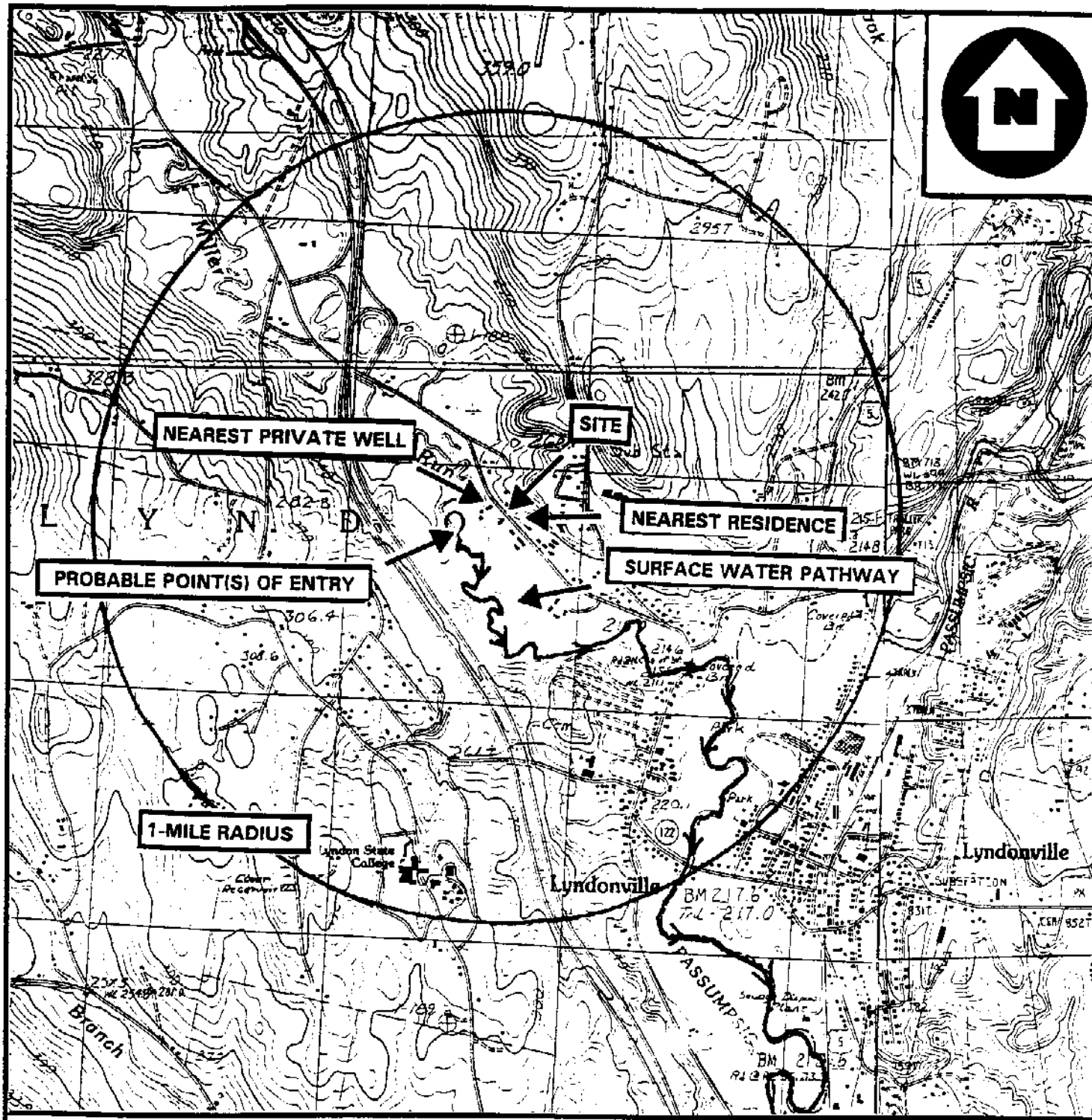
Background information used in the generation of this report was obtained through file searches conducted at the EPA Region I, Vermont Department of Environmental Conservation (VT DEC), telephone interviews with town officials, conversations with persons knowledgeable of the Mardon property, and conversations with other Federal, State, and local agencies.

This package follows the guidelines developed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, commonly referred to as Superfund. However, these documents do not necessarily fulfill the requirements of other EPA Region I regulations such as those under the Resource Conservation and Recovery Act (RCRA) or other Federal, State, or local regulations. SIs are intended to provide a preliminary screening of sites to facilitate EPA Region I's assignment of site priorities. They are limited efforts and are not intended to supersede more detailed investigations.

SITE DESCRIPTION

The Mardon property is located on both sides of Route 122 in Lyndon, Caledonia County, Vermont, at geographic coordinates 44° 33′ 06.0″ north latitude and 72° 01′ 38.0″ west longitude (Figure 1) [1; 2; 3; 4; 5]. The property is listed by the Town of Lyndon Tax Assessor's Office as Lot Nos. 114 and 179, and Lot No. 115 on Map No. 30 [8; 9]. The property is located in a residential and commercial area of Lyndon [7, p. 3].

Lot Nos. 114 and 179, located west of Route 122 (western portion), are currently owned by James H. Davis and are occupied by J&J Rental and Equipment Sales, Inc. (J&J Rental). This portion of the property is 8.1 acres and is bordered to the north by a residence (Lot No. 117) and an open grassy field (Lot No. 122), to the east by Route 122, to the south by greenhouses (Lot No. 112), and to the west by the Miller Run River (Figure 2) [7, p. 9; 9].



BASE MAP IS A PORTION OF THE FOLLOWING 7.5' X 7.5' U.S.G.S. QUADRANGLE(S):
LYNDONVILLE, VT 1986; BURKE MOUNTAIN, VT 1988.

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

QUADRANGLE LOCATION

LOCATION MAP

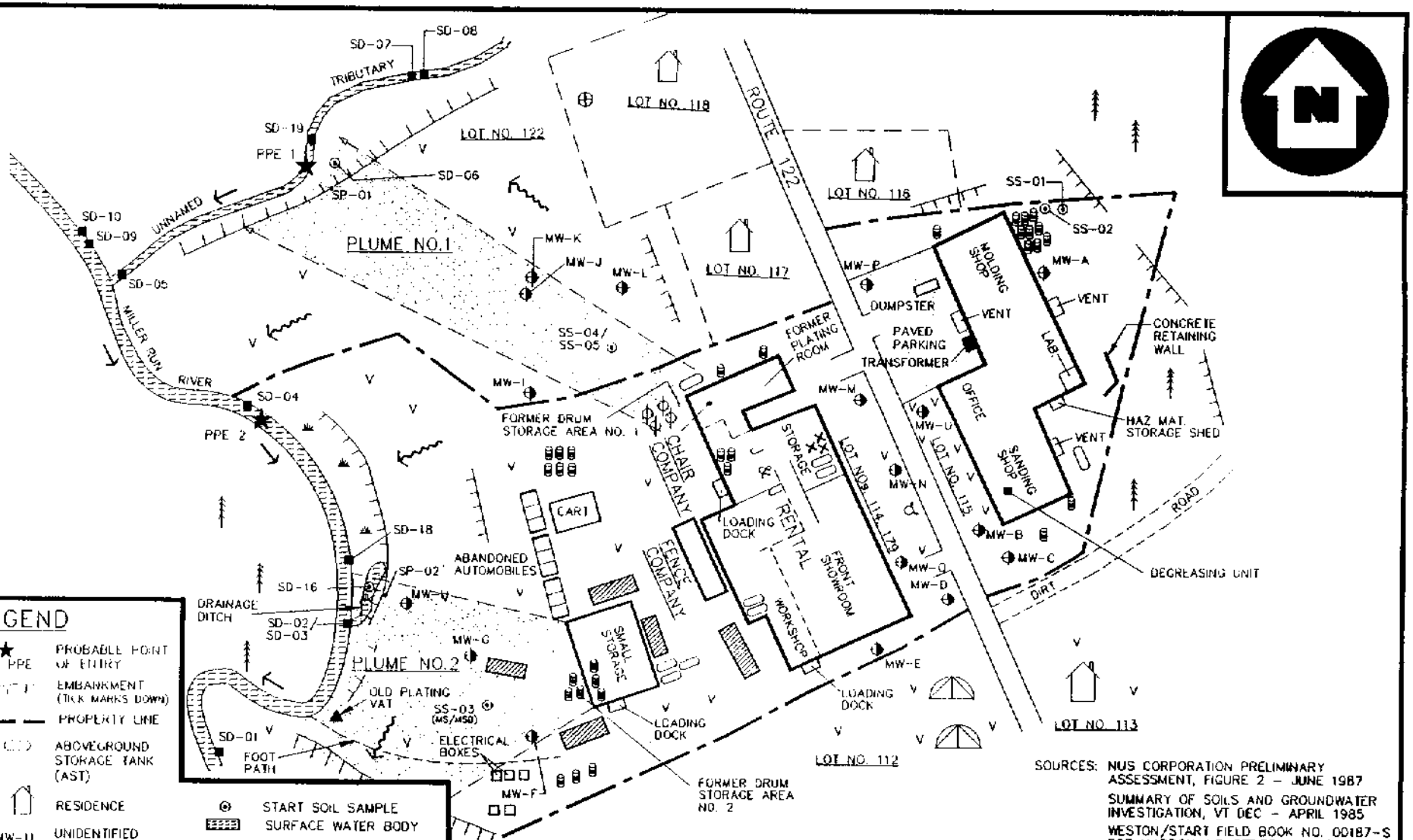
MARDON INDUSTRIES
ROUTE 122
LYNDON, VERMONT

WESTON® MANAGERS DESIGNERS/CONSULTANTS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

TDD #	DRAWN BY:	DATE
97-02-0033	LMK	4/11/97

FILE NAME: S:\97020033\MARDON1.DWG

FIGURE 1



SOURCES: NUS CORPORATION PRELIMINARY ASSESSMENT, FIGURE 2 – JUNE 1987
SUMMARY OF SOILS AND GROUNDWATER INVESTIGATION, VT DEC – APRIL 1985
WESTON/START FIELD BOOK NO. 00187-S FOR MARDON INDUSTRIES – 1997

NOT TO SCALE

SITE SKETCH

MARDON INDUSTRIES
ROUTE 122
LYNDON, VERMONT

WESTON® MANAGERS DESIGNERS/CONSULTANTS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

TDD #	DRAWN BY:	DATE
98-05-0028	W. SHAW	8/24/98

FILE NAME: S:\97020033\FIG2S

FIGURE 2

The portion of the property on the east side of Route 122 (eastern portion), identified as Lot No. 115, is approximately 2.9 acres [8]. The property is currently owned by VNH Industrial Development Corporation, and occupied by Newport Plastics, Inc. (Newport). This portion of the property is bordered by a residence (Lot No. 116) to the north, a steep hill and retaining wall to the east, a residence (Lot No. 113) to the south, and Route 122 to the west (Figure 2) [7, p. 9; 9].

The topography of the Mardon property slopes to the southwest and northwest towards the Miller Run River and an unnamed tributary to the Miller Run River, respectively (Figure 2). The property is located within the 100-year floodplain of the Miller Run River [6, p. 3; 57]. Surface water drainage from the property apparently flows to the Miller Run River, which is located approximately 350 feet west of the small storage shed located on Lot Nos. 114 and 179; and in a northwesterly direction toward the unnamed tributary, located on Lot 122 approximately 400 feet northwest of the main building [7, pp. 18, 19]. The property is served by the Lyndon municipal water and sewer system [25]. The property is not enclosed by a fence. The nearest residences to the Mardon property are less than 200 feet north of the western portion of the property on Lot No. 117, and less than 200 feet south of the eastern portion of the property on Lot No. 113 [7, pp. 7, 9, 12, 13, 16, 17].

Nine CERCLA properties are located within 1-radial mile of the Mardon property and 14 RCRA properties are located within 1-radial mile of the Mardon property [64; 65].

OPERATIONAL AND REGULATORY HISTORY AND WASTE CHARACTERISTICS

Prior to 1971, the eastern portion was owned by Alvah Edmunds. Use of the eastern portion prior to 1971 is unknown. Mardon purchased this portion from Alvah Edmunds on 27 March 1971 [8]. In 1972, Mardon built one office building and a sanding shop building. One trichloroethene (TCE) degreasing unit was installed in this building in 1972 [10, p. 2]. Land use on the western portion prior to 1976 is unknown. On 4 May 1976, Mardon purchased the western portion from Hill Manufacturing [9]. Mardon occupied two buildings on the western portion: a wood shop building and a sheet metal/plating building. Mardon operated a metal fabrication and plating facility on the western portion and an office and sanding shop on the eastern portion. In 1990, Mardon defaulted on a bank loan, and the Lyndonville Savings Bank foreclosed on the property on 11 May 1990. Table 1 presents the ownership and operational history of the Mardon property.

Table 1

Ownership and Operational History for Mardon Industries Property

Lot No.	Year(s)	Owner and Property Uses
115	Prior to 1971	Alvah Edmunds. Property use is unknown.
115	1971 - 1990	Mardon Industries. Manufactured machinery and tools.
115	1990 - 1994	Lyndonville Savings Bank. Foreclosed on property.
115	27 May 1994 to December 1994	Neal Austin (NSA Industries). Manufactured sheet metal.
115	1994 - present	VNH Industrial Development Corp. (Operated by Newport Plastics). Manufactured fiberglass.

Table 1

Ownership and Operational History for Mardon Industries Property (Concluded)

Lot No.	Year(s)	Owner and Property Uses
114 and 179	Prior to 1976	Hill Manufacturing. Property use is unknown.
114 and 179	1976 - 1990	Mardon Industries. Manufactured machinery and tools.
114 and 179	1990 - 1992	Lyndonville Savings Bank. Foreclosed on property.
114 and 179	1992 - present	James H & Lillian T. Davis. Construction and tool equipment rental.

[6; 7; 8; 9]

During plating operations on the western portion of the property, Mardon used a concrete-block dry well and four 70-foot leach lines to dispose of plating wastewater containing chromium, cadmium, zinc, copper, and nickel [6, p. 1]. The dry well collapsed in the early 1970s and was replaced with four 600-gallon dry wells with leach lines (leach system) discharging to the subsurface. According to the VT DEC, as much as 10,000 gallons of plating wastewater were discharged to the dry wells per day for a period of 9 years (from 1972 to 1981) [6, p. 2]. START was unable to locate any information regarding the exact amount wastewater discharged into the leach system or the concentration levels of any hazardous constituents in the discharged wastewater.

Approximately 16,587 kilograms (kg) of chlorinated waste solvents including TCE and 1,1,1-trichloroethane (TCA), and waste lubricating oils were reportedly disposed of on site to the ground surface [6, p. 2; 10, p. 3; 11, p. 1]. START has been unable to determine the exact location where these solvents were disposed. Approximately 1,843 kg of chlorinated waste solvents were produced each year, for a period of 9 years [6, p. 2]. There is insufficient information in the Vermont State files to determine the specific quantity of chlorinated waste solvents produced and disposed of at the Mardon property.

From 1972 to 1981, Mardon used one 1,000-gallon underground storage tank (UST) for gasoline storage and two 1,000-gallon USTs for fuel oil storage [6, p. 2]. The locations of these USTs are unknown.

Mardon used a degreasing unit located in the sanding shop on the eastern portion of the property to clean manufactured goods prior to shipping [37; 39, p. 1]. Mardon used TCE in the degreaser from 1972 to May 1980, then used TCA instead of the TCE in the degreaser from May 1980 to 1989 [38; 39].

From 1972 to 1990, Mardon stored waste paints and chlorinated waste solvents in 55-gallon drums. The drums were located outside the plating room on the western portion of the property (Figure 2) [11, p. 4; 10, p. 2]. START was unable to locate information in the Vermont State files regarding the amount of waste paints and waste solvents stored in these 55-gallon drums.

In January 1985, Mardon signed an Assurance of Discontinuance (Assurance) with the VT DEC. The Assurance required a groundwater monitoring program which extended from the subsurface disposal system to the Miller Run River [55, p. 1]. The primary objective of the Assurance was to cease the discharge of plating wastes to Mardon's leach system and to initiate a groundwater monitoring program in order to assess contaminants emanating from the leach system. The Assurance also required the removal of TCE-contaminated soil located outside the plating room by an outdoor drum storage area (former drum storage area No. 1)[6, p. 2; 10, p. 2]. START was unable to locate any additional information regarding this drum storage area or documentation of soil removal.

An area located southwest of the small storage building on the western portion of the property was also identified as a drum storage area (former drum storage area No. 2) [39, p. 11]. Reportedly, only empty 55-gallon drums were stored in this drum storage area [52, p. 3].

In March 1985, Mardon retained the services of Adams Engineering (Adams) and Industrial and Environmental Analysts, Inc. (IEA) for investigations of on-site waste disposal and discharge affects on the environment [10, p. 1]. Adams installed five groundwater monitoring wells (MW-B, MW-I, MW-J, MW-K, and MW-L) on the western portion of the property. MW-B was identified as the reference monitoring well.

On 11 April 1985, Adams collected groundwater samples from five monitoring wells (MW-B, MW-I, MW-J, MW-K, and MW-L) and from one nearby private residential supply well located on a neighboring property (Lot No. 118). In addition, one groundwater seep sample was collected along the unnamed tributary of the Miller Run River. The groundwater and seep samples were analyzed for volatile organic compounds (VOCs) and metals (Figure 2) [10, p. 2]. The groundwater and groundwater seep sample analytical results are discussed in the Groundwater Pathway and Waste/Source sections of this report, respectively.

During installation of the monitoring wells in March 1985, Adams collected soil boring samples. Composite soil boring samples were collected at a depth of 0 to 2 feet (surface soil) below ground surface (bgs) and were analyzed for TCA, TCE, and toluene by IEA and VT DEC laboratories using headspace gas chromatography [10, p. 3]. The surface soil samples are considered source samples and are discussed in the Waste/Source section of this report. Composite soil boring samples were also collected from 4 to 9 feet bgs and were analyzed for VOCs and metals [6, p. 2; 10, Exhibit E]. These analytical results are also discussed in the Waste/Source section of this report.

By April 1985, Mardon had still not ceased illegal discharges to the leach system. Since the conditions of the Assurance were not met, VT DEC recommended that the matter be turned over to the Attorney General's Office. As a result of the recommendation, Mardon agreed to comply with the leach system closure and post-closure standards under the Vermont Hazardous Waste Management Regulations [6, p. 2].

Mardon's closure plan involved restricting further migration of contaminants from the former drum disposal area (No. 2) and further monitoring of groundwater. Mardon was required to cease subsurface disposal by January 1987 and to further assess groundwater contamination emanating from the property. Mardon again retained Adams and IEA to conduct groundwater investigations of on-site waste disposal activities and environmental affects [10, p. 1].

On 26 September 1985, groundwater samples were collected from five existing on-site monitoring wells (MW-B, MW-I, MW-J, MW-K, and MW-L), the Lot No. 118 private residential supply well, and a groundwater seep (SP-01), and analyzed for VOCs and metals [14]. The seep sample was collected near the unnamed tributary. Groundwater seep samples collected during various sampling events at Mardon are considered by START to be source samples. The groundwater and groundwater seep sample analytical results are discussed in the Groundwater Pathway and Waste/Source sections of this report, respectively.

On 26 December 1985, additional groundwater samples were collected from the five existing monitoring wells (MW-B, MW-I, MW-J, MW-K, and MW-L), from the residential supply well (Lot No. 118), and from groundwater seep (SP-01), and analyzed for VOCs and metals [10, p. 2]. The groundwater and groundwater seep sample analytical results are discussed in the Groundwater Pathway and Waste/Source sections of this report, respectively.

In 1986, Mardon hired Wagner, Heidel, and Noyes, Inc. (WH&N) to continue the groundwater monitoring program. On 25 March 1986, groundwater samples were collected from two monitoring wells (MW-B and MW-I) and from the residential supply well (Lot No. 118). The groundwater samples were analyzed for VOCs and metals. Analytical results for these samples are discussed in the Groundwater Pathway section of this report.

Mardon's post-closure plan involved bimonthly groundwater monitoring for the first year and quarterly groundwater monitoring for the next 30 years. Monitoring occurred by collecting groundwater from existing monitoring wells located on the property and from a groundwater seep near the unnamed tributary of the Miller Run River [6, p. 2].

An inspection by the VT DEC on 16 April 1986 documented that Mardon employees were not properly trained, that there was no emergency equipment available on site, that there was no inventory of the hazardous wastes stored on site, that daily inspections of the facility were not performed, and that hazardous waste containers were not properly labeled [40, p. 1].

On 28 April 1986, VT DEC issued Mardon a Notice of Violation (NOV) regarding Mardon's lack of documentation of employee training and lack of a contingency plan [40].

On 11 June 1986, NUS/FIT conducted a PA of Mardon [11, p. 1]. Contaminated soil and an unspecified number of 55-gallon drums which contained waste paints and solvents were removed at the time of the PA [6, p. 2; 11, p. 4]. The PA also documented that three fuel USTs were still being used at Mardon [11, p. 4].

On 27 June 1986, WH&N collected groundwater samples from monitoring wells MW-B and MW-I, the residential supply well (Lot No. 118), and from a groundwater seep (SP-02) near the bank of the Miller Run River. The samples were analyzed for VOCs and metals. The groundwater and groundwater seep sample analytical results are discussed in the Groundwater Pathway and Waste/Source sections of this report, respectively.

In October 1986, WH&N installed seven additional groundwater monitoring wells (MW-A, MW-C, MW-D, MW-E, MW-F, MW-G, and MW-H) on the Mardon property [39, pp. 4, 8]. On 10 October 1986, WH&N collected groundwater samples from these seven monitoring wells. In addition, groundwater seep samples were collected from slopes near the unnamed tributary and the Miller Run River [52, pp. A4-A18]. Samples were analyzed by IEA for VOCs and metals. The groundwater analytical results and the groundwater seep sample analytical results are discussed in the Groundwater Pathway and Waste/Source sections of this report, respectively.

Based on analytical results from groundwater samples collected from monitoring wells and groundwater seeps between 11 April 1985 and 10 October 1986, two discernable plumes of groundwater contamination were identified migrating from on-site sources [52, pp. 10, 11, 12]. One plume (Plume No. 1), an approximate 385 square-foot (ft^2) plume, originated from the leach system area and extended to the unnamed tributary of the Miller Run River. The other plume (Plume No. 2), an approximate 645 ft^2 plume, extended from the former drum storage area (No. 2) located southwest of the small storage building to the Miller Run River [52, pp. 10, 11; 53].

On 1 December 1988, VT DEC issued Mardon an Administrative Order (AO) regarding the legal necessity for Mardon to develop an adequate contingency plan and an employee training plan [40, p. 2].

On 10 November 1989, WH&N collected groundwater samples from three monitoring wells and from the residential supply well (Lot No. 118). Samples were analyzed for VOCs using EPA Method 601. Analytical data from these wells are discussed in the Groundwater Pathway section of this report.

Mardon closed the dry wells and leach system on 10 December 1989. The sludge generated from the closure of the dry wells and leach system was stored in 55-gallon drums located at an unspecified area [41, p. 2]. During an inspection by the VT DEC on 11 December 1989, eight 55-gallon drums of sludge located in the unspecified drum storage area were observed to be unlabeled [41, pp. 1, 2]. Additionally, VT DEC documented that plating tanks and the rinsewater treatment system were closed, and that all solutions were removed from the plating tanks and rinsewater treatment system [41, p. 1]. Information concerning disposal of the drums containing sludge was not found in available State files.

On 5 February 1990, VT DEC issued Mardon another Assurance stating that Mardon agreed to correct all violations noted in the previously issued NOVs and agreed to pay a monetary penalty of $7,500 to the State of Vermont [40, pp. 3, 4].

An additional NOV was issued to Mardon on 6 February 1990 by EPA. This NOV included the unlabeled drum violations noted on the 11 December 1989 inspection report by VT DEC and violations of the Land Disposal Restrictions Rule of RCRA [42, p. 1].

On 9 February 1990, WH&N collected groundwater samples from four monitoring wells. The samples were analyzed for VOCs using EPA Method 601. Analytical data from these monitoring wells are discussed in the Groundwater Pathway section of this report.

On 16 April 1990, VT DEC issued Mardon a revised edition of the 5 February 1990 Assurance. The revisions reflected that the monetary penalty amount of $7,500 could be lessened and that Mardon was in compliance with some of the objectives listed in the 5 February 1990 Assurance [45].

A VT DEC internal memorandum, dated 17 May 1990, documented that at least 18 drums of waste water-soluble oil, a 55-gallon drum of waste cutting oil, and one 55-gallon drum of waste TCA were stored on the Mardon property. The memorandum also identified Pollution Solutions of Vermont, Inc. as the current hazardous waste transporter for Mardon [46].

An inspection of the Mardon property on 24 May 1990 by VT DEC documented that the following hazardous wastes were stored on-site: four 55-gallon drums, each separately containing waste fluorescent penetrant, waste TCA, waste Degreasol, and waste cutting oil; as well as 11 55-gallon drums of waste water-soluble oils [47]. There is no information in the Vermont State files detailing where the drums were stored.

On 28 May 1990, WH&N reported that concentrations of TCA in all the monitoring wells decreased between one-fifth and one-eighth the concentrations observed in February 1989 [44, p. 1].

WH&N collected groundwater samples from monitoring wells MW-A, MW-B, MW-C, MW-G, and the Lot No. 118 residential supply well on 6 June 1990 [48]. Analytical results are discussed in the Groundwater Pathway section of this report.

A 15 June 1990 letter from VT DEC to Mardon documented the presence of approximately 25 55-gallon drums of waste water-soluble oils that were currently being used in the machines on site. Once the Mardon closure was completed, the waste water-soluble oils were to be disposed of as hazardous waste [49]. Mardon hired Pollution Solutions of Vermont, Inc. to remove wastes from the Mardon property. The following wastes were removed from Mardon by Pollution Solutions of Vermont, Inc. on 17 June 1990: one 55-gallon drum of silver, one 55-gallon drum of asbestos, 10 55-gallon drums of waste oil, and an unspecified number of 55-gallon drums of TCA [50, pp. 1, 3].

On 2 and 3 July 1990, WH&N collected groundwater samples from seven monitoring wells (MW-A, MW-B, MW-C, MW-G, MW-J, MW-K, and MW-L) [51, p. 1]. These analytical results are discussed in the Groundwater Pathway section of this report. Based on the 2 and 3 July 1990 sampling results, VT DEC determined that no further remedial efforts were required at the Mardon property; however, VT DEC required that groundwater monitoring continue quarterly for 1 year [51, p. 1].

On 4 June 1992, WH&N collected groundwater samples from 12 monitoring wells (MW-A, MW-B, MW-C, MW-E, MW-F, MW-Gs, MW-Gd, MW-H, MW-I, MW-M, MW-O, and MW-P) and groundwater seep sample SP-02 [64]. These samples were submitted for VOC analysis. The groundwater and groundwater seep sample analytical results are discussed in the Groundwater Pathway and Waste/Source sections of this report, respectively.

On 4 and 9 May 1994, VT DEC personnel collected groundwater samples from 10 monitoring wells and from one groundwater seep. The groundwater samples were analyzed for VOCs. Levels of contaminants in nine out of the 10 monitoring wells and the seep sample were below detection

limits; and the one compound detected in one of the wells was below VT DEC groundwater standards. As a result of these data, the VT DEC determined that no further groundwater monitoring or other actions were required by Mardon [63].

On 3 June 1997, WESTON START conducted an on-site reconnaissance of the eastern portion of the Mardon property. In the Newport Building, air monitoring instruments detected total VOCs at 98 units above background levels in the ambient air [7, p. 2]. Due to health and safety concerns, START discontinued the interior reconnaissance and exited the Newport Building. Mr. Lee Chamberlain, a representative of Newport, later stated that the VOC detected in the building was most likely styrene, a component of the fiberglass manufacturing process. Mr. Chamberlain also stated that since Newport does not manufacture fiberglass on Fridays, the styrene levels should be lower, and that Fridays would be a more convenient time for START to complete the on-site reconnaissance inside the Newport Building. The on-site reconnaissance along the exterior of the eastern portion of Mardon was conducted; however, the on-site reconnaissance on the western portion of the property was not conducted on this date due to unresolved access issues.

During the 3 June 1997 reconnaissance on the exterior of the eastern portion of Mardon, START observed virgin materials located in the hazardous material storage shed, including three 55-gallon drums of acetone, six 55-gallon drums of Dion, one 55-gallon drum of resin, five 5-gallon containers of vinyl sealer, and five 5-gallon organic peroxide containers [7, p. 5]. Air monitoring instruments detected VOCs in the hazardous materials storage shed at 53 units above background levels in the ambient air [7, p. 5]. The hazardous materials storage shed is constructed of wood, and rests on cinder blocks.

One 1,000-gallon propane aboveground storage tank (AST) was observed on the southern side of the Newport Building [7, p. 13]. A laboratory located in the southeastern corner of the Newport Building contained 5-gallon containers of Chemlease 15 and Mold Cleaner, and 55-gallon drums of virgin polyester resin. The containers and the drums were stored on the concrete floor of the laboratory [7, pp. 10, 12]. Air monitoring instruments detected VOCs in the laboratory at 7 units above background levels in the ambient air [7, p. 10]. START personnel were restricted from entering the laboratory due to the elevated VOC readings detected by the air monitoring instrumentation; therefore, START has no documentation of the exact quantities or containment factors of each of the above-mentioned materials in the laboratory.

Two vents were noted on the eastern side of the Newport Building, where air monitoring instruments detected VOCs at 142 units above background levels in the ambient air [7, p. 5]. There were approximately 60 empty 55-gallon drums located at the northeastern corner of the Newport Building. These drums were stored there and awaiting to be recycled. One monitoring well (MW-A) was observed between the empty drums and one of the vents on the eastern side of the building (Figure 2). Two monitoring wells (MW-B and MW-C) were noted on the southwestern side of the building [7, p. 12]. The three monitoring wells located on the eastern portion of the property were observed by START personnel to be in good condition [7, pp. 12, 13]. One transformer and one vent were also located on the western side of the building, near the main entrance to the Newport offices [7, p. 12]. A trash dumpster was also observed in the paved parking lot near the main entrance.

On 10 October 1997, START personnel conducted a second on-site reconnaissance at the eastern portion of the property in order to assess this portion of the property during a period of non-production. START personnel completed a walk-through of the interior of the Newport Building and then conducted a site walk-through around the perimeter of the Newport Building. The same features and observations, as noted during the 3 June 1997 on-site reconnaissance, were noted during this site walk-through around the perimeter of the Newport Building.

START personnel proceeded to the western portion of the property to continue with the on-site reconnaissance. Access issues regarding the western portion of the property were resolved and START conducted an on-site reconnaissance on the western portion of the property.

The western portion of Mardon, identified as Lot Nos. 114 and 179, was leased to J&J Rental, a chair manufacturing company, and a fence company [7, p. 16]. START personnel observed approximately 10 empty 55-gallon drums, five empty cylinders, two empty 275-gallon ASTs, and two 275-gallon fuel oil ASTs inside the main building [7, p. 16]. One 275-gallon propane AST and two empty 55-gallon drums were located on the northern side of the main building. Two monitoring wells (MW-D and MW-E) and one fire hydrant were observed on the eastern side of the main building (Figure 2) [7, p. 16]. START personnel did not observe any signs of the leach system that was used at the western portion of the property from 1972 to 1989.

An area of 15 empty 55-gallon drums and approximately eight car bodies were located north of the small storage building. The small storage building contained 12 empty 55-gallon drums, miscellaneous hand tools, a pile of wooden chairs, and two small tractors [7, p. 17]. There were three empty 275-gallon ASTs located outside the storage building at the southeastern corner, and five storage trailers were located around the perimeter of the small storage building. Five electrical boxes were noted in an area southwest of the small storage building [7, p. 17].

START personnel were able to identify only three of the eight monitoring wells (MW-J, MW-K, and MW-L) that were installed by Adams in 1985 [7, pp. 14-19].

START personnel observed a decrepit plating vat located approximately 160 feet west of the small storage building [7, pp. 14, 19]. An steep embankment was observed paralleling the unnamed tributary northwest of the property in Lot No. 122. Steep embankments were also noted paralleling the Miller Run River along the western and southwestern portions of the property in Lot Nos. 114 and 179. A drainage ditch was observed along the embankment along the Miller Run River (Figure 2).

START observed less than 0.1 miles of wetland vegetation on the Mardon property contiguous with the Miller Run River [7, p. 18].

Sampling activities were conducted on the Mardon property by START on 4 and 5 August 1998. The sampling was conducted on the property to document on-site conditions and potential to impact off-site targets. Analytical data gathered from the sampling activities conducted is used to confirm or identify hazardous substances at the property.

Four sediment samples were collected from the unnamed tributary which flows into the Miller Run River (Figure 2). Three of these samples were obtained north of probable point of entry (PPE) 1 and the last sample was obtained south of PPE 1, prior to the confluence of the tributary and Miller Run River. Seven sediment samples were collected from the Miller Run River (Figure 2). Two of these samples were collected upstream of PPE 2; and upstream of the confluence of the Miller Run River and the unnamed tributary. One sample was collected between PPE2 and the confluence of the Miller Run River and the unnamed tributary. The remaining four sediment samples were collected downstream of both the confluence and PPE 2. Eight source/soil samples were collected throughout the Mardon property. Figure 2 depicts the locations of these samples.

Sediment samples, and two source/soil samples having a high moisture content, were submitted to a Delivery of Analytical Services (DAS) analytical laboratory for VOCs, semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (pest/PCBs), metals, and cyanide analyses. Source/soil samples were submitted to Contract Laboratory Program (CLP) analytical laboratories for VOCs, SVOCs, pest/PCBs, metals, and cyanide analyses.

Analytical results for the source/soil and sediment samples are discussed in detail in the Waste/Source and Surface Water pathway sections of this report, respectively [59; 60; 61; 62].

Table 2 identifies structures or areas on the Mardon property which are documented or potential sources of contamination. The containment factors associated with each source and the relative location of each source are also included in Table 2.

Table 2

Potential Sources for Mardon Industries

Source Area	Containment Factors	Spatial Location
Degreasing Unit	Use of the degreaser ceased in 1989.	In the Sanding Shop of the Newport Building (Lot No. 115).
Drums (20 55-gallon)	Stored on a concrete floor.	In the Laboratory of the Newport Building (Lot No.115).
Drums (10 55-gallon)	Stored on a concrete floor.	In the Hazardous Materials Shed of the Newport Building (Lot No.115).
Drums (60 55-gallon)	Empty.	Northwest corner of the Newport Building (Lot No.115).
Non-drum Containers (10 5-gallon)	Stored on a concrete floor.	In the Hazardous Materials Shed of the Newport Building (Lot No.115).
Non-drum Containers (25 5-gallon)	Stored on a concrete floor.	In the Laboratory of the Newport Building (Lot No.115).
Tank (one 1,000-gallon propane AST)	None.	Southeast corner of Newport Building (Lot No.115).
Other (Transformer)	Situated on a cement berm.	Northwest portion of the Newport Building (Lot No.115).

Table 2

Potential Sources for Mardon Industries (Continued)

Source Area	Containment Factors	Spatial Location
Other (Dumpster)	None.	Northwest portion of the Newport Building (Lot No.115).
Other (Original Dry Well/Leach System)	Collapsed and was replaced in the early 1970s.	Northwest corner of the Former Plating Room (Lot Nos. 114 and 179).
Other (Replaced Dry Wells/Leach System)	Use of leach system ceased in 1989.	Northwest corner of the Former Plating Room (Lot Nos. 114 and 179).
Contaminated Soil (Disposal of chlorinated solvents)	Unknown.	Unknown locations (Lots Nos. 114 and 179).
Contaminated Soil (Dry Wells/Leach System)	Use of leach system ceased in 1989.	Northwest corner of the Former Plating Room (Lot Nos. 114 and 179).
Contaminated Soil (Plume No. 1)	Unknown.	Northwest of the leach system and dry wells (Lot Nos. 114 and 179).
Contaminated Soil (Plume No. 2)	Unknown.	West of Small Storage Building (Lot Nos. 114 and 179).
Drums (eight 55-gallon)	Unknown.	Outside of the Former Plating Room (Lot Nos 114 and 179).
Drums (35 55-gallon)	Unknown. Removed in the late 1980s.	Unknown location (Lot Nos 114 and 179).
Drums (39 55-gallon)	Empty.	Inside and outside of the main building (Lot Nos. 114 and 179).
Non-drum Containers (five cylinders)	Empty.	Inside J&J Rental Building (Lot Nos. 114 and 179).
Tank (one 1,000-gallon gasoline UST)	Unknown. Ceased being used in 1981.	Unknown location (Lot Nos 114 and 179).
Tanks (two 1,000-gallon fuel oil USTs)	Unknown. Ceased being used in 1981.	Unknown locations (Lot Nos 114 and 179).
Tanks (two 275-gallon fuel oil ASTs)	Stored on a concrete floor.	Inside northeastern section of J&J Rental Building (Lot Nos. 114 and 179).
Tank (one 275-gallon propane AST)	None.	Northern (exterior) of J&J Rental Building (Lot Nos. 114 and 179).
Tanks (three 275-gallon fuel oil ASTs)	Empty.	Southeastern (exterior) corner Small Storage Building (Lot Nos. 114 and 179).

Table 2

Potential Sources for Mardon Industries
(Concluded)

Source Area	Containment Factors	Spatial Location
Tanks (two 275-gallon fuel oil ASTs)	Empty. Stored on a concrete floor.	Inside southwestern section of J&J Rental Building (Lot Nos. 114 and 179).

UST = Underground storage tank.
AST = Aboveground storage tank.

[6; 10]

Table 3 summarizes the types of potentially hazardous substances which have been disposed, used, or stored on the Mardon Industries property.

Table 3

Hazardous Waste Quantity for Mardon Industries

Substance	Quantity or Volume/Area	Years of Use/Storage	Years of Disposal	Source Area
Waste lubricating oils	Unknown	1972 to 1981	1972 to 1981	Disposal Area (Contaminated Soil), Drum Storage Area
Chlorinated Waste Solvents (including TCE and TCA)	1,843 kg per year	1972 to 1981	1972 to 1981	Drum Storage Area, Drums
	Unknown	1972 to 1981	1972 to 1981	Degreasing Unit
	16,000 kg (total)	1972 to 1981	1972 to 1981	Disposal Area
Waste Paints	Unknown	1972 to 1990	1972 to 1990	Drum Storage Area, Drums
Plating wastewater (including chromium, cadmium, copper, nickel, and zinc)	10,000 gallons per day	1972 to 1985	1972 to 1981	Leach System (dry wells)
Gasoline	Unknown	Unknown	Unknown	1,000-gallon UST
Fuel Oil	Unknown	Unknown	Unknown	Two 1,000-gallon USTs, Five empty 275-gallon ASTs, one 1,000-gallon propane ASTs, two 275-gallon fuel oil ASTs, and one 275-gallon propane AST

AST = Aboveground Storage Tank
UST = Underground storage tank
TCE = Trichloroethylene
TCA = 1,1,1-trichloroethane
kg = kilograms

[6; 10]

WASTE/SOURCE SAMPLING

During installation of the monitoring wells in March 1985, Adams collected soil boring samples. Composite soil boring samples were collected a depth of 0 to 2 feet (surface soil) bgs and were analyzed for TCA, TCE, and toluene by IEA and VT DEC laboratories using headspace gas chromatography [10, p. 3]. Although the compositing of soil samples for VOCs analysis results in the loss of target volatile compounds, these results documented concentrations of TCA [28 micrograms per kilogram (μg/kg)], TCE (18 μg/kg), and toluene (18 μg/kg) in SS-3 [10, Exhibit I]. No reference sample was identified for the soil sampling events.

Composite soil boring samples were also collected from 4 to 9 feet bgs and were analyzed for VOCs and metals [6, p. 2; 10, Exhibit E]. Analytical results for subsurface soil samples documented concentrations of metals including total chromium [45.5 milligrams per kilogram (mg/kg) in SS-1], hexavalent chromium (1.99 mg/kg in SS-3), copper (11.5 mg/kg in SS-4), cadmium (1.8 mg/kg in SS-1 and SS-4), nickel (30.3 mg/kg in SS-8), and zinc (182 mg/kg in SS-1) [10, Exhibit F].

In April 1985, Mardon retained the services of Adams and IEA for investigations of on-site waste disposals and discharge affects on the environment [10, p. 1]. Adams collected a groundwater seep sample (SP-01) near the unnamed tributary [10, p. 2]. Analytical results of the tributary seep sample documented the presence of nickel [140 micrograms per liter (μg/L)], zinc (21,000 μg/L), TCA (64 μg/L), TCE (21 μg/L), 1,1-dichloroethylene (1,1-DCE) (18 μg/L), 1,2-dichloroethylene (1,2-DCE) (1.3 μg/L), and tetrachloroethylene (PCE) (1.7 μg/L) [10, Exhibit H].

On 26 September 1985, a groundwater seep sample (SP-01) was collected near the unnamed tributary and submitted for VOCs and metals analyses. Analytical results of SP-01 documented the presence of zinc (4,400 μg/L), TCA (4.0 μg/L), and TCE (1 μg/L) [10, Exhibit H].

On 26 December 1985, a groundwater seep sample (SP-01) was collected near the unnamed tributary and submitted for VOCs and metals analyses. Analytical results of the tributary seep sample documented the presence of nickel (60 μg/L), zinc (7,400 μg/L), TCA (4.6 μg/L), TCE (2 μg/L), 1,1-DCE (78 μg/L), and 1,2-DCE (24 μg/L) [10, Exhibit H].

On 27 June 1986, WH&N collected a groundwater seep sample (SP-02) near the bank of the Miller Run River. The seep sample was analyzed for VOCs and metals. Analytical results of SP-02 documented the presence of nickel (40 μg/L), zinc (4,460 μg/L), TCA (18 μg/L), TCE (3 μg/L), and PCE (2.1 μg/L) [10, Exhibit H].

In October 1986, WH&N, collected groundwater seep sample SP-02 near the bank of the unnamed tributary and sample SP-01 near the bank of the Miller Run River [52, pp. A4-A17]. The samples were analyzed for VOCs and metals. Analytical results of SP-01 documented the presence of zinc (2,500 μg/L), TCA (8.1 μg/L), and trichlorofluoromethane (8.9 μg/L). Seep sample SP-02 was found to contain zinc (70 μg/L), TCA (6.3 μg/L), trichlorofluoromethane (5.8 μg/L), and 1,1-DCE (2.2 μg/L) .

In May 1994, VT DEC personnel collected a groundwater seep sample and submitted it for VOC analysis. No VOCs were detected in this sample.

On 4 and 5 August 1998, START personnel collected eight source/soil samples at various locations throughout the Mardon property. The locations of the eight samples, SS-01, SS-02, SS-03, SS-04/SS-05, SD-06, SS-07, and SD-16, were selected to identify potential sources of contamination on the property and attempt to assign attribution of certain hazardous substances to past operations at Mardon (Figure 2). Although two of the samples have the prefix designation for sediment samples "SD", these samples are source/soil samples, which were analyzed via a DAS laboratory due to high moisture content. All source/soil samples, except SD-06 and SD-16, were submitted to CLP laboratories for full target compound list (TCL) VOCs, SVOCs, pest/PCBs, and target analyte list (TAL) inorganics and cyanide.

Table 4 summarizes the source/soil samples collected by START as part of the SI and Table 5 is a summary of organic compounds and inorganic elements detected through CLP and DAS analyses of START source/soil samples. For each sample location, a compound or element is listed if it is detected at three times or greater than the reference sample concentration SS-01/SS-02. However, if the compound or element is not detected in the reference sample, the reference sample's quantitation limit (SQL) (for organic analyses) or sample detection limit (SDL) (for inorganic analyses) is used as the reference value. These compounds or elements are listed if they occurred at a value equal to or greater than the reference sample's SQL or SDL and are designated by their approximate relative concentration above these values.

Complete analytical results of START source/soil samples including quantitation and detection limits are presented in Attachment A. Sample results quantified with a "J" on analytical tables are considered approximate because of limitations identified during CLP data validation. In addition, organic sample results reported at concentrations below quantitation limits and confirmed by mass spectrometry are also qualified by a "J" and considered approximate.

Table 4

Sample Summary: Mardon Industries
Source/Soil Samples Collected by START on 4 and 5 August 1998

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Source/Soil					
SS-01	ANX31 MALK03	1742	Grab	0 to 24 inches	Soil sample collected at a revised location from the embankment of a kame terrace at the northeastern portion of Lot No. 115. Location: 30 feet northeast of the northeastern most corner of the Newport building. The soil material consisted of a red-brown oxidized fine sand-soil formed in outwash deposits. PID reading = 0 units above background.

Table 4

Sample Summary: Mardon Industries
Source/Soil Samples Collected by START on 4 and 5 August 1998
(Continued)

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Source/Soil (Continued)					
SS-02	MALH33	1732	Grab	0 to 24 inches	Soil sample collected at a revised location from the embankment of a kame terrace at the northeastern portion of Lot No. 115. Location: 31 feet northeast of the northeastern most corner of the Newport building. The soil material consisted of a red-brown oxidized fine sand-soil formed in outwash deposits. PID reading = 0 units above background.
SS-03	ANX32 MALK04	1545	Grab	0 to 24 inches	Soil sample collected west of the small storage building on Lot Nos. 114 and 179. Location: 63 feet southwest of the northwestern most corner of the small storage building on Lot Nos. 114 and 179 and approximately 56 feet northwest of the electrical boxes. The soil material consisted of a light brown fine sand that lacked horizon development. Possibly fill material. PID reading = 0 units above background. (MS/MSD).
SS-04	ANX33 MALK05	1630	Grab	0 to 24 inches	Soil sample collected at Lot No. 122. Location: 15 feet southwest of monitoring well MW-L and 15 feet east of monitoring well MW-J. The soil material consisted of a medium brown silt, some sand and trace clay. PID reading = 0 units above background.
SS-05	ANX34 MALK06	1645	Grab	0 to 24 inches	Soil sample collected as a duplicate to SS-04.
SS-06 (identified as SD-16 due to high moisture content)	DAFW48	1041	Grab	0 to 24 inches	Soil sample collected from the drainage ditch on Lot No. 179. Location: 4 feet upstream from the mouth of the drainage ditch. The soil material consisted of a light gray to black very fine sand with trace organics and root material. PID reading = 0 units above background.

Table 4

Sample Summary: Mardon Industries
Source/Soil Samples Collected by START on 4 and 5 August 1998
(Continued)

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Source/Soil (Concluded)					
SS-07	ANX36 MALK08	1715	Grab	0 to 24 inches	Soil sample collected downgradient of monitoring well MW-B on Lot No. 115. Location: 1.5 feet west of monitoring well MW-B and 20 feet east of Route 122. The soil material consisted of a medium brown silt with some sand and possibly imported topsoil. PID reading = 0 units above background.
SS-09 (identified as SD-06)	DAFW32	1514	Grab	0 to 24 inches	Soil sample collected in the wetlands upgradient of the unnamed tributary, and aligned with SD-19. The soil material consisted of dark brown very fine sand and silt with trace organics. PID reading = 0 units above background.
MATRIX: Aqueous					
TB-01	ANW78	1728	Grab	NA	Trip blank for quality control for the CLP laboratory.
TB-02	DAFW25	1220	Grab	NA	Trip blank for quality control for the DAS laboratory.
RB-01	ANW79 MALK11	1750	Grab	NA	Sampling equipment rinsate blank for quality control for the CLP laboratory.
RB-02	DAFW26	1230	Grab	NA	Sampling equipment rinsate blank for quality control for the DAS laboratory.
Matrix: Performance Evaluation Samples					
PE-V00071	DAFW49	NA	Grab	NA	Performance Evaluation for low to medium concentration VOCs in water for the DAS laboratory (95-001).
PE-0005104	DAFW50	NA	Grab	NA	Performance Evaluation for low to medium concentration SVOCs in water for the DAS laboratory (90-002).
PE-0000094	DAFW51	NA	Grab	NA	Performance Evaluation for low to medium concentration Pest/PCBs in water for the DAS laboratory (90-003).

Table 4

Sample Summary: Mardon Industries
Source/Soil Samples Collected by START on 4 and 5 August 1998
(Continued)

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
Matrix: Performance Evaluation Samples (Continued)					
PE-0011296	DAFW52	NA	Grab	NA	Performance Evaluation for low to medium concentration cyanide in water for the DAS laboratory (90-006).
PE-TT1586	DAFW53	NA	Grab	NA	Performance Evaluation for low to medium concentration metals in soil for the DAS laboratory (90-005).
PE-TT00977	DAFW54	NA	Grab	NA	Performance Evaluation for low to medium concentration Aroclor-1260 in soil for the DAS laboratory (91-011).
PE-0012344	MALK12	NA	Grab	NA	Performance Evaluation for low to medium concentration cyanide in water for the CLP laboratory (90-006).
PE-TT0064	MALK13	NA	Grab	NA	Performance Evaluation for low to medium concentration metals in soil for the CLP laboratory (90-005).
PE-V00540	ANX39	NA	Grab	NA	Performance Evaluation for low to medium concentration VOCs in water for the CLP laboratory (95-001).
PE-0021391	ANX41	NA	Grab	NA	Performance Evaluation for low to medium concentration Pest/PCBs in water for the CLP laboratory (90-003).
PE-TT01351	ANX40	NA	Grab	NA	Performance Evaluation for low to medium concentration Aroclor-1260 in soil for the CLP laboratory (91-011).

Table 4

Sample Summary: Mardon Industries
Source/Soil Samples Collected by START on 4 and 5 August 1998
(Concluded)

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
Matrix: Performance Evaluation Samples (Concluded)					
PE-0004621	ANX42	NA	Grab	NA	Performance Evaluation for low to medium concentration SVOCs in water for the CLP laboratory (90-002).

hrs = hours
MS/MSD = Matrix Spike/Matrix Spike Duplicate
NA = Not applicable
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
Pest/PCBs = Pesticides/Polychlorinated biphenyls
CLP = Contract Laboratory Program
DAS = Delivery of Analytical Services
PID = Photoionization Detector

NOTES: Although SS-09 (SD-06) was collected from an area of wetland vegetation, this sample is considered a source/soil sample due to the soil material. The wetland vegetation along this slope appeared to be caused by groundwater discharge, and not as a function of the surface water pathway. Due to the high moisture content in this sample, the sample was identified as SD-06 in order to submit the sample to a DAS laboratory under the same Sample Delivery Group as the sediment samples.

Table 5

Summary of Analytical Results
Source/Soil Sample Analysis for
Mardon Industries

Sample Location	Compound/ Element	Sample Concentration		Reference Concentration		Comment	Risk-Based Concentrations (mg/kg)	
SD-06 (DAFW27_I) (DAFW32)	**INORGANICS**							
	Beryllium	0.55	mg/kg	0.24 U	mg/kg	2.3 × SDL	4.1E+03	N
	Silver	1.9	mg/kg	0.49 U	mg/kg	3.9 × SDL	1.0E+04	N
	Zinc	535	mg/kg	19.6	mg/kg	27.3 × Ref	6.1E+05	N

Table 5

Summary of Analytical Results
Source/Soil Sample Analysis for
Mardon Industries (Concluded)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comment	Risk-Based Concentrations (mg/kg)
SS-07 (MALH33) (MALK08)	**INORGANICS**				
	Lead	12.1 mg/kg	2.1 mg/kg	5.8 × Ref	*
SD-16 (DAFW27_1) DAFW48	**INORGANICS**				
	Aluminum	13,000 mg/kg	4090 mg/kg	3.2 × Ref	2.0E+06 N
	Beryllium	0.57 mg/kg	0.24 U mg/kg	2.4 × SDL	4.1E+03 N
	Chromium	31.8 mg/kg	9.2 mg/kg	3.4 × Ref	6.1E+03 N
	Lead	11.3 J mg/kg	2.1 mg/kg	5.4 × Ref	*
	Manganese	777 mg/kg	249 mg/kg	3.1 × Ref	4.1E+04 N
	Silver	4.1 mg/kg	0.49 U mg/kg	8.4 × SDL	1.0E+04 N
	Zinc	68.6 mg/kg	19.6 U mg/kg	3.5 × SDL	6.1E+05 N

Ref = Reference value.
J = Quantitation is approximate due to limitations identified during the quality control review.
U = Indicates the sample was analyzed for, but not detected and reports the detection value.
mg/kg = milligrams per kilogram [equivalent to parts per million (ppm)].
SQL = Sample Quantitation Limit.
SDL = Sample Detection Limit.
N = Noncarcinogenic Effects.
- - - = No Risk-Based Concentration value listed.
* = Recommended soil lead level by EPA Office of Solid Waste is less than 400 mg/kg.

[59; 60; 61; 66]

Seven metals were detected above reference criteria in the source/soil samples. No SVOCs, pest/PCBs, or cyanide were detected above reference criteria in any of the source/soil samples. Methylene chloride was detected in the reference sample (SS-01) at a concentration of 13 μg/kg. Beryllium, silver, and zinc were detected above reference criteria in SD-06 and SD-16; and lead was detected in SD-16 and SS-07. Maximum concentrations of the metals detected include: aluminum (13,000 mg/kg), beryllium (0.57 mg/kg), chromium (31.8 mg/kg), lead (12.1 mg/kg), manganese (777 mg/kg), silver (4.1 mg/kg), and zinc (535 mg/kg) [59; 60; 61; 62]. Positive results for methoxychlor were rejected in sample SS-01 since the target compound identification criteria were

not met [59]. None of the metal concentrations detected in these surface soil samples exceeded their respective industrial risk-based concentration values [66].

Barium, iron, manganese, sodium, thallium, and zinc detection limits were raised for the aqueous equipment (rinsate) blank sample due to laboratory blank contamination [62]. Sodium and thallium detection limits were raised for source/soil and sediment samples due to laboratory blank contamination [62].

GROUNDWATER PATHWAY

Surficial deposits in the area of the Mardon property consist of a thick sequence of glacio-lacustrine sands and post-glacial sands and gravels deposited in the Connecticut Valley glacial and post-glacial lake. Post-glacial alluvium is as little as 15 feet thick at the edges of the valley, while older littoral sediments at the valley center exceed thicknesses of 145 feet or more [39, p. 3]. Valley bottom deposits also consist of fine silt and clay.

Bedrock underlying the area of the Mardon property consists of the Saint Francis Group of the Waits River Formation, a composite of impure rocks, ranging from limey quartzites to limestones [15, Plate I, p. 16-18]. No bedrock formation mapped within 4-radial miles of the Mardon property exhibits karst characteristics [56, Plate 1].

Groundwater beneath the property flows in a westerly and southwesterly direction towards the Miller Run River, which is located approximately 350 feet west of the small storage shed located on Lot Nos. 114 and 179; and in a northwesterly direction toward the unnamed tributary, located on Lot 122 approximately 400 feet northwest of the main building [10, p. 1]. The property is underlain by a shallow aquifer, where groundwater occurs approximately 7 feet bgs [10, Exhibit A]. Groundwater seeps are evident along some of the slopes paralleling the Miller Run River and along the unnamed tributary [6, p. 2].

Prior to 1990, Mardon's drinking water was supplied by on-site wells. There is no information regarding the locations of the Mardon on-site drinking water supply wells or whether contamination was ever documented in these wells. Currently, the property is connected to the Lyndon Municipal Water and Sewer System [25].

The following Vermont towns are located within 4-radial miles of the Mardon property: Lyndon, Lyndonville, Burke, Wheelock, St. Johnsbury, and Kirby [1; 2; 3; 4]. There are no public water supplies located within 4-radial miles of Mardon in the towns of Burke, Wheelock, St. Johnsbury, and Kirby

An estimated 4,114 people in Lyndon and Lyndonville are served by public water supplies within 4-radial miles of the Mardon property [16; 26; 35]. The Lyndonville Water System is supplied by three supply wells, which are located approximately 1.5 miles east of Mardon [26]. The water in the wells is pumped into two reservoirs prior to serving an estimated 4,000 people. Well Nos. 1 and 2, each having a pumping rate of 150 gallons per minute (gpm), are alternately pumped with Well No. 3, which has a pumping rate of 350 gpm. The entire system is pumped at a rate of 500 gpm [26].

The Lyndonville Water System has a wellhead protection area consisting of a 200-foot radius around each of the three wells [58, p.2, Appendix A]. The Lyn Haven, Inc. bedrock well, located 3.8 miles northeast of Mardon Industries, serves an estimated 114 people [35].

Table 6 summarizes public groundwater supplies within 4-radial miles of the Mardon property.

Table 6

Public Groundwater Supply Sources Within 4-Radial Miles of Mardon Industries

Distance/ Direction from Site	Source Name	Location of Source[a]	Estimated Population Served	Source Type[b]
1.5 miles/east	Lyndonville Water System	Lyndonvile	4,000	Three Overburden Wells
3.8 miles/northeast	Lyn Haven, Inc.	Lyndon	114	Bedrock

[a] Indicates Town in which well is located.
[b] Overburden, Bedrock, or Unknown.
[16; 26; 35]

An estimated 1,217 people obtain drinking water from private groundwater supply wells located within 4-radial miles of the Mardon property [16]. Private groundwater supplies within 4-radial miles of the Mardon property were estimated using equal distribution calculations of U.S. Census CENTRACTS data identifying population, households, and private water wells for "Block Groups" which lie within or partially within individual radial distance rings of the property [16]. The nearest known private groundwater supply well, a deep overburden well, is located less than 200 feet north of an area of documented groundwater contamination on Lot No. 118 [7, Figure 2]. Table 7 summarizes estimated drinking water populations served by groundwater sources located within 4-radial miles of the Mardon property.

Table 7

Estimated Drinking Water Populations Served by Groundwater Sources Within 4-Radial Miles of Mardon Industries

Radial Distance From Mardon Industries (miles)	Estimated Population Served by Private Wells	Estimated Population Served by Public Wells	Total Estimated Population Served by Groundwater Sources Within the Ring
0.00 < 0.25	5	0	5
0.25 < 0.50	18	0	18
0.50 < 1.00	74	0	74
1.00 < 2.00	264	4,000	4,264
2.00 < 3.00	395	0	395
3.00 < 4.00	461	114	575
TOTAL	1,217	4,114	5,331

[16; 26; 33]

In April 1985, Mardon retained the services of Adams and IEA for investigations of on-site waste disposals and discharge affects on the environment [10, p. 1]. Adams installed and sampled one groundwater monitoring well (MW-B) on the eastern portion (Lot No. 115) of the Mardon property as a reference well. Adams also installed and sampled four groundwater monitoring wells (MW-I, MW-J, MW-K, and MW-L) on the western portion (Lot No. 122) of the Mardon property and a neighboring (Lot No. 118) residential supply well [10, p. 2].

Analytical results of the 11 April 1985 sampling event documented the presence of one metal and four VOCs above detection limits. Zinc was detected at a maximum concentration of 10 μg/L in MW-I, MW-J, MW-K, and MW-L. TCE was detected at a maximum concentration of 249 μg/L (MW-J), TCA at 99 μg/L (MW-B), ethylbenzene at 2.7 μg/L (MW-K), and carbon tetrachloride at 3.3 μg/L (MW-L) in the groundwater samples [10, Exhibit G, H]. Groundwater samples collected from the Lot No. 118 residential drinking water supply well, located west of Route 122, were analyzed for VOCs. Analytical results of the residential groundwater samples documented the presence of methylene chloride (4.1 μg/L) and ethylbenzene (3.9 μg/L) [10, Exhibit H].

In April 1985, Mardon agreed to comply with the Assurance and the leach system closure plan standards under the Vermont Hazardous Waste Management Regulations. Since the plan involved further monitoring of groundwater emanating from the property, Adams and IEA continued the groundwater monitoring program [12, 14]. The reference well, MW-B, located on the eastern portion of the property (Lot No. 115), documented the highest concentrations of TCA of all monitoring wells. The high concentrations of TCA were presumed to be caused by the degreasing unit located in the building on the eastern portion of the Mardon property.

On 26 September 1985, groundwater samples were collected from monitoring wells MW-B, MW-I, MW-J, MW-K, and MW-L, and from the residential supply well (Lot No. 118), and analyzed for VOCs and metals [10, p. 2]. Analytical results of the 26 September 1985 sampling event documented the presence of three VOCs exceeding detection limits in the monitoring wells. No metals were detected above detection limits in any of the monitoring wells. TCE was detected at a maximum concentration of 230 μg/L (MW-J), TCA at 16 μg/L (MW-B), and methylene chloride at 1 μg/L (MW-I and MW-J). No VOCs or metals were detected above detection limits in the residential supply well.

On 26 December 1985, additional groundwater samples were collected from monitoring wells MW-B, MW-I, MW-J, MW-K, and MW-L, and from the residential supply well (Lot No. 118), and analyzed for VOCs and metals [10, p. 2]. One metal (zinc) and two VOCs were detected above detection limits in the monitoring wells. Zinc was detected at a maximum concentration of 250 μg/L (MW-I), TCA at 21 μg/L (MW-J), and TCE at 230 μg/L (MW-J). The only substance detected in the residential supply well was zinc, at a concentration of 30 μg/L.

In 1986, Mardon hired WH&N to continue the groundwater monitoring program. On 25 March 1986, groundwater samples were collected from monitoring wells MW-B and MW-I; and from the residential supply well (Lot No. 118). Analytical results of this sampling event documented the presence of four VOCs exceeding detection limits in the monitoring wells. No metals were detected exceeding reference criteria in any of the monitoring wells. TCA was detected at a maximum concentration of 168 μg/L (MW-B), 1,1-DCE at 14 μg/L (MW-B), methylene chloride at 1 μg/L (MW-I), and PCE at 6 μg/L (MW-I). No VOCs or metals were detected above detection limits in the residential supply well.

On 27 June 1986, WH&N collected groundwater samples from monitoring wells MW-B and MW-I; and the residential supply well (Lot No. 118). The samples were analyzed for VOCs and metals. Two VOCs were detected above detection limits in MW-B; TCA was detected at a maximum concentration of 650 μg/L and trichlorofluoromethane at 580 μg/L. No VOCs or metals exceeding detection limits were detected in the residential supply well.

In October 1986, WH&N installed seven monitoring wells (MW-A, MW-C, MW-D, MW-E, MW-F, MW-G, and MW-H) on the Mardon property [39, pp. 4, 8]. On 9 October 1986, WH&N collected samples from monitoring wells MW-A, MW-C, MW-D, MW-E, MW-F, and MW-G [52, pp. A4-A17]. The samples were analyzed for VOCs and metals. Six VOCs were detected above detection limits in the groundwater samples. Chloroform was detected at a maximum concentration of 5.4 μg/L (MW-A), TCE at 10 μg/L (MW-F), TCA at 800μg/L (MW-G), trichlorofluoromethane at 1,600 μg/L (MW-G), carbon tetrachloride at 2 μg/L (MW-G), and PCE at 4.2 μg/L (MW-H). No metals exceeding detection limits were detected in these groundwater samples.

Based on analytical results from groundwater samples collected from monitoring wells and groundwater seeps between 11 April 1985 and 9 October 1986, two discernable plumes of groundwater contamination were identified as migrating from on-site sources [52, pp. 10, 11, 12]. One plume (Plume No. 1) was migrating to the northwest from the leach system towards the unnamed tributary and the second plume (Plume No. 2) was migrating to the west from the small storage shed towards the Miller Run River (Figure 2).

On 10 November 1989, WH&N collected groundwater samples from monitoring wells MW-A, MW-G, and MW-P, and from the residential supply well (Lot No. 118). Samples were analyzed for VOCs using EPA Method 601. Analytical results of this sampling event documented the presence of two VOCs exceeding detection limits in the monitoring wells. TCA was detected at a maximum concentration of 24.5 μg/L (MW-G) and PCE at 23.9 μg/L (MW-P). No VOCs exceeding detection limits were detected in MW-A or the residential supply well.

On 9 February 1990, WH&N collected groundwater samples from monitoring wells MW-B, MW-C, MW-M, and MW-N. The samples were analyzed for VOCs using EPA Method 601. Three VOCs were detected above detection limits in the groundwater samples. TCA was detected at a maximum concentration of 38.2 μg/L (MW-N), TCE at 2.61 μg/L (MW-C), and 1,1-DCE at 16 μg/L (MW-N).

On 28 May 1990, WH&N reported that concentrations of TCA in all monitoring wells decreased between one-fifth and one-eighth the February 1989 concentrations [44, p. 1].

On 6 June 1990, WH&N collected groundwater samples from MW-A, MW-B, MW-C, MW-G, MW-M, MW-N, and MW-P, and from the Lot No. 118 residential supply well. In addition, a groundwater seep sample (SP-01) was collected near the Miller Run River at this time. Analytical results of this sampling event documented the presence of three VOCs exceeding detection limits in the monitoring wells. TCA was detected at a maximum concentration of 33 μg/L (MW-G), chloroform at 7.89 μg/L (MW-C), and PCE at 3.92 μg/L (MW-P). No VOCs exceeding detection limits were detected in MW-A or the residential supply well.

On 2 and 3 July 1990, WH&N collected groundwater samples from seven monitoring wells (MW-A, MW-B, MW-C, MW-Gs, MW-J, MW-K, MW-L, MW-M, and MW-N) [51, p. 1]. Analytical results of this sampling event documented the presence of TCA in MW-B (μg/L), MW-Gs (21 μg/L), MW-J (98 μg/L), MW-K (79 μg/L), MW-M (11 μg/L), and MW-N (11 μg/L). Based on these groundwater sampling results, VT DEC determined that no further remedial efforts were required at the Mardon property; however, VT DEC required that groundwater monitoring continue quarterly for 1 year [51, p. 1].

On 4 June 1992, WH&N collected groundwater samples from 12 monitoring wells (MW-A, MW-B, MW-C, MW-D, MW-E, MW-F, MW-Gs, MW-Gd, MW-H, MW-J, MW-K, MW-L, MW-M, MW-N, MW-O, and MW-P) and submitted them for VOC analysis [64]. Low levels of TCA were detected in MW-Gs (23.9 μg/L) and MW-H (20.9 μg/L).

On 4 and 9 May 1994, VT DEC personnel collected groundwater samples from 10 monitoring wells and from one seep. The groundwater samples were analyzed for VOCs. Levels of contaminants in nine out of the 10 monitoring wells and the seep sample were below detection limits; and the one compound detected in one of the wells was below VT DEC groundwater standards. As a result of these data, the VT DEC determined that no further groundwater monitoring or other actions were required on the site [63].

START did not perform groundwater sampling as part of the Mardon property SI. Based on analytical results from previous monitoring well, residential supply well, and groundwater seep samples collected on the Mardon property and the surrounding area, a release of hazardous

substances which appear to be partially attributable to on-site sources had occurred on the Mardon property. However, concentrations of hazardous substances in monitoring wells and groundwater seeps have decreased over time and are below State groundwater enforcement standards. Concentrations of hazardous substances in the residential supply well have also decreased over time to below detection levels.

Actions taken to remediate groundwater include the implementation of a closure plan for the leach system and the removal of potential sources (soil and drums) from the property. In January 1985, Mardon signed an Assurance of Discontinuance with VT DEC, requiring a groundwater monitoring program. The primary objective of the Assurance was to cease the discharge of plating wastes to Mardon's leach system, initiate a groundwater monitoring program, and to remove TCE-contaminated soil located outside the plating room. Mardon had completed the requirements of the Assurance, and in May 1994, the VT DEC determined that no further groundwater monitoring or other actions were required on the site and Mardon was removed from the Active Vermont Hazardous Sites List [63].

SURFACE WATER PATHWAY

Depth to groundwater beneath the Mardon property is approximately 7 feet bgs [6, p. 3]. Groundwater seeps are evident near some of the slopes paralleling the Miller Run River and along the unnamed tributary [6, p. 2]. Lot No.114 of the Mardon Industries property is located within the 100-year floodplain zone of the Miller Run River [57].

The perennial unnamed tributary to the Miller Run River is located approximately 400 feet northwest of the Main Building [10, p. 1]. According to the VT DEC, the unnamed tributary appeared to form as a result of seepage from the embankment of the property on Lot No. 122, north of the Mardon property and west of Route 122 (Figure 2) [10, p. 1].

Surface water runoff from Mardon flows west and southwest, toward the Miller Run River, which is located approximately 350 feet west of the small storage shed located on Lot Nos. 114 and 179; and to the northwest toward the unnamed tributary [6, p. 3]. There are two PPEs to the surface water pathway from the Mardon property; one at the unnamed tributary to the Miller Run River (PPE1) and one at the Miller Run River (PPE2) (Figure 2) [1; 2; 3; 4; 7, pp. 18, 19]. The flow rates of the surface water bodies along the 15-mile downstream surface water pathway were calculated by multiplying the square mileage of the drainage basin area by the USGS estimating factor of 1.8 cubic feet per second per square mile (cfs/mi^2). This factor is an estimate and average of the intensity, rate, and frequency of overland flow in New England. The following table describes surface water bodies located along the 15-mile downstream pathway for the Mardon property. There is an approximate flow rate of 76 cubic feet per second (cfs) at the PPE on the Miller Run River and a flow rate of less than 10 cfs for the unnamed tributary to the Miller Run River [22].

From PPE1, the unnamed tributary flows approximately 250 feet southwest into the Miller Run River. PPE2 is located approximately 300 feet downstream of the confluence between the unnamed tributary and the Miller Run River. From PPE2, the Miller Run River flows 0.5 miles southeast to the Passumpsic River [1; 2; 3; 4;]. The flow rate of the Passumpsic River is approximately 434 cfs at the confluence of the two rivers [21]. The flow of the Passumpsic River is approximately 653 cfs

at the 15-mile surface water pathway terminus, located approximately 0.5 miles downstream from the Saint Johnsbury/Waterford Town border, in Waterford, Vermont (Figure 3) [1; 2; 3; 4; 32].

There are no known surface water drinking water intakes along the 15-mile downstream surface water pathway [29].

An estimated 2 miles of wetland frontage are located along the 15-mile surface water pathway from Mardon [17; 18; 19; 20; 23]. According to the Vermont Agency of Natural Resources Nongame and Natural Heritage Program, there is one unique natural biotic community (obligate calcareous riverine species) located along the Passumpsic River (Figure 3) [24]. Based on START observations during the reconnaissance, the Miller Run River and the unnamed tributary are considered to be fisheries.

Table 8 summarizes the surface water bodies along the 15-mile downstream pathway from Mardon.

Table 8

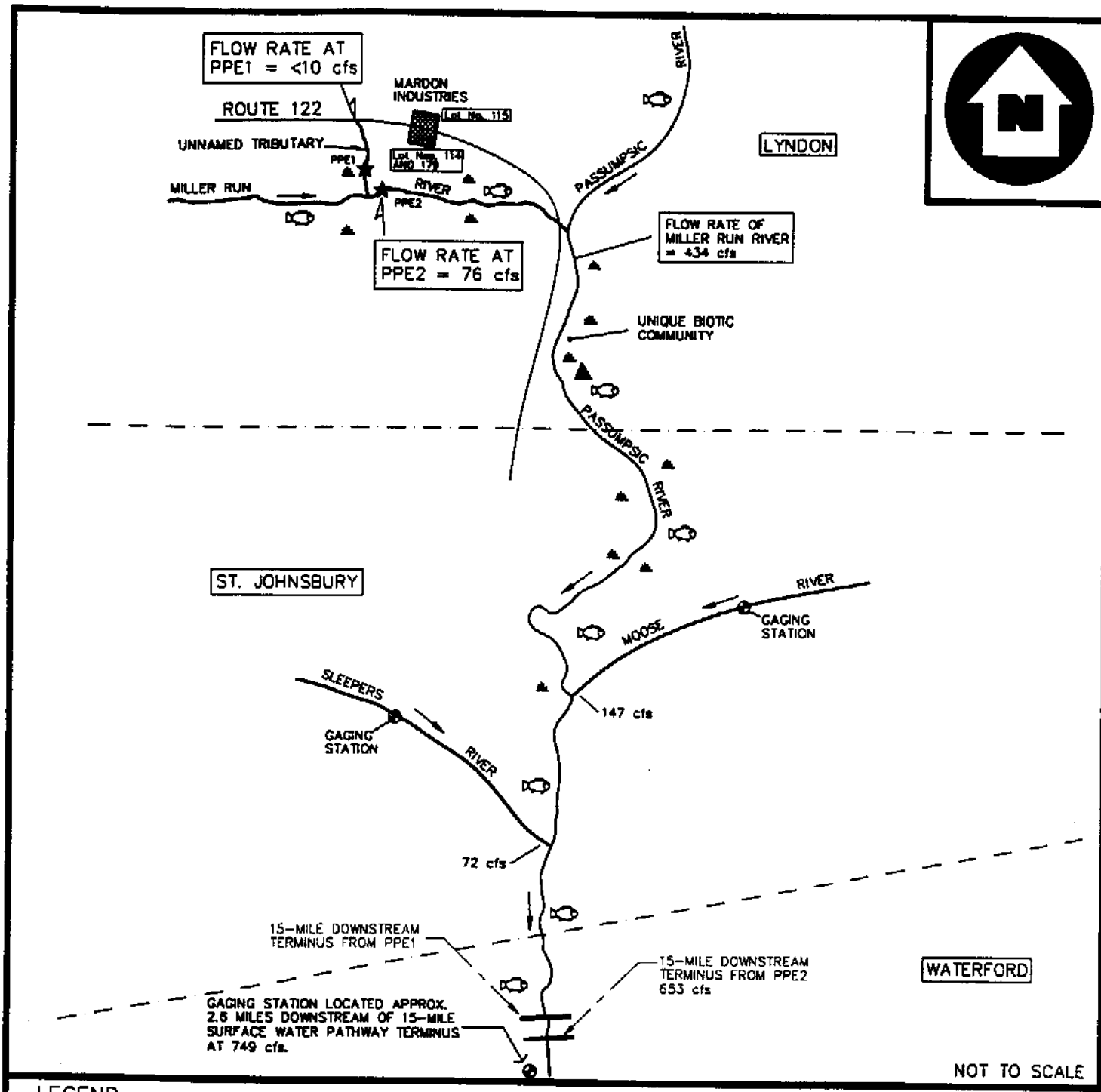
Surface Water Bodies Along the 15-Mile Downstream Pathway from Mardon Industries

Surface Water Body	Descriptor[a]	Length of Reach (miles)	Flow Characteristics (cfs)[b]	Length of Wetland Frontage (miles)
Unnamed tributary	Minimal	0.1	< 10	0
Miller Run River	Small to moderate	0.5	76	0.5
Passumpsic River	Moderate to large	14.5	434-653	1.5

[a] Minimal stream < 10 cfs. Small to moderate stream 10-100 cfs. Moderate to large stream > 100-1,000 cfs. Large stream to river > 1,000-10,000 cfs. Large river > 10,000-100,000 cfs. Very large river > 100,000 cfs. Coastal tidal waters (flow not applicable). Shallow ocean zone or Great Lake (flow not applicable). Moderate depth ocean zone or Great Lake (flow not applicable). Deep ocean zone or Great Lake (flow not applicable). Three-mile mixing zone in quiet flowing river 10 cfs or greater.

[b] Cubic feet per second.

[1; 2; 3; 4; 17; 18; 19; 20; 21; 22; 23]



LEGEND

- WETLANDS
- PROBABLE POINT OF ENTRY TO SURFACE WATER
- FISHERY
- UNIQUE BIOTIC COMMUNITY
- FLOW DIRECTION
- cfs CUBIC FEET PER SECOND
- PROPERTY
- TOWN BORDER

SOURCE: U.S.G.S. QUADRANGLE(S): ST JOHNSBURY, VT. 1977. CONCORD, VT. 1988, LYNDONVILLE, VT. 1986, BURKE MOUNTAIN, VT. 1988.

DOI QUADRANGLE: ST. JOHNSBURY, VT. 1994

SURFACE WATER PATHWAY

MARDON INDUSTRIES
ROUTE 122
LYNDON, VERMONT

WESTON® MANAGERS DESIGNERS/CONSULTANTS

REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

TDD #	DRAWN BY:	DATE
97-02-0033	W. SHAW	11/14/97

FILE NAME: S:\97020033\FIG3

FIGURE 3

Sensitive environments along the surface water pathway are shown in Table 9.

Table 9

Sensitive Environments Along the 15-Mile Downstream Pathway from Mardon Industries

Sensitive Environment Name	Sensitive Environment Type	Water Body	Downstream Distance From PPE	Flow Rate at Environment
Unnamed wetlands	State-designated area for protection and maintenance of aquatic life under the Clean Water Act	Unnamed tributary	0.05 miles	< 10 cfs
Unnamed wetlands	Wetlands, 0.5 frontage miles	Miller Run River	0.06 - 0.5 miles	76 cfs
Unnamed wetlands	Wetlands, 1.5 frontage miles	Passumpsic River	0.5 - 2 miles	434 - 653 cfs
Obligate calcareous riverine species	Unique Biotic Community	Passumpsic River	0.75 miles	434 - 653 cfs

cfs = cubic feet per second
PPE = Probable Point of Entry

Surface water sediment sampling was conducted on the Mardon property by START on 4 and 5 August 1998. The sampling was conducted on the property to document on-site conditions and potential to impact off-site targets. Analytical data gathered from the sampling activities is used to confirm or identify hazardous substances at the property.

On 4 and 5 August 1998, START personnel collected seven sediment samples (SD-01, SD-02/SD-03, SD-04, SD-09, SD-10, and SD-18) from the Miller Run River and four sediment samples from the unnamed tributary (SD-05, SD-07, SD-08, and SD-19) (Figure 2) [7, pp. 32-37]. These sediment samples were analyzed by a DAS laboratory for VOCs, SVOCs, pest/PCBs, and inorganics (total metals and cyanide). Table 10 summarizes the sediment samples collected by START as part of the SI and Table 11 is a summary of organic compounds and inorganic elements detected through DAS analyses of START sediment samples.

For each sample location, a compound or element is listed if it was detected at three times or greater than the detected reference concentrations (SD-07/SD-08) for sediment samples SD-05 and SD-19; and SD-09/SD-10 for sediment samples SD-01, SD-02/SD-03, SD-04, and SD-18. However, if the compound or element is not detected in the reference sample, the reference sample SQL (for organic analyses) or SDL (for inorganic analyses) is used as the reference value. These compounds or elements are listed if they occurred at a value equal to or greater than the reference sample's SQL or SDL and are designated by their approximate relative concentration above these values. Sample results quantified with a "J" on are considered approximate because of limitations identified during data validation.

Complete analytical results of START sediment samples including quantitation and detection limits are presented in Attachment B. Sample results quantified with a "J" on analytical tables are considered approximate because of limitations identified during data validation. In addition, organic sample results reported at concentrations below quantitation limits and confirmed by mass spectrometry are also qualified by a "J" and considered approximate.

Table 10

Sample Summary: Mardon Industries
Sediment Samples Collected by START on 4 and 5 August 1998

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Sediment					
SD-01	DAFW27	1005	Grab	0 to 6 inches	Sediment sample collected from Miller Run River Location: Approximately 57 feet downstream of SD-02/SD-03. The sample consisted of medium to coarse light gray sand. An oil sheen was observed on the surface of the sediment. Conductivity = 235 μmhos, Temperature = 22° C, pH = 7. PID reading = 0 units above background.
SD-02	DAFW28	1022	Grab	0 to 6 inches	Sediment sample collected from Miller Run River at its confluence with the drainage ditch. The sample material consisted of gray very fine to fine sand, some silt, with wood fragments. Conductivity = 240 μmhos, Temperature = 22° C, pH = 7. PID reading = 0 units above background.
SD-03	DAFW29	1028	Grab	0 to 6 inches	Sediment sample collected as a duplicate to SD-02.
SD-04	DAFW30	1233	Grab	0 to 6 inches	Sediment sample collected from the PPE on Miller Run River. Location: Approximately 25 feet upstream from the drainage ditch. Sample material consisted of medium to coarse sand with trace fine clay and trace clay. This soil material was medium gray in color. Conductivity = 240 μmhos, Temperature = 22 °C, pH = 7. PID reading = 0 units above background. (MS/MSD).
SD-05	DAFW31	1317	Grab	0 to 6 inches	Sediment sample collected from a revised location on the unnamed tributary to Miller Run River. Location: Approximately 2 feet upstream from the confluence with Miller Run River. Conductivity = 470 μmhos, Temperature = 29 °C, pH = 7. PID reading = 0 units above background.

Table 10

Sample Summary: Mardon Industries
Sediment Samples Collected by START on 4 and 5 August 1998
(Continued)

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Sediment (Continued)					
SD-07	DAFW33	1600	Grab	0 to 6 inches	Sediment sample collected as a reference from the unnamed tributary to Miller Run River. Location: Approximately 35 feet upstream from SD-19. Conductivity = 440 µmhos, Temperature = 29 °C, pH = 7. PID reading = 0 units above background.
SD-08	DAFW34	1548	Grab	0 to 6 inches	Sediment sample collected as a reference for metals analysis only from the unnamed tributary to Miller Run River. Location: Approximately 35 feet upstream from SD-19. Conductivity = 440 µmhos, Temperature = 29 °C, pH = 7. PID reading = 0 units above background.
SD-09	DAFW35	1343	Grab	0 to 6 inches	Sediment sample collected as a reference from Miller Run River. Location: Approximately 30 feet upstream from the Miller Run River confluence with the unnamed tributary. Conductivity = 250 µmhos, Temperature = 22 °C, pH = 7. PID reading = 0 units above background.
SD-10	DAFW36	1350	Grab	0 to 6 inches	Sediment sample collected as a reference for metals analysis only from Miller Run River. Location: Approximately 30 feet upstream from the Miller Run River confluence with the unnamed tributary. Conductivity = 250 µmhos, Temperature = 22 °C, pH = 7. PID reading = 0 units above background.
SD-18 (formerly identified as SS-08)	DAFX12	1210	Grab	0 to 24 inches	Sediment sample collected from Miller Run River. Location: The sample material consisted of medium course sand with trace fine gravel and medium gray in color. PID reading = 0 units above background.

Table 10

Sample Summary: Mardon Industries
Sediment Samples Collected by START on 4 and 5 August 1998
(Concluded)

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Sediment (Concluded)					
SD-19 (formerly identified as SD-06)	DAFX11	1531	Grab	0 to 6 inches	Sediment sample collected from the unnamed tributary to Miller Run River. Location: Approximately 80 feet upstream from the confluence with Miller Run River, and downgradient of the source/soil sample SS-09. Conductivity = 440 µmhos, Temperature = 29 °C, pH = 7. PID reading = 0 units above background.

MS/MSD = Matrix Spike/Matrix Spike Duplicate
PID = Photoionization Detector
µmhos = micromhos per centimeter
°C = Degrees Celsius
hrs = hours
PPE = Probable Point of Entry

Table 11

Summary of Analytical Results
Sediment Sample Analysis for
Mardon Industries

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comment
SD-04 (DAFW30)	**INORGANICS**			
	Selenium	0.99 J mg/kg	0.72 UJ mg/kg	1.4 × SDL
	ORGANICS			
	Heptachlor epoxide	2.3 µg/kg	2.2 UJ µg/kg	1.0 × SQL
SD-19 (DAFX11)	**ORGANICS**			
	Trichloroethene	160 J µg/kg	6 J µg/kg	26.7 × Ref

Ref = Reference value.
J = Quantitation is approximate due to limitations identified during the quality control review.
UJ = Indicates the sample was analyzed for, but not detected and reports the estimated detection value.
µg/kg = micrograms per kilogram [equivalent to parts per billion (ppb)].
mg/kg = milligrams per kilogram [equivalent to parts per million (ppm)].
SQL = Sample Quantitation Limit.
SDL = Sample Detection Limit.

[59; 60; 61; 62]

Non-detected results for chloroethane were rejected in all sediment samples due to "Action Low" score in the performance evaluation (PE) sample and non-detected results for 4-nitrophenol were rejected in all sediment samples since continuing calibration criteria were not met [61]. Non-detected acid and base/neutral results were rejected for sample SD-07 since acid and base/neutral surrogate recovery was low [61].

One VOC, attributable to the Mardon property, was detected above reference criteria in one sediment sample collected from the unnamed tributary. Trichloroethane was detected in sediment sample SD-19 at a concentration of 160 μg/kg. The concentrations of SVOCs, pest/PCBs, metals, and cyanide in sediment samples collected from the unnamed tributary were all below detection limits. Sample location SD-19 is located immediately upstream of PPE1 and in the area of Plume No. 1.

Selenium, which will not be considered attributable to the Mardon property, was detected in one sediment sample collected from the Miller Run River at concentrations of 990 J μg/kg (SD-04). Sediment sample location SD-04 is located immediately upstream of PPE2. The pesticide heptachlor epoxide was detected at a concentration of 2.3 μg/kg in sediment sample SD-04 [59; 60; 61; 62]. Heptachlor epoxide will not be evaluated by START in this investigation since this pesticide cannot be attributed to the property. Use of this pesticide is not known to have occurred on the property and the pesticide was not detected in any of the source/soil samples discussed in the Waste/Source section of this report. No other SVOCs, pest/PCBs, metals, or cyanide substances were detected above reference criteria in sediment samples collected from the Miller Run River.

It is suspected that a release of hazardous substances to surface water has occurred to the Miller Run River and the unnamed tributary to the Miller Run River; however, concentrations of hazardous substances from on-site sources have been decreasing over time and are below State enforcement standards. Actions taken to address the release of hazardous substances to the surface water pathway are the same as those taken to remediate the groundwater by implementation and completion of a closure plan in accordance with the Assurance of Discontinuance signed by Mardon in January 1985.

SOIL EXPOSURE PATHWAY

The nearest residences to the Mardon property are located approximately 200 feet south of the property on Lot No. 113, and approximately 200 feet north of the property on Lot No. 117 [7, p. 12, 13]. There are no known terrestrial sensitive environments on the property. There are no schools or day-care centers located within 200 feet of an area of observed contamination on the Mardon property [36]. There are an estimated 461 residents located within 1-radial mile of the Mardon property [16].

Access to the western portion of the Mardon property, occupied by J&J Rental, is unrestricted. The eastern portion of the property, occupied by Newport, is partially restricted by the retaining wall on the eastern property border [7, pp. 3, 12, 13]. Currently, there are 55 full-time employees at Newport and three full-time employees at J&J Rental [7, pp. 11, 14].

Surface soil samples collected during monitoring well installation by Mardon and its contractors, and surface soil samples collected by START during SI activities are considered source samples and are discussed in the Waste/Source section of this report.

Based on the START source/soil and previous soil boring sample results, a release of hazardous substances has occurred to the soil exposure pathway; however, none of the metal concentrations detected in the source/soil samples exceeded their respective industrial risk-based concentration values. Furthermore, no resident population exists and no impacts to nearby populations are known or suspected.

AIR PATHWAY

Currently, there are 55 full-time employees at Newport and three full-time employees at J&J Rental [7, pp. 11, 14]. The nearest residences to the Mardon property are located approximately 200 feet south of the property on Lot No. 113 and approximately 200 feet north of the property on Lot No. 117 [7, pp. 16, 17]. START personnel did not observe any day-care facilities with a 0.25-mile radius of Mardon. The nearest schools are the Lyndon Town School, the Riverside School, and Lyndon State College, located approximately 1 mile east, southeast, and southwest, of the Mardon property, respectively [1; 31]. An estimated 461 people reside within 1-radial mile of the property [16]. Employee and student populations are not included in the above-mentioned population estimation. Table 12 presents the estimated population residing within 4-radial miles of the Mardon property.

Table 12

Estimated Population Within 4-Radial Miles of Mardon Industries

Radial Distance From Mardon Industries (miles)	Estimated Population
On a Source	58
> 0.00 to 0.25	38
> 0.25 to 0.50	90
> 0.50 to 1.00	333
> 1.00 to 2.00	1,589
> 2.00 to 3.00	1,856
> 3.00 to 4.00	1,603
TOTAL	5,567*

* Includes the 58 on-site workers

[16]

Two State-threatened species habitats are located within 4-radial miles of the property. There are a total of 506 acres of wetlands located within 4-radial miles of the Mardon property [17; 18; 19; 20]. Table 13 presents the sensitive environments located within 4-radial miles of the Mardon property.

Table 13

Sensitive Environments Located Within 4-Radial Miles of Mardon Industries

Radial Distance from Mardon Industries (miles)	Sensitive Environment/Species (status)
On a Source	None
> 0.00 to 0.25	Clean Water Act
	Wetlands (13 Acres)
> 0.25 to 0.50	Wetlands (23 Acres)
> 0.50 to 1.00	Wetlands (43 Acres)
> 1.00 to 2.00	Wetlands (105 Acres)
> 2.00 to 3.00	Wetlands (95 Acres)
> 3.00 to 4.00	Wetlands (227 Acres)
	1 Habitat for State-threatened species (Hooker's orchis)
	1 Habitat for State-threatened species (Ram's head lady's slipper)

During the START on-site reconnaissance, ambient air monitoring was performed using field screening equipment. On 3 June 1997, START conducted an on-site reconnaissance of the eastern portion of the Mardon property. In the Newport Building, air monitoring instruments detected total VOCs at 98 units above background levels in the ambient air [7, p. 2]. Mr. Lee Chamberlain, a representative of Newport, later stated that the VOC detected in the building was most likely styrene, a component of the fiberglass manufacturing process.

A hazardous material storage shed, with no associated secondary containment features, was located on the south side of the building on the western portion of the property [7, p. 5]. Air monitoring instruments detected VOCs at 53 units greater than ambient air in the hazardous waste storage shed [7, p. 5].

On 10 October 1997, START personnel conducted an on-site reconnaissance on the eastern and western portions of the property. There was a laboratory located in the southeastern corner of the Newport building [7, p. 12]. The laboratory contained 5-gallon buckets of Chemlease 15 and Mold Cleaner, and 55-gallon drums of polyester resin. Air monitoring instruments detected VOCs at 7 units greater than ambient air [7, p. 10]. Two vents were located on the east side of the Newport building, where air monitoring instruments detected VOCs at 142 units greater than ambient air [7, p. 5].

No laboratory qualitative air samples are known to have been collected from the Mardon property. Based on available background information, no release of hazardous substances to the ambient air from on-site sources is known or suspected to have occurred and no impacts to nearby residential populations or sensitive environments are known or suspected.

SUMMARY

The Mardon Industries (Mardon) property is located on both sides of Route 122, Lyndon, Caledonia County, Vermont in a residential and commercial area of Lyndon. The property consists of a 2.1-acre eastern section (Lot No. 122) and an 8.9-acre western portion (Lot Nos. 114 and 179). The eastern portion of the property is currently owned by VNH Industrial Development Corporation, and occupied by Newport Plastics, Inc. (Newport). The western portion is currently owned by James H. Davis and is occupied by J&J Rental and Equipment Sales, Inc. (J&J Rental).

The topography of the Mardon property slopes to the southwest and northwest towards the Miller Run River and an unnamed tributary to the Miller Run River, respectively. Surface water drainage from the property flows to the Miller Run River and the unnamed tributary. Depth to groundwater beneath the Mardon property is approximately 7 feet below ground surface (bgs). Groundwater seeps are evident along some of the slopes paralleling the Miller Run River and along the unnamed tributary. Access to the eastern portion of the property is partially restricted by a steep hill to the north and access to the western portion is partly restricted by the Miller Run River and the unnamed tributary.

Mardon was a machinery and tool manufacturer from 1976 to 1990. During manufacturing operations, Mardon used a solvent degreaser on the eastern portion of the property. Plating operations were conducted on the western portion of the property, where Mardon used a concrete-block dry well and four 70-foot leach lines (leach system) to dispose of plating wastewater. Sources on the Mardon property included the degreaser, leach system, contaminated soil, aboveground storage tanks (ASTs), underground storage tanks (USTs), 55-gallon drums, and 5-gallon containers. Materials generated or used during manufacturing operations at Mardon included spent chlorinated solvents [1,1,1-trichloethane (TCA) and trichloroethene (TCE)], waste lubricating oils, waste paints, plating wastewater (containing chromium, cadmium, copper, nickel, and zinc), gasoline, and fuel oil.

Chlorinated waste solvents including TCE and TCA, and waste lubricating oils were reportedly disposed of on site to the ground surface. In January 1985, Mardon signed an Assurance of Discontinuance (Assurance) with the Vermont Department of Environmental Conservation (VT DEC). The primary objective of the Assurance was to cease the discharge of plating wastes to Mardon's leach system and to initiate a groundwater monitoring program in order to assess contaminants emanating from the leach system. The Assurance also required the removal of TCE-contaminated soil located outside the plating room by an outdoor drum storage area (former drum storage area No. 1)

Based on analytical results from groundwater samples collected from monitoring wells and groundwater seeps between April 1985 and October 1986, two plumes of groundwater contamination were identified migrating from on-site sources; one plume extending to the unnamed tributary of the Miller Run River, and the other plume extending to the Miller Run River.

Groundwater monitoring continued until May 1994, when levels of contaminants in the groundwater had decreased over time and were below VT DEC groundwater enforcement standards. Since concentrations of hazardous substances in monitoring wells, a nearby residential supply well, and

groundwater seeps have decreased over time and were below State groundwater enforcement standards, the State determined that no further groundwater monitoring or other actions were required on the site and Mardon was removed from the Active Vermont Hazardous Sites List.

Surface water sediment sampling was conducted by Roy F, Weston, Inc. (WESTON$_{®}$) Superfund Technical Assessment and Response Team (START) in August 1998. START personnel collected sediment samples from the Miller Run River and from the unnamed tributary. TCA, attributable to the Mardon property, was detected in one sediment sample collected from the unnamed tributary at a concentration of 160 micrograms per kilogram (μg/kg). The metal, selenium, which will not be considered by START to be attributable to the Mardon property, was detected in a sample collected from the Miller Run River at concentrations of 990 J μg/kg. The pesticide heptachlor epoxide was detected at a concentration of 2.3 μg/kg in a sample; however, heptachlor epoxide is not attributed to the property.

Although a release of hazardous substances to surface water has occurred to the Miller Run River and the unnamed tributary to the Miller Run River, concentrations of hazardous substances from on-site sources have been decreasing over time and are below State enforcement standards. Actions taken to address the release of hazardous substances to the surface water pathway are similar to those discussed for groundwater.

Soil boring (0 to 2 feet) samples collected during monitoring well installations have documented concentrations of TCA (28 μg/kg), TCE (18 μg/kg), and toluene (18 μg/kg). Seven metals were detected above reference criteria in the source/soil samples collected by START in August 1998, and methylene chloride was detected in the reference sample (SS-01). Metals detected above reference criteria included aluminum, beryllium, chromium, lead, manganese, silver, and zinc. Although the eight metals were detected above reference criteria, none of the concentrations exceeded industrial risk-based concentration levels. Based on the past surface soil sample results, a release of hazardous substances has occurred to the soil exposure pathway; however, no resident population exists and no impacts to nearby populations are known or suspected.

Currently, there are 55 full-time employees at Newport and three full-time employees at J&J Rental. The nearest residences to the Mardon property are located approximately 200 feet south of the property and approximately 200 feet north of the property. An estimated 461 people reside within 1-radial mile of the property [16]. Two State-threatened species habitats are located within 4-radial miles of the property, and there are 506 acres of wetlands located within 4-radial miles of the Mardon property.

During the START on-site reconnaissance, ambient air monitoring conducted in the Newport Building detected total VOCs at 98 units above background levels in the ambient air and 53 units above background levels in the hazardous materials storage shed. No laboratory qualitative air samples are known to have been collected from the Mardon property. Based on available background information, no release of hazardous substances to the ambient air from on-site sources is known or suspected to have occurred and no impacts to nearby residential populations or sensitive environments are known or suspected.

MARDON INDUSTRIES
REFERENCES

[1] USGS (U. S. Geological Survey). 1986. 7 × 15 Topographic Map of Lyndonville, Vermont.

[2] USGS (U. S. Geological Survey). 1988. 7 × 15 Topographic Map of Burke Mountain, Vermont.

[3] USGS (U. S. Geological Survey). 1988. 7 × 15 Topographic Map of East Half of Saint Johnsbury, Vermont.

[4] USGS (U. S. Geological Survey). 1967. 7 × 15 Topographic Map of Concord, Vermont.

[5] Kiino, L. (START). 1997. Project Note, Mardon Industries, Latitude and Longitude Calculation. TDD No. 97-02-0033. 28 March.

[6] NUS/FIT (NUS Corporation Field Investigation Team). 1987. Draft Preliminary Assessment, Mardon Industries, Lyndon, Vermont. 29 June.

[7] START. 1997. Field Logbook for Mardon Industries Site Inspection. No. 00187-S. TDD No. 97-02-0033. 10 October.

[8] Town of Lyndonville. 1981. Tax Assessment Records, RE: Map No. 30, Lot No. 115. 1 July.

[9] Town of Lyndonville. 1981. Tax Assessment Records, RE: Map No. 30, Lot No. 114 & 179. 14 July.

[10] VT DEC (Vermont Department of Environmental Conservation). 1985. Summary of Soils and Groundwater Investigations for Mardon Industries, Lyndonville, VT. 30 April.

[11] EPA (U.S. Environmental Protection Agency). 1987. EPA Potential Hazardous Site Preliminary Assessment. Site No. D990800641. 5 June.

[12] Industrial & Environmental Analysts, Inc. 1986. Water Quality Analysis Report for Mardon Industries. 20 January and 13 January.

[13] VT DEC (Vermont Department of Environmental Conservation). 1985. Status Report on Mardon Industries, Lyndonville. October.

[14] Industrial & Environmental Analysts, Inc. 1985. Groundwater Analysis Report for Mardon Industries. 14 October.

[15] The Vermont Geological Survey. 1956. The Geology of the Lydonville Area, Vermont. Bulletin 8. Published by Div. Comm.

[16] Frost Associates. 1997. Project Note, Mardon Industries, RE: Private Well User and Population Information. TDD No. 97-02-0033. 18 April.

[17] DOI (U.S. Department of the Interior). 1994. Department of Fish and Wildlife, National Wetlands Inventory Map of Lyndonville, Vermont.

[18] DOI (U.S. Department of the Interior). 1994. Department of Fish and Wildlife, National Wetlands Inventory Map of Burke Mountain, Vermont.

[19] DOI (U.S. Department of the Interior). 1994. Department of Fish and Wildlife, National Wetlands Inventory Map of East Half of Saint Johnsbury, Vermont.

[20] DOI (U.S. Department of the Interior). 1994. Department of Fish and Wildlife, National Wetlands Inventory Map of Concord, Vermont. Undated.

[21] Angelo, M. (START). 1997. Project Note, Mardon Industries, RE: Flow Rate Calculation of Passumpsic River. TDD No. 97-02-0033. 17 November.

[22] McGrath, D. (START). 1997. Project Note, Mardon Industries, RE: Flow Rate Calculation of Miller Run River. TDD No. 97-02-0033. 16 December.

[23] Operach, B. (START). 1997. Project Note, Mardon Industries, RE: Wetland Acreage within 4-Radial Miles and Wetland Mileage along 15-Mile Downstream Surface Water Pathway. TDD No. 97-02-0033. 2 July.

[24] Vermont Agency of Natural Resources. 1997. Department of Fish and Wildlife. Project Note, Mardon Industries, RE: Sensitive Environments. TDD No. 97-02-0033. 12 May.

[25] Mahoney, M. (START). 1997. Phone Conversation Record with Ken Yeltsey (VT DEC), RE: Type of Water Supply to Map No. 30, Lot Nos. 114, 115, and 179. TDD No. 97-02-0033. 5 November.

[26] Mahoney, M. (START). 1997. Phone Conversation Record with Scott Townsend (Lyndonville Water System), RE: Lydonville Water System. TDD No. 97-02-0033. 29 December.

[27] Mahoney, M. (START). 1997. Project Note, RE: Apportionment Calculation for the Lyndonville Water System. TDD No. 97-02-0033. 30 December.

[28] Reserved.

MARDON INDUSTRIES
REFERENCES (Continued)

[29] Mahoney, M. (START). 1997. Phone Conversation Record with Ken Yeltsey (VT DEC), RE: Surface Water Drinking Water Intakes Along 15-mile Downstream Surface Water Pathway. TDD No. 97-02-0033. 16 October.

[30] Vermont Agency of Transportation. Map of the Lyndonville Water System and the Lyn Haven Inc. Drinking Water Wells with Delineated Wellhead Protection Areas. Undated.

[31] U.S. Soils Conservation Service. 1974. General Soil Map of Caledonia County, Vermont. U.S. Department of Agriculture. November.

[32] Mahoney, M. (START). 1997. Project Note, Mardon Industries, RE: Surface Water 15-Mile Downstream Pathway. TDD No. 97-02-0033. 5 November.

[33] DeLorme Mapping Company. 1987. Vermont Atlas and Gazetteer. Seventh Edition.

[34] Vermont Property Transfer Tax Deed. 1992. Deed, RE: Property Identified by Book No. 109, Page Nos. 243-245. 4 September.

[35] Lyn Haven, Inc. 1983. Lyn Haven, Inc. Well Data. 14 June.

[36] Mahoney, M. (START). 1998. Phone Conversation Record with the Lyndonville Town Clerk, RE: Schools Within 1-Radial Mile of Mardon Industries. TDD No. 97-02-0033. 20 January.

[37] VT DEC (Vermont Department of Environmental Conservation). 1987. Letter to G. Wilson (Mardon Industries), RE: Mardon Industries Inspection of 12 June 1987. 9 July.

[38] Moye, T. (VT DEC). 1985. Memorandum, RE: Mardon Industries On-site Disposal of Hazardous Waste. 13 March.

[39] Wagner, Heindel, & Noyes, Inc. 1986. Mardon Industries Closure/Post-Closure Report. 19 December.

[40] VT DEC (Vermont Department of Environmental Conservation). 1990. Letter to J. Hammang (Mardon Industries), RE: Issuance of an Assurance of Discontinuance. 5 February.

[41] VT DEC (Vermont Department of Environmental Conservation). 1989. RCRA Inspection Report, RE: Mardon Industries. 11 December.

[42] EPA (U.S. Environmental Protection Agency). 1990. Notice of Violations to Mardon Industries. 6 February.

MARDON INDUSTRIES
REFERENCES (Continued)

[43] Endyne, Inc.1990. Laboratory Report for Mardon Industries, Reference Nos. 10,264, 10,266, 10,268. 20 February.

[44] Wagner, Heindel, & Noyes, Inc. 1990. Letter to D. Conrad (VT DEC) , RE: Mardon Industries Quarterly Sampling Results. 28 March.

[45] VT DEC (Vermont Department of Environmental Conservation). 1990. Letter to G. Wilcox (Mardon Industries), RE: Revision of the Assurance of Discontinuance for Mardon Industries. 16 April.

[46] Reed, P. (VT DEC). 1990. Memorandum to G. Gluka (VT DEC), RE: Mardon Industries Hazardous Wastes On Site. 17 May.

[47] Reed, P. (VT DEC). 1990. Memorandum to G. Gulka (VT DEC), RE: Mardon Industries Post Closure Hazardous Wastes Stored On Site. 24 May.

[48] Endyne, Inc. 1990. Laboratory Report for Mardon Industries, Reference Nos. 12,592-12,597. 11 June.

[49] VT DEC (Vermont Department of Environmental Conservation). 1990. Letter to J. Hammang (Mardon Industries), RE: Facility Closing and Hazardous Wastes Stored On Site. 15 June.

[50] Joseph C. Palmisano Associates, Inc. 1990. Letter to W. Ahern (VT DEC), RE: Hazardous Waste On Site at Mardon Industries and the Closing of the Facility. 21 June.

[51] VT DEC (Vermont Department of Environmental Conservation). 1990. Letter to Joseph C. Palmisan Associates, Inc., RE: Mardon Industries Site Status. 11 July.

[52] Wagner, Heindel, & Noyes, Inc. 1987. Mardon Industries Closure/Post Closure Plan Modifications. 5 February.

[53] Bowen, B. (START). 1998. Project Note, RE: Area Calculation for Plume Nos. 1 and 2 at Mardon Industries. TDD No. 97-02-0033. 2 March.

[54] Mahoney, M. (START). 1997. Project Note, RE: Supplemental Questionnaire for Mardon Industries. TDD No. 97-02-0033. 10 October.

[55] VT DEC (Vermont Department of Environmental Conservation). 1986. Letter J. Hammang (Mardon Industries), RE: Closure/Post-Closure Plan Submittal for Subsurface Waste Disposal at Mardon Industries. 25 June.

[56] Vermont Geological Survey. 1956. Geology of the Lyndonville Area, Vermont. Bulletin No. 8.

[57] Mahoney, M. (START). 1998. Phone Conversation Record with Justin Smith of the Lyndon Town Hall, RE: Miller Run River Floodplain Information. 30 June.

[58] Forcier Aldrich & Associates, Inc. 1995. Village of Lyndonville Water Source Protection Plan. 12 September.

[59] START. 1999. Data Validation Memorandum to Ms. Christine Clark, Organic Case No. 26388, Sample Delivery Group No. ANX31, Southwest Laboratories-Tulsa/American Analytical and Technical Services, Mardon Industries Site. TDD No.: 98-05-0028.

[60] START. 1999. Data Validation Memorandum to Ms. Christine Clark, Inorganic Case No. 26388, Sample Delivery Group No. MALH33, Chemtech Laboratory, Mardon Industries Site. TDD No.: 98-05-0028.

[61] START. 1999. Data Validation Memorandum to Ms. Christine Clark, Organic Case No. 0168F, Sample Delivery Group No. DAFW27-O, Ceimic Corporation, Mardon Industries Site. TDD No.: 98-05-0028.

[62] START. 1999. Data Validation Memorandum to Ms. Christine Clark, Inorganic Case No. 0168F, Sample Delivery Group No. DAFW27_I, Ceimic Corporation, Mardon Industries Site. TDD No.: 98-05-0028.

[63] State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, Hazardous Materials Management. 1994. Letter submitted to Ms. Wendy Davenport, Lydonville, Vermont, Re: Former Mardon Industries Site. 25 May.

[64] EPA (U.S. Environmental Protection Agency). 1998. Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Superfund Program, Region I.

[65] EPA (U.S. Environmental Protection Agency). 1998. Resource Conservation and Recovery Information System (RCRIS) Superfund Program, Region I.

[66] EPA (U.S. Environmental Protection Agency), Region III. 1999. Risk-Based Concentrations. Available from http://www.epa.gov/reg3hwmd/risk/riskmenu. htm. Latest update on 12 April. Internet; accessed 4 May 1999.

[67] Smith, D. (U.S. EPA) 1999. Memorandum to Mr. George Mavris (START), Draft SIP Review, Mardon Industries, Lyndon, VTD990800641, TDD No. 99-05-0053. 13 May.

MARDON INDUSTRIES
REFERENCES (Concluded)

[68] Smith, D. (U.S. EPA) 1999. Memorandum to Mr. George Mavris (START), Draft SIP Review, Mardon Industries, Lyndon, VTD990800641, TDD No. 99-05-0053. 8 July.