Table 2.1
List of Reported Historical Spills/Releases through February 2008(1)

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Date	Type of Materials	Quantity	Description of Incident	Response Action
1962 - 1976	Process water and stormwater containing ammonia, dithiocarbamates, arsenic, and zinc	Unknown	Fish kills likely related to ammonia in Tributary One, Jeddo Creek, and/or Johnson Creek.	• Prior to 1974, FMC developed and implemented a program for controlled release of process wastewater based on ammonia levels. In approximately 1974-1977, FMC constructed a treatment system (evaporation/crystallization) for the pre-treatment of process wastewater from the production of dithiocarbamates. To comply with proposed NPDES permit limitations, during the period of 1976-1977 FMC regraded the Site so that surface water from the northern half of the Site was collected in a new lined impoundment (the Western Surface Impoundment) and treated in a new water treatment plant prior to discharge under the terms of the permit. FMC eliminated the use of the surface impoundments for collection of process wastewater, and eliminated the direct discharge of process wastewater.
April - May 1975	Dithiocarbamate wastewater and carbofuran maintenance wastewater	N/A	Bird kill in the eastern wastewater/process water basin due to carbofuran as a result of failure of a treatment system for maintenance water at the carbofuran production area.	• Attempts were made to prevent migratory birds from landing in the basin by installing netting and alarms/horns. The basin was saponified in 1975 with caustic to break down carbofuran levels. It was closed and filled in 1977 as part of the program to meet NPDES permit requirements and limitations.
Late 1960s - Early 1970s	Dithiocarbamate wastewater	Unknown	Burrowing animals in the berm to the eastern retention basin resulted in releases of wastewater to the Northern Ditches.	• The berm was repaired at times and the eastern basin was closed in 1977.
1977 - 1978	Stormwater from the Site	Unknown	Overflows from the newly constructed Western Surface Impoundment during rain events resulted in the flooding of several private properties at the northwest corner of the Facility along Vernon Street during winter 1977-1978.	• FMC constructed the Central and Eastern Surface Water Impoundments at the Facility in 1978-1979 for additional stormwater storage capacity.

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November 1, 1977 - April 30, 1978 (sample dates: 1/9/78 [arsenic daily average] and 2/22/78 [all other exceedances])	Stormwater from the Site	Unknown	Two overflows of the WSI (1/9/78 and 2/22/78) resulted in exceedances of the NPDES permit limits for the following parameters: arsenic (daily average) 1.05 mg/L (permit limit 0.2 mg/L); arsenic (maximum) 6.8 mg/L (permit limit 0.4 mg/L); ammonia (maximum) 265.4 mg/L (permit limit 4 mg/L); phenol (maximum) 6.8 mg/L (permit limit 0.5 mg/L); carbofuran (maximum) 2.6 mg/L (permit limit 0.12 mg/L).	• Water in WSI pumped and treated as rapidly as possible.
May 1, 1978 - October 31, 1978 (sample date: 6/5/78)	Untreated runoff from south side of Site	Unknown	Runoff water (Outfall 01B) from the Site exceeded the maximum allowable discharge for arsenic (0.4 mg/L) during the 6 month SPDES monitoring period with a maximum arsenic concentration of 0.62 mg/L.	• Unknown
November 1, 1978 - April 30, 1979 (sample date: 3/14/78)	Untreated runoff from south side of Site	Unknown	Runoff water (Outfall 01B) from the Site exceeded the maximum allowable discharges for arsenic (0.4 mg/L), ammonia (4.0 mg/L), and carbofuran (0.12 mg/L) during the 6 month SPDES monitoring period. The exceedances were arsenic 1.15 mg/L, ammonia 19.15 mg/L, and carbofuran 0.17 mg/L.	• Unknown
May 1, 1979 - October 31, 1979 (sample date: 9/14/79)	Untreated runoff from south side of Site	Unknown	Runoff water (at Outfall 01B) from the Site exceeded the maximum allowable discharge for arsenic (0.4 mg/L) during the 6-month SPDES monitoring period with an arsenic exceedance of 26.4 mg/L.	• Unknown
November 1, 1979 - April 30, 1980 (sample date: 12/25/79)	Untreated runoff from south side of Site	Unknown	Runoff water (at Outfall 01B) from the Site exceeded the maximum allowable discharge for arsenic (0.4 mg/L) and ammonia (4.0 mg/L) during the 6-month SPDES monitoring period. The exceedances were arsenic 0.9 mg/L and ammonia 18.8 mg/L.	• Unknown

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May 1, 1980 - October 31, 1980 (sample date: 5/7/80)	Water from the Site	Unknown	Two events caused exceedances of SPDES parameters during the 6 month SPDES monitoring period. The outage of a pH monitor/controller caused a maximum pH reading of 9.5 (permit limit 9.0) and the leakage of surface drainage into an inactive roof drain caused the exceedances of the following: maximum arsenic 1.6 mg/L (permit limit 0.4 mg/L); maximum phenols 1.36 mg/L (permit limit 0.5 mg/L); maximum carbofuran 0.22 mg/L (permit limit 0.12 mg/L); maximum ammonia 21.2 mg/L (permit limit 4.0 mg/L).	• The pH monitor/controller was repaired and the roof drain was sealed.
July 5, 1981	Stormwater from the Site	Unknown	A bypass of the treatment system occurred when heavy rains eroded temporary earthern dikes during reconstruction of the east retention basin dikes.	• The dikes were repaired.
January 27, 1982	Water discharge from the Site	Unknown	A 24-hour composite of Outfall 001 water yielded a maximum zinc concentration of 0.71 mg/L, in exceedance of the permit limit of 0.6 mg/L.	• Unknown.
October 26, 1982	Methyl iscocyante	7 lbs.	A leak occurred otdoors at a loose flanged pipe connection following maintenance work on piping. This resulted in the spill of methyl isocyanate onto a concrete pad on site.	• Niagara County Health Department and the National Response Center was notified. • Repairs were made prior to restarting the system.
October 30, 1984	Titanium oxide tube bundle	No spill	Titanium oxide tubes caught on fire during demolition/decommissioning activities.	• FMC Fire and Rescue Squad responded. • Niagara County Health Department was notified.
November 15, 1984	Methyl isocyanate	40 gallons	A pump malfunction resulted in the spill of methyl isocyanate onto a concrete pad on site.	• FMC personnel used activated carbon and water to clean up and contain spill. • NYSDEC and USEPA were notified. • Notified Roy-Hart School and school was evacuated. • In 1985 FMC eliminated the storage and use of methyl isocyanate at the Middleport facility.
November 30, 1984	Carbon disulfide	1 to 5 lbs.	A small pocket of carbon disulfide was encountered in a line which had been cut during decommissioning of an empty carbon disulfide tank. A spill and fire occurred and the carbon disulfide was burned and/or was contained within a concrete containment area on site.	• FMC Fire and Rescue Squad responded. • NYSDEC was notified. • The water was removed for off-Site disposal, the dike concrete structure was decontaminated and removed along with the remaining storage facilities.

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Date	Type of Materials	Quantity	Description of Incident	Response Action
February 23 through February 25, 1986	Stormwater from the Site	39,000 to 78,000 gallons (based on 44-hour overflow at 15-30 gpm).	Heavy rain and accompanying snowmelt necessitated the need to bypass the WSI or else risk flooding. Composite samples of bypass water indicated the first and second 24 hour composite samples exceeded limit of arsenic (0.4 mg/L) at concentrations of 0.65 mg/L and 1.11 mg/L, respectively.	• Stormwater flow rerouted back into WSI as soon as practicable.
February 1986 (sample date: 2/4/86) and March 1986 (sample date: 3/11/86)	Water discharge from Site	Unknown	Twenty-four hour monthly composite of Outfall 001 mercury samples of February 1986 and March 1986 reported by contract laboratory to be 14.0 mg/L and 151 mg/L, respectively, and so reported on February and March 1986 Discharge Monitoring Reports (permit limit was 1 mg/L).	• Magnitude and isolated nature of detections instigated the adoption of an accelerated mercury sampling plan utilizing the original and another contract laboratory. The February and March 1986 results were deemed to be spurious and due to laboratory contamination following receipt of additional sample results which showed non-detections of mercury from samples analyzed by the new laboratory versus mercury detections in samples analyzed by the original laboratory. Laboratory blank water from the original laboratory was ultimately shown to be contaminated with mercury at 18 mg/L.
May 16, 1986	Carbofuran (75 base)	200 lbs.	Carbofuran from a tote bin spilled onto a concrete containment pad outside the carbofuran formulating building.	• FMC personnel vacuumed the spilled material and sprayed the area down to prevent air migration of the spilled material. All material was cleaned up within an hour. • NYSDEC and the National Response Center were notified.
September 23, 1986	Stormwater from the Site	284,000 gallons	Storm event caused overflow of WSI from 8:30 AM to 6:30 PM on September 23, 1986. Composite samples of overflow water showed an arsenic exceedance of 6.6 mg/L (permit limit 0.4 mg/L) and ammonia exceedance of 3.6 mg/L (permit limit of 0.4 mg/L).	• Stormwater in WSI pumped to WTP and treated as rapidly as possible.
March 1, 1987	Water discharge from Site	Unknown	Twenty-four hour monthly composite sample of treated water at Outfall 001 showed a carbofuran exceedance of 0.14 mg/L (permit limit was 0.05 mg/L).	• Carbofuran exceedance was termed anomalous after review of Calgon unit samples and subsequent outfall samples showed no detections for carbofuran.
August 28, 1990	Fuel oil #2	50 - 100 gallons	Oil from NYSDEC registered tank was spilled onto a concrete/asphalt area during filling.	• FMC personnel contained and cleaned up spill. • NYSDEC was notified.

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August 5, 1992	Water discharge from Site	Unknown	The 24-hour composite quarterly (July 1, 1992 to September 30, 1992) sample for beta benzene hexachloride (BHC) yielded a result of 0.07 mg/L (permit limit 0.02 mg/L for total BHC).	• The reported beta-BHC result was only slightly above the method detection limit of 0.05 mg/L and within the range of variability of the practical quantitation limit.
August 28 - 29, 1992	Stormwater from the Site	932,000 gallons	Heavy rains resulted in overflow of the WSI from 8:15 AM August 28 to 11:30 AM August 29, 1992. Arsenic sample collected during composite sampling of event was 0.46 mg/L, an exceedance of the permit limit of 0.40 mg/L.	• Stormwater in the WSI was pumped to WTP and treated as rapidly as possible.
May 28, 1993	Water discharge from Site	Unknown	Twenty-four hour composite May monthly sampling for 1993 carbofuran yields a result of 0.009 mg/L (permit limit 0.0032 mg/L).	• Believed that lab glassware used in concurrent carbofuran study contaminated sample and lab, as no carbofuran detections were reported before or after.
July 1 to December 31, 1993 (sample dates: 11/26 - 27/93)	Water discharge from Site	Unknown	Twenty-four hour semi-annual composite sampling for net iron (for semi-annual period July 1 to December 31, 1993) yielded result of 0.41 mg/L (permit limit 0.3 mg/L).	• The sample was collected before the installation of the polishing filters in the WTP.
January 1 to June 30, 1994 (sample date: 4/13/94)	Water discharge from Site	Unknown	Twenty-four hour semi-annual composite sampling for aluminum (for semi-annual period January 1 to June 30, 1994) yielded result of 0.29 mg/L (permit limit 0.2 mg/L).	• None. Analysis of Tributary One upstream sample yielded aluminum concentration of 3.3 mg/L.
January 1 to June 30, 1995 (sample date: 5/15/95)	Water discharge from Site	Unknown	Twenty-four hour semi-annual composite sampling for net iron (for semi-annual period January 1 to June 30, 1995) yielded a result of 0.67 mg/L (permit limit 0.3 mg/L).	• Net iron is total iron concentration at Outfall 001 (0.83 mg/L) minus total iron concentration at Jeddo Creek/Tributary One (0.16 mg/L); which yielded 0.67 mg/L for this sample. This resulted in an exceedance because the total iron concentration at Jeddo Creek was unusually low, due to low flow conditions in the creek (total iron concentration in the creek varies proportionally with creek particulate and sediment load which is low when creek flow is low). No exceedance of dissolved iron occurred.
January 19 - 20, 1996	Stormwater from the Site	826,560 gallons	Heavy rains and snow melt resulted in an overflow of the WSI from 8:00 AM January 19 to 7:00 AM January 20, 1996. Hourly composite sampling during the event yielded an arsenic concentration of 0.37 mg/L (permit limit is 0.30 mg/L).	• WSI water pumped to WTP and treated as rapidly as possible.
January 1996	Water discharge from Site	Unknown	Monthly composite sampling at Outfall 001 during direct discharge (Option B) in January 1996 yielded an average phenolics concentration of 0.012 mg/L (permit limit 0.05 mg/L).	• Phenolics detection proved to be anomalous.

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Date	Type of Materials	Quantity	Description of Incident	Response Action
April 23 - 24, 1996	Stormwater from the Site	144,000 gallons (estimated and based on 100 GPM for 24 hours)	Heavy rain storms resulted in an overflow of the WSI from 8:00 AM April 23 to 8:00 AM April 24, 1996. Hourly composite sampling during the overflow yielded an arsenic concentration of 0.55 mg/L (permit limit is 0.30 mg/L).	• WSI water pumped to WTP and treated as rapidly as possible.
August 8 - 9, 1996	Stormwater from the Site	300,000 gallons	Heavy rains resulted in an overflow of the WSI from 6:45 PM August 8 to 7:30 AM August 8, 1996. Hourly composite sampling of the overflow yielded an arsenic concentration of 0.60 mg/L (permit limit is 0.30 mg/L).	• WSI water pumped to WTP and treated as rapidly as possible.
October 21, 1996	Stormwater from the Site	280,000 gallons	Heavy rains resulted in an overflow of the WSI from 6:00 AM to 6:00 PM on October 21, 1996. Hourly composite sampling during the event yielded an arsenic concentration of 0.69 mg/L (permit limit 0.3 mg/L).	• WSI water pumped to WTP and treated as rapidly as possible. FMC commits to conducting a surface water and storage evaluation report in 1997 to minimize possibility of future WSI overflows.
January 8 - 9, 1998	Stormwater from the Site	Unknown (Outfall 001 totalizer malfunction)	Heavy rain and snowmelt resulted in an overflow of the WSI from 7:30 AM January 8 to 7:00 PM January 9, 1998. No exceedances occurred.	• WSI water was withdrawn and treated as rapidly as possible.
January 1 to June 30, 1998 (sample date: 6/15/98)	Water discharge from Site	Unknown	Twenty-four hour semi-annual composite sampling (for semi-annual period January 1 to June 30, 1998) yielded an exceedance of the chloroform action level of 0.01 mg/l with a result of 0.037 mg/L.	• Suspected source of chloroform is tap water used to rinse WTP cation exchange beds. A short-term high intensity monitoring of tap water for chloroform was performed.
January 1 to June 30, 1998 (sample date: 6/15/98)	Water discharge from Site	Unknown	Twenty-four hour semi-annual composite sampling (for semi-annual period January 1 to June 30, 1998) yielded an exceedance of net iron at 0.36 mg/L (permit discharge limitation is 0.30 mg/L).	• None. Sample taken from Tributary One/Jeddo Creek for purposes of calculating net iron value was 0.13 mg/L, a very low iron concentration (previous three Tributary One iron samples ranged from 0.40 to 0.68 mg/L). Outfall 001 iron sample (0.49 mg/L) was within range of three previous Outfall 001 iron samples (0.37 to 0.62 mg/L). Tributary One iron sample anomalously low due to anomalously low creek flow. Total iron in creek heavily dependent on particulate matter and sediments. When creek flow is low, total iron in creek is low.
January 24-25, 1999	Stormwater from the Site	Unknown	Rapid snowmelt and rainfall resulted in an overflow of the WSI from January 24 to January 25, 1999. No exceedances occurred.	• WSI water pumped to WTP and treated as rapidly as possible.

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Date	Type of Materials	Quantity	Description of Incident	Response Action
May 14-15, 2002	Stormwater from the Site	Unknown	Heavy rain resulted in an overflow of the WSI from 6:00PM May 13 to 8:00AM May 15, 2002. Hourly composite sampling during the event yielded an arsenic concentration of 0.54 mg/L (permit limit 0.3 mg/L).	• WSI water pumped to WTP and treated as rapidly as possible.
April 14-15, 2004	Stormwater from the Site	826,120 gallons	Heavy rain resulted in an overflow of the WSI from 2:00AM April 14 to 8:15AM Apri 15, 200. Hourly composite sampling during the event yielded an arsenic concentration of 0.51 mg/L (permit limit 0.3 mg/L).	• WSI water pumped to WTP and treated as rapidly as possible. FMC critically evaluating key elements of the water treatment system that bear on managing storage capacity and holding times in the WSI and groundwater storage tanks.
August 31, 2005	Stormwater from the Site	370,210 gallons	Heavy rain resulted in an overflow of the WSI from 10:00AM to 5:30PM on August 31, 2005. No exceedances occurred.	• WSI water pumped to WTP and treated as rapidly as possible.
October 26, 2005	Stormwater from the Site	951,500 gallons	Heavy rain resulted in an overflow of the WSI from 9:50 PM to 8:15 PM on October 26, 2005. No exceedances occurred.	• WTP operated at full capacity and treated water as rapidly as possible.
November 9-10, 2005	Stormwater from the Site	551,840 gallons	Heavy rain resulted in an overflow of the WSI from 5:30 PM on November 9 to 2:40 AM No exceedances occurred.	• Continued to operate WTP until water receeded from overflow discharge point.
May 24, 2006	Water discharge from Site	Unknown	Twenty-four hour semi-annual composite sampling (for semi-annual period January 1 to June 30, 2006) yielded an exceedance of net iron at 0.93 mg/L (permit discharge limitation is 0.30 mg/L).	• Net iron for this sample was 0.93 mg/L. Ferric chloride is used to treat arsenic in water at the WTP. The concentration ferric chloride will be monitored. FMC intends to upgrade the WTP to improve treatment efficiency. No exceedences of dissolved iron occurred.
July 11-12, 2006	Stormwater from the Site	Unknown	Heavy rain (over 2 inches on July 11-12, 2006) resulted in an overflow of the WSI No exceedances occurred.	WTP operated at full capacity and treated water as rapidly as possible.
August 3, 2006	Stormwater from the Site	Unknown	Heavy rain resulted in an overflow of the WSI from 11:00 AM on August 3 to 8:00 AM on August 4. No exceedances occurred.	• WTP operated at full capacity and treated water as rapidly as possible.
September 14-16, 2006	Stormwater from Site	Unknown	Heavy rain (2.66 inches) fell between September 12-14. Rainfall exceeded capacity of WSI. No exceedances occurred.	• WTP operated at full capacity.
September 19, 2006	Stormwater from Site	Unknown	The WSI was at high volume level of 6'. Approximately 0.77 inches of rain on September 19th caused the WSI to overflow. No exceedances occurred.	• WTP operated at full capacity and treated water as rapidly as possible.
October 2006	Stormwater from Site	Unknown	Due to heavy and continuous rainfall during the month of October 2006, there were 11 WSI overflow events. No exceedances occurred.	• WTP operated at full capacity on a 24-hour a day schedule

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December 1, 2006	Stormwater from Site	Unknown	Heavy rainfall (1.8 inch) from November 30 - December 1 causing the WSI to overflow. No exceedances occurred.	• WTP operated at full capacity on a 24-hour a day schedule.
January 9, 2007	Water discharge from Site	Unknown	Daily maximum concentration of carbofuran was exceeded for the sampling event of January 8-9 at 0.0233 mg/L (permit discharge limitation is 0.01 mg/L).	• Investigated potential source of carbofuran into influent stream. No spills or releases were found. Reviewed subsequent data - all carborfuran levels were below permit limits or were not detected. Lab glassware or collection carboy may have been contaminated.
March 13, 2007	Stormwater from Site	Unknown	Overflow of WSI due to heavy rainfall and snow melt. No exceedances occurred.	• WTP operated at full capacity on a 24-hour a day schedule.
March 26-27, 2007	Stormwater from Site	Unknown	Frequent rainfall events including 0.53 inch on March 24 and 0.4 inch on March 26) caused the WSI to overflow. The March 26-27 composite sample yielded an arsenic concentration of 0.37 mg/L (permit discharge limitation is 0.30 mg/L). The March 27-28 composite outfall sample yielded 0.30 mg/L arsenic, below the discharge limit.	• WTP operated at full capacity on a 24-hour a day schedule.
April 16-17, 2007	Water discharge from Site	Unknown	The 24-hour composite sample collected on April 16-17 contained carbofuran at 0.02 mg/L (permit discharge limitation is 0.01 mg/L).	• Permit exceedance caused by breakthrough of Carbofuran from the activiated carbon filters. Change out of the filters had been deferred due to previous heavy rainfall and rapid snowmelt events. FMC began collecting weekly samples between the 2 carbon units to monitor for breakthrough of the lead unit.
April 18-19, 2007	Stormwater from Site	Unknown	Heavy and frequent rainfall (0.86 inch on Aprl 16th and 0.15 inch on April 17th) caused an overflow of WSI. The April 16-17 and the April 17-18 composite samples contained carbofuran at 0.027 mg/L and 0.123 mg/L, respectively (permit discharge limitation is 0.01 mg/L).	• WTP operated at full capacity on a 24-hour a day schedule. Activated carbon units were changed out. Weekly sampling between the the lead and polish carbon units was intitiated to to monitor for breakthrough of the lead unit.
April 23-24, 2007	Water discharge from Site	Unknown	The April 23-24 composite sample contained carbofuran at 0.63 mg/L (permit discharge limitation is 0.01 mg/L). The April 30-May 1 composite sample yielded carboufuran at 0.008 mg/L, below the permit discharge limit.	• WTP operated at full capacity on a 24-hour a day schedule. Activated carbon units were changed out. Weekly sampling between the the lead and polish carbon units was intitiated to to monitor for breakthrough of the lead unit.
December 23, 2007	Stormwater from Site	Unknown	Overflow of WSI due to heavy rainfall (0.27inch on December 23) and snowmelt. No exceedances occurred.	• WTP operated at full capacity on a 24-hour a day schedule.

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February 7-8, 2008	Stormwater from Site	Unknown	Heavy rain (0.5 inch on February 3-5) and snow melt resulted in overflow of WSI. No exceedences occurred.	• WTP operated at full capacity on a 24-hour a day schedule.
February 18-19, 2008	Stormwater from Site	Unknown	Heavy rain (0.5 inch on February 17-18) and snow melt resulted in overflow of WSI. No exceedences occurred.	• WTP operated at full capacity on a 24-hour a day schedule.

Notes:
(1) Also includes any SPDES permit exceedances and WSI overflows after the isolation of the ESI and closure of the CSI (1987-1989).

Table 2.2
Environmental-Related Permits

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Year(s)	Responsible Agency	Permit Description
March 1968	NYSDEC	Permit issued for the construction of a deep disposal well
1969 - 1970	NYSDEC	Permit to operate and use the deep well for disposal of wastewaters was applied for but not issued by the NYSDEC (see note 6)
1970 to Present	NYSDEC	Various NYSDEC permits for air emission points (see note 7)
1974 and 1977	USEPA	NPDES Permit (Permit No. NY0000345)
Late 1970s - Present	Village of Middleport	Sewer use permit (Permit No. 2)
1979 - Present	NYSDEC	SPDES Permit (Permit No. NY0000345)
1980 - 1985	USEPA/NYSDEC	RCRA Part A and Part B/NY Part 375 permit applications for management of hazardous waste

Notes:

1. NYSDEC = New York State Department of Environmental Conservation
2. USEPA = United States Environmental Protection Agency
3. NPDES = National Pollutant Discharge Elimination System
4. SPDES = State Pollutant Discharge Elimination System
5. RCRA = Resource Conservation and Recovery Act
6. Deep well was not used and was plugged and permanently sealed December 1986
7. Air discharge permits are listed in Table 2.3

Table 2.3
Summary of Historic Air Discharge Permits[1]

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Emission Point	Manufacturing Process	Process/Equipment	Estimated Operation or Permit Period [1]	Pollution Control Equipment	Nature of Emissions	Estimated Emission Rate* (lb/hr)
21-1	Fairfield Dust Formulation/ Packaging [6]	Mixer and Packaging Equipment	1974 to 1995 8 hours/day 250 days/year	Fuller Co. Model B, #6 Uni-Flow Dust Collector	*per permit effective 1987 to 1988* [6] Pyrethrum Piperonyl Butoxide Petroleum Distillate Silica Gel Sevin Malathion Napthalene Acetic Acid and Sodium Salt Clays, Inerts	 0.002 0.0078 0.0231 0.016 0.005 0.0016 0.015 0.0387
23-1	Lead Arsenate Pesticide Manufacturing/Formulation/ Packaging	Litharge Pneumatic Conveying System	1950s to 1974	Cyclone-fabric filter/ collector	*Not Available*	*Not Available*
23-2	Lead Arsenate Pesticide Manufacturing/Formulation/ Packaging	Drum Dyer Wet Scrubber	1950s to 1974	Wet scrubber	*Not Available*	*Not Available*
23-3 [4]	Dithiocarbamate Manufacturing/ Formulation/Packaging	Drum Dryer	1974 to 1981	None	Particulates *(per permit effective 1974 to 1977)*	0.07 lbs/1000 lbs
23-4 [4]	Dithiocarbamate Manufacturing/ Formulation/Packaging	Drum Dryer	1974 to 1985 24 hours/day 200 days/year	None	1974 - Particulates 1980 - Metiram 1985 - Ferbam	0.07 lbs/1000 lbs 0.072 grains/DSCF 0.79
23-5 [4]	Dithiocarbamate Manufacturing/ Formulation/Packaging	Drum Dryer	1974 to 1985 24 hours/day 200 days/year	None	1974 - Particulates 1980 - Metiram 1985 - Ferbam	0.06 lbs/1000 lbs 0.010 grains/DSCF 0.79
23-6 [4]	Dithiocarbamate Manufacturing/ Formulation/Packaging	Drum Dryer	1974 to 1985	None	1974 - Particulates	0.05 lbs/1000 lbs
23-7 [4]	Dithiocarbamate Manufacturing/ Formulation/Packaging	Drum Dryer	1974 to 1981	None	1974 - Particulates	0.05 lbs/1000 lbs
23-8	Dithiocarbamate Manufacturing/ Formulation/Packaging	Spray Dryer Product Collector	1976 to 1985 24 hours/day 250 days/year	Fabric Collector	1976 - Particulates 1985 - Metiram	0.20 lbs/1000 lbs 2.83
23-9	Dithiocarbamate Manufacturing/ Formulation/Packaging	North Copper Mixer Miscellaneous Dust Mixing	1975 to 1987 24 hours/day 250 days/year	Fabric Collector	1975 - Particulates	0.14
23-10	Dithiocarbamate Manufacturing/ Formulation/Packaging	Imp Mill Ventilation System	1975 to 1986 16 hours/day 200 days/year	Fabric Collector	1975 - Particulates 1978 - Particulates 1986 - Metiram	Trace 0.002 grains/DSCF 0.07
23-11	Lead Arsenate Pesticide Manufacturing/Formulation/ Packaging	Arsenicals Processing (Micro Mill vent)	1950s to 1974 24 hours/day 40 days/year	Fabric Collector	Lead arsenate	0.1 (permit issued 10/28/1974)
23-12	Lead Arsenate Pesticide Manufacturing/Formulation/ Packaging	Arsenicals Packaging (hopper vents)	1950s to 1974 24 hours/day 40 days/year	Fabric Collector	Lead arsenate	0.2 (permit issued 10/28/1974)

Table 2.3
Summary of Historic Air Discharge Permits[1]

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Emission Point	Manufacturing Process	Process/Equipment	Estimated Operation or Permit Period [1]	Pollution Control Equipment	Nature of Emissions	Estimated Emission Rate* (lb/hr)
23-13	Dithiocarbamate Manufacturing/ Formulation/Packaging	Drum Dryer Product Discharge Point	1974 to 1984 24 hours/day 200 days/year	Fabric Collector	1974 - Particulates 1980 - Metiram 1984 - Metiram	0.01 lbs/1000 lbs 0.037 grains/DSCF 0.037
23-14	Liquid Herbicide Formulations (Command®/Commence®)	Liquid Formulation & Packaging	1985 to 1988 24 hours/day 330 days/year	Activated Carbon	*per permit effective 1987 to 1988* Fenoxan (or Clomazone) Dimethylformamide Tenneco 500-100 Trifluralin	 0.0000024 1.8 9.19 0.00058
	Liquid Herbicide Formulations	Liquid Formulation & Packaging	1988 to present	Activated Carbon	*per permit effective 2006* Fenoxan (or Clomazone) 1,2,4 Trimethylbenzene Xylene Cumene Butanol	 0.001 0.012 0.058 0.007 0.001
23A-2	Dithiocarbamate Manufacturing/ Formulation/Packaging	Imp Mill Cyclone Vent	1974 to 1986	Fabric Collector	1974 - Particulates 1980 - Metiram	0.04 lbs/1000 lbs 0.03 grains/DSCF
26-1	Endosulfan Formulations/ Packaging	Raymond Mill Packaging Ventilation System	1974 to 1977	Fabric Collector	1974 - Particulates	0.15
26-1	Pesticide Formulation/Packaging	Plastic Container Shredder	Permit to Construct issued 10/10/89 - ***"Source not built" - emission point deleted 1990***	Fabric Collector	*-- Source not built --*	*-- Source not built --*
27-1	Endosulfan Formulations/ Packaging	Raymond Mill Air Purge	1974 to 1987 8 hours/day 70 days/year	Fabric Collector	1974 - Particulates 1981 - Thiodan Base	0.75 0.8
31-3	Liquid Herbicide Formulations (Command®/Commence®)	Fenoxan Storage Tank 31-3 (10,000 Gallons)	1985 to 1989 24 hours/day 365 days/year	Ventsorb Activated Carbon Filter	*per permit effective 1986 to 1987* Fenoxan (or Clomazone)	 0.001
31-4	Liquid Herbicide Formulations (Command®/Commence®)	Solvent Storage Tank 31-4 (10,000 Gallons) (dimethylformamide)	1985 to 1989 24 hours/day 365 days/year	Ventsorb Activated Carbon	*per permit effective 1986 to 1987* Dimethylformamide Trimethyl Benzene	 0.008 0.04
31-6	Liquid Herbicide Formulations (Command®/Commence®)	Fenoxan Storage Tank T-8100 (40,000 Gallons)	1985 to 1988 24 hours/day 365 days/year	Ventsorb Activated Carbon Filter	*per permit effective 1986 to 1987* Fenoxan	 1.0x10-7
32-1	Dithiocarbamate Manufacturing/ Formulation/Packaging	Liquid Carbamate Production	1974 to 1984 12 hours/day 150 days/year	Packed Tower	1974 - Hydrogen Sulfide 1981 - Hydrogen Sulfide 1982 - Hydrogen Sulfide Ammonia Carbon Disulfide Ethylene Diamine	Trace 0.002 0.004 0.6 8.05 0.07
32-10	Dithiocarbamate Manufacturing/ Formulation/Packaging	Carbon Disulfide Storage Tank	1980 to 1985 24 hours/day 365 days/year	None	1983 - Carbon Disulfide	0.28

Table 2.3
Summary of Historic Air Discharge Permits[1]

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Emission Point	Manufacturing Process	Process/Equipment	Estimated Operation or Permit Period [1]	Pollution Control Equipment	Nature of Emissions	Estimated Emission Rate* (lb/hr)
32-11	Dithiocarbamate Manufacturing/ Formulation/Packaging	Carbon Disulfide Storage Tank	1980 to 1985 24 hours/day 365 days/year	None	1983 - Carbon Disulfide	0.28
32-14	Dithiocarbamate Manufacturing/ Formulation/Packaging	Ethylene Diamine Storage Tank	1980 to 1984 24 hours/day 365 days/year	None	1983 - Ethylene Diamine	0.024
32-15	Dithiocarbamate Manufacturing/ Formulation/Packaging	Ethylene Diamine Storage Tank	1980 to 1985 24 hours/day 365 days/year	None	1983 - Ethylene Diamine	0.024
32-22	Dithiocarbamate Manufacturing/ Formulation/Packaging	Ethylene Diamine Storage Tank	1982 to 1984 24 hours/day 365 days/year	None	1983 - Ethylene Diamine	0.024
32-23	Dithiocarbamate Manufacturing/ Formulation/Packaging	Ethylene Diamine Storage Tank	1982 to 1984 24 hours/day 365 days/year	None	1983 - Ethylene Diamine	0.024
32-24	Dithiocarbamate Manufacturing/ Formulation/Packaging	Ethylene Diamine Storage Tank	1982 to 1984 24 hours/day 365 days/year	None	1983 - Ethylene Diamine	0.029
33-1	Endosulfan Formulations/ Packaging	Raymond Mill Packaging Ventilation	1977 to 1987 8 hours/day 280 days/year 8 hours/day 70 days/year 8 hours/day 210 days/year	Fabric Collector Fabric Collector None None 	1977 - Particulates *1981 - Unit I* Mineral Particulates Particulates Total Solid Part Thiodan Sodium Alk Ary Sulfo Ethylene Glycol *1981 - Unit I01* Thiodan Mineral Particulates Ethylene Glycol *1981 - Unit I02* Mineral Particulates Sodium Alk Ary Sulfo Particulates	0.2 0.202 0.018 NA 0.152 0.051 0.01 0.08 0.062 0.01 0.133 0.051 0.018

Table 2.3
Summary of Historic Air Discharge Permits[1]

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Emission Point	Manufacturing Process	Process/Equipment	Estimated Operation or Permit Period [1]	Pollution Control Equipment	Nature of Emissions	Estimated Emission Rate* (lb/hr)
33-2	Endosulfan Formulations/ Packaging	Raymond Mill Materials Addition Ventilation System	1977 to 1986 (2) 8 hours/day 280 days/year	Fabric Collector Fabric Collector	1977 - Particulates *1981 - Unit I* Thiodan Sodium Alk Ary Sulfo Glycol Clay Dust Particulates 1986 - Total Solid Particulates	0.2 0.162 0.051 0.01 0.204 0.018 NA
			8 hours/day 70 days/year	Fabric Collector	*1981 - Unit I01* Thiodan Clay Dust Glycol	 0.086 0.066 0.01
			8 hours/day 210 days/year	Fabric Collector	*1981 - Unit I02* Clay Dust Sodium Alk Ary Sulfo Particulates	 0.135 0.051 0.018
42-1	Custom Formulations (Miscellaneous Pesticides)	Miscellaneous Dust Mixing, Packaging and Dust Hoods	1973 to 1984 24 hours/day 260 days/year	Fabric Collector	1980 - Clay base or Pesticide Dusts (Polyram, Kelthane, Dochlone, Iprodione)	0.24
			1984 to 1989 24 hours/day 250 days/year	Fabric Collector	*per permit effective 1984 to 1989* Kelthane Dichlone Particulates	 0.12 0.12 0.12
42-2	Custom Formulations (Miscellaneous Pesticides)	Custom Formulations Sturtevant Air Milling	1973 to 1984 24 hours/day 260 days/year	Fabric Collector	1980 - Pesticide Dusts (Polyram, Kelthane Dochlone, Iprodione)	1.2
			1984 to 1989 24 hours/day 250 days/year	Fabric Collector	*per permit effective 1984 to 1989* Kelthane Dochlone	 1.2 1.2
46-2	Arsenical Pesticide Manufacturing	Roof Ventilation Hood Above Arsenic Acid Reaction Vessel	1950s to 1974 0.002 hours/day 40 days/year		*per permit effective 1974 to 1977* Nitrogen Dioxide	 280
46-3	Arsenical Pesticide Manufacturing	Roof Ventilation Hood Above Arsenic Acid Reaction Vessel	1950s to 1974 0.002 hours/day 40 days/year		*per permit effective 1974 to 1977* Nitrogen Dioxide	 280
46-4	Arsenical Pesticide Manufacturing	Roof Ventilation Hood Above Arsenic Acid Reaction Vessel	1950s to 1974 0.002 hours/day 40 days/year		*per permit effective 1974 to 1977* Nitrogen Dioxide	 280
46-5	Arsenical Pesticide Manufacturing	Roof Ventilation Hood Above Arsenic Acid Reaction Vessel	1950s to 1974 0.002 hours/day 40 days/year		*per permit effective 1974 to 1977* Nitrogen Dioxide	 280

Table 2.3
Summary of Historic Air Discharge Permits[1]

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Emission Point	Manufacturing Process	Process/Equipment	Estimated Operation or Permit Period [1]	Pollution Control Equipment	Nature of Emissions	Estimated Emission Rate* (lb/hr)
46-6	Arsenical Pesticide Manufacturing	Arsenic Hopper Ventilation System	1950s to 1974 24 hours/day 40 days/year	Fabric Collector	*per permit effective 1974 to 1977* Arsenic Trioxide	 0.12
46-A1	Arsenical Pesticide Manufacturing	Nitric Acid Reclaim System	1950s to 1974 24 hours/day 40 days/year		*per permit effective 1974 to 1977* Nitrogen Dioxide	 19.2
46-B1	Arsenical Pesticide Manufacturing	Pneumatic Conveying System	1950s to 1974 24 hours/day 40 days/year	Fabric Collector	*per permit effective 1974 to 1977* Arsenic Trioxide	 3.4
54-1	Sulfur Formulations/ Packaging	Sulfur Dust Mixing Ventilation	1950s to 1975 8 hours/day 100 days/year	Fabric Collector	*per permit effective 1974 to 1977* Pesticide Dusts	 0.15
54-2	Dichlone Formulations/ Packaging	Miscellaneous Dust Hoods Kidwell Ventilation	1974 to 1986	Fabric Collector	1974 - Particulates	0.05
54-3	Dichlone Formulations/ Packaging	Miscellaneous Packaging (Kidwell Area)	1975 to 1985 24 hours/day 175 days/year	Fabric Collector	1975 - Particulates 1983-1985 Dithane M45 (Macozeb) Dithane M-22 (Maneb) Organic Particulates	0.16 0.09 0.09 0.09
54-4	Dichlone Formulations/ Packaging	Kidwell Product Collector	1974 to 1981	Fabric Collector	1974 - Particulates	0.5
62-1	Liquid Herbicide Formulations (Command®/Commence®)	Herbicide Formulations (Methazole Production)	1978 to 1984	Fabric Collector	1978 - Methazole	0.3
65-3	Warehouse Area/Rebagging Sulfur Products	East Warehouse Rebagging	1974 to 1981	Fabric Collector	1974 - Particulates	0.07 lbs/1000 lbs
65-4	Carbofuran Formulations/ Packaging	Carbofuran Tech Handling Ventilation	1985/1986 to Present 24 hours/day 365 days/year	Fabric Collector Carbon Filter	*per permit effective 1985 to 1986* Carbofuran	 0.036
65-5	Refuse Incinerator (i.e., cardboard)	Incinerator Combustall Model 200	1973 to 1987 7 hours/day 250 days/year	Thermal Afterburner	1982 - Particulates	0.2
65A-1	Dithiocarbamates Manufacturing/ Formulation/Packaging	Miscellaneous Dust Hoods Sturtevant Mill Ventilation	1975 to 1986 24 hours/day 250 days/year	Fabric Collector	1975 - Particulates 1984 - Metiram	Trace 0.08
65A-2	Dithiocarbamates Manufacturing/ Formulation/Packaging	Sturtevant Mill Product Recovery	1975 to 1986 (3)	Fabric Collector	1975 - Particulates 1980 - Particulates	0.06 grains/DSCF 1.0
65-6	Pesticide Formulation/ Packaging	Drum Compactor	1986 to Present 8 hours/day 20 days/year	CRN Filter System, Flanders Filter (HEPA and charcoal filter)	*per permit effective 1986 to 1987* Particulates	 0.0041
66-1	Research Formulations Lab	Miscellaneous Dust Hoods	1963 to 1984 8 hours/day 260 days/year	Fabric Collector	1982 - Carbofuran	0.001

Table 2.3
Summary of Historic Air Discharge Permits[1]

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Emission Point	Manufacturing Process	Process/Equipment	Estimated Operation or Permit Period [1]	Pollution Control Equipment	Nature of Emissions	Estimated Emission Rate* (lb/hr)
66-2	Research Formulations Lab	Miscellaneous Dust Formulations Lab	1963 to 1984 8 hours/day 260 days/year	Fabric Collector	1982 - Carbofuran	0.001
70-1	Carbofuran Manufacturing [5], Formulations and Packaging	Unit I - Emergency Standby Thermal Oxidizer Unit I03- MIC Storage Vault Ventilation Unit I04- Wet Room Maintenance/ Emergency Ventilation	1969 to 1985[5] 24 hours/day 45 days/year	Thermal Afterburner (Oxy-Catalyst)	*Unit I03 - per permit effective 1985 to 1988* Methyl Isocyanate Triethylamine *Unit I04 - per permit effective 1985 to 1988* Methyl Isocyanate Methylene Chloride Hydrogen Chloride *Unit I - per permit effective 1985 to 1988* Carbofuran Particulates Methyl Isocyanate Methylene Chloride Triethylamine Hydrogen Chloride	 0.002 0.058 0.06 0.1 0.28 0.001 0.996 0.762 0.1 0.058 0.28
70-2	Carbofuran Manufacturing [5], Formulations and Packaging	Unit I - Process Thermal Oxidizer (PTO)	1969 to 1985[5]	PTO	*per permit effective 1986 to 1989 [5]* Carbofuran Particulates Methyl Isocyanate Methylene Chloride Triethylamine Benzofuranol,hydmeth Hydrogen Chloride Nitrogen Dioxide Benzofuran,hydrometh Total Aromatics NEC Benzofuran,chlormeth	 0.006 0.127 0.29 2.67 0.597 0.022 7.33 12.9 0.98 0.81 1.08
		Unit I01 - PTO Enriched Burner Stream (scrubber exhaust)	24 hours/day 305 days/year	Venturi Scrubber, Thermal Afterburner	*Unit I01 - per permit effective 1986 to 1989 [5]* Methyl Isocyanate Methylene Chloride Triethylamine Benzofuranol,hydmeth	 0.001 0.001 0.14 0.001
		Unit I02 - MIC Railcar Unloading Building Exhaust	24 hours/day 350 days/year	Thermal Afterburner	*Unit I02 - per permit effective 1986 to 1989 [5]* Methyl Isocyanate	 1.36
		Unit I03 - MIC Storage Vault & Triethylamine Tank Exhaust	24 hours/day 350 days/year	Thermal Afterburner	*Unit I03 - per permit effective 1986 to 1989 [5]* Methyl Isocyanate Triethylamine	 0.001 0.034

Table 2.3
Summary of Historic Air Discharge Permits[1]

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Emission Point	Manufacturing Process	Process/Equipment	Estimated Operation or Permit Period [1]	Pollution Control Equipment	Nature of Emissions	Estimated Emission Rate* (lb/hr)
70-2 (cont'd)		Unit I04 - Wet Room Maintenance Ventilation	24 hours/day 305 days/year	Thermal Afterburner	*Unit I04 - per permit effective 1986 to 1989* [5]	
					Methyl Isocyanate	0.036
					Methylene Chloride	0.271
					Hydrogen Chloride	7.33
		Unit I05 - General Ventilation from Dry Rooms & Recycle Areas	24 hours/day 350 days/year	Fabric Collector Thermal Afterburner	*Unit I05 - per permit effective 1986 to 1989* [5]	
					Carbofuran	0.004
					Particulates	0.001
					Methyl Isocyanate	0.042
					Methylene Chloride	0.21
		Unit I07 - East Product Line Collection	24 hours/day 350 days/year	Fabric Collector Thermal Afterburner	*Unit I07 - per permit effective 1986 to 1989* [5]	
					Carbofuran	0.001
					Particulates	0.001
					Methyl Isocyanate	0.021
					Methylene Chloride	0.362
					Triethylamine	0.175
		Unit I08 - Wet Room, 7-Oh Scrubbers and Flowable Mixing Area	24 hours/day 350 days/year	Thermal Afterburner	*Unit I08 - per permit effective 1986 to 1989* [5]	
					Methyl Isocyanate	0.167
					Methylene Chloride	1.452
					Triethylamine	0.07
					Benzofuranol,hydmeth	0.022
					Benzofuran,hydrometh	0.98
					Total Aromatics NEC	0.81
					Benzofuran,chlormeth	1.08
		Unit I09 - Emergency Seal Pot Vent	24 hours/day 350 days/year	Thermal Afterburner	*Unit I09 - per permit effective 1986 to 1989* [5]	
					Methyl Isocyanate	0.001
					Methylene Chloride	0.001
		Unit I10 - Reactor Purge System for vapor recovery/recycle	24 hours/day 305 days/year	Thermal Afterburner	*Unit I10 - per permit effective 1986 to 1989* [5]	
					Methyl Isocyanate	0.001
					Methylene Chloride	0.001
		Unit I11 - Technical Carbofuran Packout	24 hours/day 45 days/year	Thermal Afterburner	*Unit I11 - per permit effective 1986 to 1989* [5]	
					Carbofuran	0.001
					Methyl Isocyanate	0.021
					Methylene Chloride	0.362
					Triethylamine	0.175
		Unit I87 - West Product Line Collection	24 hours/day 305 days/year	Thermal Afterburner	*Unit I87 - per permit effective 1986 to 1989* [5]	
					Carbofuran	0.001
					Particulates	0.001
					Methyl Isocyanate	0.021
					Methylene Chloride	0.362
					Triethylamine	0.175

Table 2.3
Summary of Historic Air Discharge Permits[1]

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Emission Point	Manufacturing Process	Process/Equipment	Estimated Operation or Permit Period [1]	Pollution Control Equipment	Nature of Emissions	Estimated Emission Rate* (lb/hr)
70-2 (cont'd)		Unit I96- West Product Line Collection	24 hours/day 45 days/year		*Unit I96 - per permit effective 1986 to 1989 [5]*	
				Fabric Collector Thermal Afterburner	Carbofuran Particulates Methyl Isocyanate Methylene Chloride Triethylamine	0.001 0.001 0.001 0.001
70-3	Carbofuran Manufacturing [5], Formulations and Packaging	Clay Handling System	1981 to 1984 24 hours/day 350 days/year	Fabric Collector	1981 - Particulates	0.43
70-4	Carbofuran Formulations and Packaging	Unit I - Export & Flowable Packaging Areas	1982 to Present	--	*Unit I - per permit effective 1982 to 1983*	
					Carbofuran Particulates	0.001 0.533
		Unit I01 - Export Packaging Ventilation	24 hours/day 350 days/year	Fabric Collector	*Unit I01 - per permit effective 1982 to 1983*	
					Carbofuran Particulates	0.001 0.469
		Unit I02 - Flowable Packaging Ventilation	24 hours/day 350 days/year	None	*Unit I02 - per permit effective 1982 to 1983*	
					Carbofuran Particulates	0.001 0.064
70-5	Carbofuran Formulations and Packaging	Unit I - Clay Blending	1982 to Present 24 hours/day	Fabric Collector	*Unit I - per permit effective 1984 to 1989*	
					Particulates	1.29
		Unit I01-Clay Blending for Base	350 days/year	Fabric Collector	*Unit I01 - per permit effective 1984 to 1989*	
					Particulates	0.09
		Unit I01-Clay Handling for Flowable		Fabric Collector	*Unit I03 - per permit effective 1984 to 1989*	
					Particulates	0.326
80-1	Water Treatment Plant	Surface Water Plant Dust Hoods	1980 to Present 1 hour/day 110 days/year	Fabric Collector	*per permit effective 1983 to 1987*	
					Ferric Sulfate Calcium Oxide Particulates	0.04 0.05 0.06
80-2	Water Treatment Plant	Surface Water Plant Filter Cake Dryer	1989 to early 1990s			
1004P	R&D Laboratory	Herbicide Lab Hood	1978 to 1982	Fan	C14 - radioactive organics	none
1005P	R&D Laboratory	Residue Lab Hood Rm 117				
1006P	R&D Laboratory	Residue Lab Hood Rm 111				
1007P	R&D Laboratory	Residue Lab Hood Rm 114				
114-1	Dithiocarbamate Manufacturing/ Formulation/Packaging	Dithiocarbamate Scrubber	1977 to 1985	Cyclone Venturi Scrubber Fan	1977 - Particulates 1977 - Total Solid Particulates 1984 - Ammonium Sulfate 1984 - Sodium Sulfate	1.09 gr/100 scf 2.18 gr/100 scf 0.2 0.2

Notes:

* Estimated annual emission rate as stated in the NYSDEC permit available.

(1) Based on information from available historic air discharge permits and related documents issued for known air emission points during the approximate period of mid-1970s through 1980s

(2) Source not operating during annual inspections in 1984, 1985, and 1986.

(3) Per 1984 annual inspection, operates only when customer orders product.

(4) Emission points 23-3, 23-4, 23-5, 23-6 and 23-7 were used for the lead arsenate manufacturing process prior to 1972 (corresponding air discharge permits were not available).

(5) Carbofuran manufacturing and the use of methyl isocyanate (MIC) ceased in 1985. The carbofuran manufacturing process equipment was decontaminated in 1985-1986, and was later dismantled/removed in the 1980s and 1990s. Carbofuran formulations and packaging from 1969 to present.

(5) Permit issued to owner of emission point 21-1, Fairfield American Corporation.

Table 2.4
Historic Solid and Hazardous Waste Disposal Summary (1)

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SWMU/Disposal Area	Approximate Years of Operation	Process	Materials
SMWU #2 - Waste burial area east of the manufacturing facilities.	1928-1970*	Production and formulation of inorganic and organic pesticides	Process and other wastes from various production and/or formulation operations at the Facility. The nature and exact sources of the buried materials are not known. Inorganic and organic pesticides which may be present include including lead and calcium arsenates, dithiocarbamates, chlorinated pesticides, and organophosphate pesticides.
SWMUs #5 and #6 - Surface water settling lagoons in northwest corner of Facility.	1930-1960s**	Arsenical pesticides	Surface water runoff and washwater from process areas
SWMU #8 - Dinitrocresol lagoon north of Building 61.	1962-1968*	Dinitrocresol	Sodium sulfate by-product wastewater
SWMU #7 - Central process wastewater retention basins.	1964-1977	Dithiocarbamate pesticides	Process wastewater primarily consisting of inorganic salt by-products
SWMU #3 - Eastern process wastewater retention basin.	1964-1977*	Dithiocarbamate pesticides	Process wastewater from dithiocarbamate pesticide manufacturing
	1969-1975	Carbofuran	Treated maintenance washwater from carbofuran manufacturing
SWMU #1 - Arsenic acid production area.	1930-1965*	Arsenic acid	Spills and releases from production areas

Notes:
* As referenced in the 1989 Modified RFA Report.
** Based on the 1989 Modified RFA Report and aerial photographs in the USEPA Aerial Photography Site Analyses Report, dated May 1987.
SWMU Solid Waste Management Unit.
(1) The 1989 Modified RFA Report has not been approved by the Agenices. The NYSDEC September 8, 1989 letter acknowledged the 1989 Modified RFA Report and stated that the NYSDEC's 1988 RFA Report and the 1989 Modified RFA Report would be considered in the RFI process.

Table 2.5
SWMU List

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SWMU Number [1]	SWMU Name	SWMU Description
1	Arsenic Acid Area	Spillage arsenic acid production tanks and drums.
2	Old Landfill Area	Burial of various pesticide wastes.
3	Former Wastewater Basin	Eastern carbofuran and dithiocarbamate waste water impoundment.
4	Western Surface Impoundment (WSI)	Lined stormwater impoundment, proceses closed with respect to hazardous wastes by removal in 1988 and retrofitted as a non-hazardous stormwater basin.
5	Stormwater Retention Impoundment	Unlined arsenical surfacewater settling lagoon.
6	Stormwater Retention Impoundment	Unlined arsenical surfacewater settling lagoon.
7	Process Wastewater Basin	Unlined dithiocarbamate process waste water retention basin.
8	Dinitrocresol (Phenolic) Surface Impoundment	Unlined lagoon.
9	Dithiocarbamate Wastewater Tank	Aboveground storage tank (AST).
10	Dithiocarbamate Wastewater Tank	AST [2]
11	Dithiocarbamate Wastewater Tank (Indoor)	AST
12	Dithiocarbamate Wastewater Tank (Indoor)	AST
13	Dithiocarbamate Wastewater Tank (Indoor)	AST
14	Compressor Blowdown Sump	Concrete-lined indoor sump for oily water.
15	Flowable Wastewater Sump	Concrete-lined indoor sump for carbofuran wastewater.
16	Evaporator Sump	Concrete-lined sump closed and filled with concrete.
17	Dithocarbamate Tank Sump	Concrete-lined outdoor sump.
18	Kidwell Sump	Concrete-lined partially outdoor sump.
19	Contaminated Scrap Metal Waste Lugger	Scrap metal waste lugger located at end of access road, east of Building #23.
20	R&D Soil Lugger Area	Waste lugger located on a containment pad.
21	Filter Cake Luggers	Waste lugger located on a containment pad.
22	Metabolism Lab Generation Waste Area	Indoor waste drum storage.
23	Formulations Generation Waste Area	Outdoor waste drum generation area.
24	Formulations Waste Storage Area	Outdoor waste drum storage area.
25	Product Formulations Waste Area	Indoor drum storage area.
26	Formulations Waste Storage Area	Indoor drum storage area.
27	Research Solvent Storage Area	Outdoor drum storage area.
28	Specialty Products Storage Area	Indoor drum storage area.
29	Dithiocarbamate Waste Area	Indoor drum storage area.
30	Laboratory Solvent Waste Area	Indoor drum storage/generation area.
31	Storage Area	Outdoor drum storage area.
32	Carbofuran Storage Area	Indoor drum storage area.
33	Empty Drum Storage Area	Indoor empty drum storage area.
34	Carbofuran Storage Area	Indoor container storage area.
35	Sulfur Shed Storage Area	Indoor drum storage area.
36	Spent Oil Waste Area	Indoor drum storage area.
37	R&D Waste Area	Indoor drum storage area.
38	Carbofuran Trash Area	Indoor trash and empty container storage area.
39	Dithiocarbamate Trash Area	Indoor trash and empty container storage area.
40	Warehouse Storage	Indoor container storage area.
41	North Tandex Dust House	Aboveground dust house/collector.
42	South Tandex Dust House	Aboveground dust house/collector.
43	R&D Waste Area (East) Dust House	Aboveground dust house/collector.
44	R&D Waste Area (West) Dust House	Aboveground dust house/collector.
45	Fairfield Dust House	Aboveground dust house/collector.
46	Kidwell (East) Dust House	Aboveground dust house/collector.
47	Kidwell (West) Dust House	Aboveground dust house/collector.
48	West Miscellaneous Dust House	Aboveground dust house/collector.

Table 2.5
SWMU List

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SWMU Number [1]	SWMU Name	SWMU Description
49	Central Surface Impoundment (CSI)	Unlined stormwater runoff impoundment closed in 1988 by removal of sediments and capping.
50	Eastern Surface Impoundment (ESI)	Unlined stormwater runoff retention impoundment removed from service and isolated in 1988. Closure has been deferred pending completion of the RFI/CMS. Subsequent to 1988, the area has been used for the placement of soils and other non-hazardous remediation wastes generated in the course of various IRM and ICM projects.
AOCn #1 [3]	Carbon Disulfide Storage Tank Area (3)	AST
52	Xylene Storage Area	ASTs
53	Contaminated Soil Storage Area	Temporary lined storage unit for soils excavated from the off-site Northern Ditches.
54	ESI Soil Deposition Area or ESI Fill Area	Placement of soils and debris removed as part of several remediation projects, including the 1996 Roy Hart School Bleacher Area IRM, 1999-2000 Roy-Hart School Football Field Area ICM, 2003 West Properties ICM, 2005 Phase 1 North Railroad Property ICM, 2007 Early Actions.

Notes:
AOCn Area of Concern
(1) Solid Waste Management Unit (SWMU) numbers are those identified in the NYSDEC's 1988 RFA document and in FMC revised version of the NYSDEC document entitled "RCRA Facility Assessment, Preliminary Review", dated May 1, 1989 (the 1989 Modified RFA Report has not been approved or accepted by the Agencies).
(2) AST - Aboveground Storage Tank
(3) Formerly designated as SWMU #51; designated as AOCn #1 as requested by the Agencies (Agencies 1998).

Table 2.6
SWMU Grouping Key [1]

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SWMU Group	SWMUs in Group	General Location of SWMU(s)	Grouping Criteria
Group A	1 and 31	South of Building 71 (former arsenic acid production area)	Geographical
Group B	2, 14, 15, 19, 33 and 34	Old landfill on east-central portion of the Site	Geographical
Group C	3, 53, and 54	Northeast portion of the Site (same location or adjacent to Eastern Surface Impoundment)	Geographical and similar wastes
Group D	5, 6, and 22	Northwest corner of the Site	Geographical and similar wastes
Group E	7 and 52	North-central portion of the Site	Geographical, SWMU #52 is entirely within the boundaries of SWMU #7
Group F	8	North-central portion of the Site	Geographical separation from other units and unique waste material
Group G	9, 10, 11, 12, 13, 16, 17, 29, 39, and 48	Within or in vicinity of Buildings 23 and 24	Geographical and similar waste types
Group H	18, 46, and 47	Within Building 24	Geographical and similar waste types
Group I	23, 24, 25, 43, 44, and 45	Within or in vicinity of Building 24	Geographical and similar waste types
Group J	27 and 37	Former FMC-owned property southwest of Facility	Geographical and similar waste types
Group K	30	South of Building 48	Geographical separation from other units and unique waste material
Group L	35, 41, and 42	Within or in vicinity of Building 67	Geographical and similar waste types
Group M [2]	formerly SWMU #51 [2]/AOCn #1	Southwest corner of present Facility	Geographical separation from other units and unique waste material

Table 2.6

SWMU Grouping Key [1]

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SWMU Group	SWMUs in Group	General Location of SWMU(s)	Grouping Criteria
Group N	4, 49, and 50	All are surface impoundments at various locations across the Site	Handled similar waste types because of interconnection
Group O	20, 21, 26, 28, 32, 36, 38, and 40	Various locations across the Site	All container storage areas

Notes:

(1) Solid Waste Managment Unit (SWMU) numbers and groups are those identified in the NYSDEC's 1988 RFA document and FMC revised version of the NYSDEC document entitled "RCRA Facility Assessment, Preliminary Review," dated May 1, 1989 (the 1989 Modified RFA Report has not been approved or accepted by the Agencies).

(2) SWMU #51 has been redesignated as AOCn #1.

Table 2.7
Site-Specific Parameter List [1]

RCRA Facility Investigation Report
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FMC Corporation - Middleport, New York

Test Parameter	Products Manufactured, Formulated or Used [1]
Metals Arsenic Lead Zinc Thallium Mercury Selenium Cadmium	[Arsenic Acid, Arsenic Trioxide, Lead Arsenate, Calcium Arsenate, Sodium Arsenite] [Lead Arsenate, Lead Oxide] Lead [Dithiocarbamate (Zn)] [Thallium Sulfate]
Total Dithiocarbamates	[Ambam Oxidation Product, Zinc Ammonium Carbamate (Polyram), Ferbam, Maneb, Mancozeb, Nabam, Niacide, Thiram, Zineb, Ziram, Carbon Disulfide]
Chlorinated Pesticides	Aldrin, BHC(alpha, beta, delta, gamma), Chlordane (alpha, gamma), DDD, DDE, DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan Sulfate, Endrin, Endrin Aldehyde, Endrin Ketone, Heptachlor, Heptachlor Epoxide, Methoxychlor, Toxaphene, Isodrin
Organophosphate Pesticides	Ethion (ethoprophos), Malathion, Methyl Parathion, Parathion, Ronnel, Dursban, Diazinon, Phorate, DDVP (Dichlorovos), Phosdrin (Mevinphos)
Methyl Carbamates	Carbaryl, Carbofuran, Chlorpropham, Propoxur, 7-hydroxybenzofuran
Phenolic Compounds	Dinitro-butylphenol (DNBP, Dinoseb)*, Karathane* (or Dinocap)
Volatile Organic Compounds	Acetone, Benzene, Ethyl Benzene, Methylene Chloride, Toluene, Total Xylenes, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Chlorobenzene, Chloroform, 1,2-Dichloroethane, Trichloroethene, 1,1-Dichloroethene
Ammonia (Total)	[Ammonia Sulfate, Ammonia (anhydrous), Zinc Ammonium Carbamate (Polyram)], Amban
FMC Test Procedures	Karbutilate, Ethylene Thiourea (ETU)

Table 2.7
Site-Specific Parameter List [1]

RCRA Facility Investigation Report
Volume 1 - Background Information
FMC Corporation - Middleport, New York

Test Parameter	Products Manufactured, Formulated or Used [1]
EPA Industrial Technology Division, List of Analytes, March 1987	Dichlone, Rotenone, Trithion
Semi-Volatile Compounds	1,4-Dichlorobenzene, bis(2-ethylhexyl) phthalate, Napthalene, Phenol, Aramite, Isophorone, O-Cresol (2-methylphenol), Dinitro-o-Cresol (2-methyl-4,6-dinitrophenol)
General Inorganics	Cyanide
Dinitroaniline Pesticides	Trifluralin

Notes:

* These compounds may also be analyzed as chlorinated herbicides. Other compounds detected by the methods employed may be reported where compounds are included in the analytical standards being used.

[ ] Compounds within the brackets are not analytes of the associated analytical methods but are materials historically handled at the Site.

( ) Compounds within parentheses are synonyms (different name) for the compound immediately preceding the parentheses.

(1) This Site-Specific Parameter List (SSPL) was presented in the approved RCRA Facility Investigation Work Plan (dated July 1993). The SSPL was developed as described in the "Master Compound List and Various Related Lists for Environmental Studies, FMC Corporation, Middleport, New York" (dated December 19, 1988) from a list of known materials used and/or produced historically at the FMC Middleport Plant from the mid-1920s through 1988.

Table 3.1
Environmental Investigation and Monitoring Programs

RCRA Facility Investigation Report
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FMC Corporation - Middleport, New York

Program [1]	Date(s) Conducted	Description	Number of Analytical Samples/Locations	Purpose
Groundwater				
1. Investigation of Groundwater Contamination on FMC Property	1979-1980	Samples of on-site observation wells	45/23	Review chemical and hydrological data
2. Investigation of Groundwater Conditions Along the Northern Property Line of the FMC Corporation Plant	1981	Three part groundwater sampling program of existing overburden and bedrock observation wells	45/8	Determine more precisely the levels of groundwater contamination in overburden and shall bedrock formations and evaluate most likely off-site locations where contaminants may have migrated
3. Investigation of Hydrogeologic Conditions in the Bedrock at Four Locations North of the FMC Corporation Plant	1981-1982	Sampling of shallow and deep bedrock wells located along FMC's northern plant boundary	19/8	Determine whether groundwater contamination detected along northern boundary of FMC plant has migrated off-site
4. Investigation of Groundwater Contamination	1983	Quarterly sampling of overburden and bedrock monitoring wells	63/28	Monitor presence of contaminants detected in groundwater beneath the Site
5. Geophysical Survey	1985	Earth resistivity survey (vertical electrical sounding)	total of 50 soundings taken (survey performed along 11 transects with sounding stations at 200-ft intervals)	Determine whether chemical plume existed in groundwater beneath the site
6. Site Investigation	1985-1986	Three rounds of sampling of groundwater monitoring wells and private water supply wells	190/82	Obtain additional information to allow accurate assessment of site's impact on public welfare and environment
7. Surface Water Impoundment Monitoring Program (SWIM)	1985-1986	Semi-annual monitoring of groundwater adjacent to the eastern, central, & western surface impoundments	240/12	To fulfill the 6 NYCRR Part 373 interim status groundwater monitoring requirements
8. Comprehensive Roy-Hart School Sampling Program	1987	Samples of four wells (overburden and shallow bedrock) located on Royalton-Hartland school property	5/4	To establish vertical and areal contaminant boundaries throughout open school property
9. Surface Water Treatment Plant Trial Demonstration Plan	1988	Sampling of on-site groundwater collection sumps and extraction wells	19/11	Evaluate quality and volume of groundwater which will be generated and treated on-Site
10. Interim Groundwater Assessment Program	1988-1990	Quarterly sampling of groundwater monitoring wells	approx. 20/17 per event	To fulfill the 6 NYCRR Part 373 interim status groundwater monitoring requirements
11. Site Groundwater Quality Assessment Monitoring Plan (SGQAMP) and Supplemental Groundwater Data Collection (SGDC) Program	1990	Quarterly sampling of groundwater monitoring wells	approx. 44/39 per event	To fulfill the 6 NYCRR Part 373 interim status groundwater monitoring requirements
12. Groundwater Monitoring Program (GMP)	1991-present	Monthly and quarterly sampling of extraction wells, the WSI underdrain sump and on-Site and off-Site monitoring wells	average 73/68 per event	To fulfill the 6 NYCRR Part 373 interim status groundwater monitoring requirements
13. Supplemental Aquifer Testing	1992	Samples from extraction wells	23/5	Determine methylene chloride concentrations at 10 foot intervals within shallow, intermediate, and deep bedrock intervals
14. RCRA Facility Investigation	1993-1997	As part of the 1993 RFI field activities, two new monitoring wells were installed and sampled in addition to sampling and analysis of existing GMP monitoring wells and three other existing on-site wells that were not in the GMP. In 1995 through 1997, eight new monitoring wells were installed and sampled for the purposes of the RFI and the GMP.	13/13	Supplement existing database to characterize groundwater quality beneath the Site and groundwater conditions up- & downgradient of the SWMUs. Determine possible off-Site extent of relevant chemicals

Reference CRA 2788 (55)

Table 3.1
Environmental Investigation and Monitoring Programs

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Program [1]	Date(s) Conducted	Description	Number of Analytical Samples/Locations	Purpose
15. Additional ICM Phase II Bedrock Groundwater Migration Control Trench Installation	Aug/Sept 1995	Samples collected before and after pumping test from extraction wells located near newly installed trenches	5/3	Determine initial impact on chemical concentrations within the newly installed trenches
16. On-Site Contaminant Delineation Piezometers Installation	1997	Samples collected for selected indicator parameter list compounds	77/5	Determine optimal location for additional contaminant recovery blast fractured trenches
17. Private Water Well Study	1999 - 2002	Update of private water well inventory and sample collection from selected wells.	48/48	Provide additional data for characterization of potential off-Site groundwater impacts from the Facility and to determine whether ammonia is present in deep bedrock.
18. Supplemental Hydraulic Performance Assessment of Groundwater ICMs	2002 - 2004	Supplemental evaluation of the hydraulic performance of the Trench A, B, C and D extraction systems, including installation of 9 trench piezometers, biomass investigation and trench cleaning, hydraulic monitoring and pumping tests.	NA	Obtain additional data for the evaluation of bacterial fouling of the trench extraction well systems and the hydraulic performance in the areas between Trenches B and C and east and north of Trench D.
19. Supplemental Downgradient Groundwater Investigation	2002 - 2004	Delineation of the extent of ammonia presence in the deep bedrock groundwater north, east and south of the Plant Site, including the installation, testing, monitoring and sampling of nine new monitoring wells and other existing wells.	50/24	To further investigate the occurrence of ammonia in deep bedrock groundwater and to supplement groundwater data needed for the Facility's RCRA Facility Investigation.
20. Bedrock Groundwater Isotope Investigation	2006-2007	Supplemental groundwater sampling from selected shallow and deep bedrock monitoring wells and analysis for the tritium isotope, ammonia, and other inorganic parameters related to the natural geochemistry of the groundwater.	11/10	Investigate the potential for ammonia to be present as a result of natural sources in the deep bedrock.
21. Off-Site Vapor Intrusion Studies & VOC Groundwater Investigations	2005-2007	Sampling of soil gas, ambient air, indoor air and sub-slab vapors on the Roy-Hart school property. Installation new groundwater wells on the school property, and monitoring/sampling of existing and new groundwater wells.	groundwater: 87/53 air/vapor/other: 90/47	Part of a state-wide initiative to evaluate potential vapor intrusion at sites in New York. To evaluate the possible extent of FMC-related groundwater impacted by volatile organic chemicals (VOCs) and the potential for vapor intrusion in off-site structures.
22. On-Site Vapor Intrusion Study	2007-2008	Evaluation of vapor intrusion pathway through collection of indoor air, ambient air and sub-slab samples.	32/17	Part of a state-wide initiative to evaluate potential vapor intrusion at sites in New York. To evaluate the possible extent of FMC-related groundwater impacted by volatile intrusion to on-site structures.
On-Site Soil Investigations				
23. Arsenic Soil Boring Program	1973	Sitewide grid sampling of soils for arsenic analysis	2228/316	Gather data for development of a surface water management plan
24. Geophysical Survey	1985	Earth resistivity survey (vertical electrical sounding)	total of 50 soundings taken (survey performed along 11 transects with sounding stations at 200-ft intervals)	Obtain background stratigraphic information to confirm selection of sites for proposed overburden monitoring wells
25. Site Investigation	Jan/Feb 1986	Samples of native soils and fill materials at locations of suspected former waste disposal/storage or spill areas	41/24	Refine understanding of relationship between contaminants found in surficial soils and underlying native soils at site
26. RCRA Facility Investigation	1993 - 1997	Sampling of subsurface soils associated with SWMUs	38/28	Identify and characterize wastes and waste residues and develop a site soil indicator parameter list
27. Phase II RCRA Facility Investigation	Sept/Dec 1995	Samples from soil borings located along FMC's property boundaries	23/11	Provide additional information on possible presence of ETU, arsenic, and lead

Reference CRA 2788 (55)

Table 3.1
Environmental Investigation and Monitoring Programs

RCRA Facility Investigation Report
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Program [1]	Date(s) Conducted	Description	Number of Analytical Samples/Locations	Purpose
28. 2002 Sampling Program	2002	Sampled surface and subsurface soil, sediment, and surface water from numerous areas within the Site.	1585 soil and sediment samples 11/ surface water	Supplement existing data and to further characterize the presence of Site-related parameters in areas adjacent to the Facility and in areas within historic surface water migration pathways from the Facility.
29. North Railroad Property RFI/CMS	2003 - 2005	Sampling of soils associated with the North Railroad Property	578/76	Characterize and delineate impacted soils of the North Railroad Property
Off-Site Soil Investigations				
30. Surface Soil Sampling & Analysis Program, Royalton-Hartland & Gasport School Properties	Nov 1985	Sampling of surface soils in Roy-Hart & Gasport schools	14/10	Assess chemical exposure at school properties
31. Supplemental Soil Sampling Program, Royalton-Hartland School Property	Mar 1987	Sampling of soil in bleacher area of the Roy-Hart school	6/6	Supplement soil sample database on the Roy-Hart school
32. Comprehensive Roy-Hart School Sampling Program	Dec 1987	Sampling of surface soils in Roy-Hart school property	86/78	Supplement soil sample database on the Roy-Hart school
33. NYSDOH Soil Sampling Program, Middleport, New York	Jan 1989	Sampling of surface soils in properties north and east of the Plant and along Tributary One	25/23	Characterize background surface soil on properties east of the Plant and to evaluate potential historic air deposition impacts from the FMC Plant in properties north of the Plant and to evaluate potential impacts of properties within the flood plain of Tributary One
34. Schwab Orchard Soil Sampling	Mar 1989	Collection and analysis of soil samples at locations within and adjacent to apple orchards	19/9	Ascertain background levels of arsenic and lead in agricultural soils
35. Off-Site Investigation	1990-1993	Sampling of surface and subsurface soils in private yards, Roy-Hart schools, flood plain of Tributary One, Northwest Conrail property, and background areas	138/31	Investigate and evaluate soil, stream sediment and surface water conditions at specific locations outside boundaries of plant which may have been contaminated as result of historic operations at site
36. Arsenic Bioavailability Evaluation	Aug 1995	Samples of surface soils of a nearby residence on Vernon Street and behind bleachers at the high school track	12/12	Assess arsenic bioavailability for off-site soils and develop site-specific bioavailability adjustment for arsenic
37. Supplemental Arsenic & Chlorinated Pesticide Soil Sampling	July 1996	Samples of surface soils in Private Yards West and North of Site, and near FMC's southern and eastern property boundaries	21/20	Better characterize off-Site arsenic and chlorinated pesticide presence in surface soils
38. Bleacher Area Excavation Project	Jul/Aug 1996	Samples collected from base of excavation	14/12	Document extent of excavation activities
39. Additional Off-Site Arsenic Soil Sampling Program	Nov 1996	Samples of surface soils in Private Yards West and North of Site, and near FMC's southern and eastern property boundaries	27/25	Better characterize off-Site arsenic presence in surface soils
40. Additional Off-Site Arsenic Soil Sampling	Apr 1997	Samples of surface soils in Private Yards West and North of Site, and near FMC's southern and eastern property boundaries	23/21	Better characterize off-Site arsenic presence in surface soils
41. 1999-2000 Roy-Hart School Football Field Area ICM	1998-1999	Samples of soil from the ICM area of the Roy-Hart school property.	573/179 (pre-) 216/200 (post-)	Pre-excavation soil sampling to determine the initial excavation depths and post-excavation soil sampling to confirm the final excavation depths.
42. Roy-Hart School Property Surface Soil Data Comparison Study	1999	Samples of soil from the unremediated areas of the Roy-Hart school property.	57/20	Compare arsenic soil data collected from sampling depths of 0-3-inch to 0-6-inch.
43. 2001-2003 Gasport Area Background Study	2001-2003	Collection and arsenic analysis of surface soil samples from orchards, agricultural fields, undeveloped wooded properties, public properties and residential properties in Gasport.	135/103	Re-evaluate local arsenic background concentrations in Middleport soils with collection of a larger, more extensive data set.

Reference CRA 2788 (55)

Table 3.1
Environmental Investigation and Monitoring Programs

RCRA Facility Investigation Report
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Program [1]	Date(s) Conducted	Description	Number of Analytical Samples/Locations	Purpose
44. 2002 Sampling Program	2001-2003	Additional sampling in the North Commercial/Industrial Area, the 14 Western Residential Properties ICM Area, FMC's Former R&D Property, the North Railroad Property, Culvert 105 and flood zone, and Tributary One and its flood plain South of Pearson/Stone Road	1,759/418	To address data gaps and better characterize and delineate arsenic and other constituents in the sampled areas
45. 2003 West Properties Soil and Former Sewer Removal ICM	2003	Additional sampling on the 14 Western Residential Properties ICM Area as part of ICM design and implementation.	378/78	To determine the excavation limits within the ICM area and to document the arsenic concentration in the remaining soil within the buffer zone.
46. Soil Sampling for Areas Potentially Affected by Historic Air Deposition	2004-2005	Phase 1 & 2 soil sampling of approximately 270 properties within the historic air deposition study area for analysis of total arsenic	4,132/1481	Better characterize off-Site areas impacted by historic air deposition.
47. Dermal and Oral In Vivo Bioavailability Studies	2004-2006	Soil sampling from the Middleport Study area for invitro and invivo testing and evaluation	18/15	Assess arsenic dermal and oral bioavailability in soils from the Middleport study areas.
48. Tributary One South of Pearson Road and Culvert 105 Additional RFI Sampling and Analysis	2004-2005	Phase 1, 2, 3 soil and sediment sampling within and along the flood zones of Tributary One south of Pearson/Stone Roads and Culvert 105.	2,862/496	Better characterize the extent of arsenic presence along Tributary One south of Pearson/Stone Roads and Culvert 105.
49. Soil and Sediment Sampling Along Tributary One North of Pearson Road and East of Stone Road, Jeddo Creek and Johnson Creek	2006-2007	Soil/sediment sampling within and along the flood zone of Tributary One North of Pearson Road and East of Stone Road, Jeddo Creek and Johnson Creek	600/136	Delineate the extent of arsenic presence along the waterways.
Surface Water				
50. Site Investigation	1985-1987	Sampling of surface water in on-site ditches	14/13	Obtain additional information to allow accurate assessment of site's impact on public welfare and environment
51. Off-Site Investigation	1990-1993	Sampling of surface waters in Northwest Conrail property, Northern Ditches, Tributary One, Culvert 105, Jeddo Creek, and background areas	43/21	Investigate and evaluate surface water conditions at specific locations outside boundaries of plant which may have been contaminated as result of historic operations at site
52. Surface Water Monitoring Program	1992-Present	Quarterly sampling of Western Surface Impoundment (WSI) surface water Inflow monitoring during precipitation events greater than 0.15 inches of rainfall	2/2 each event 2/1 each event	Monitor quality of surface water in WSI Monitor quality of surface water in WSI
53. Phase 1 North Railroad Property ICM	2005-Present	Pre-design surface water sampling and analysis, and post-construction surface water sampling and analysis	10/10	Monitor quality of surface water runoff to and on the Phase 1 ICM area..
Sediment				
54. Western Surface Impoundment Sampling	1992-Present	Annual sampling of WSI sediments	4/≥4 each event	Monitor quality of sediments in WSI
55. Central Surface Impoundment Sampling	1988	Sediment at base of impoundment	6/5	Waste characterization of sediment for off-Site disposal as part of the impoundment closure
56. Site Investigation	1985-1987	Two rounds of sampling of sediments at locations north of the plant site	12/11	Obtain additional information to allow accurate assessment of site's impact on public welfare and environment
57. Off-Site Investigation	1990-1993	Sampling of sediments in Northwest Conrail Property, Tributary One, Culvert 105, Jeddo Creek, and background areas	70/31	Investigate and evaluate sediment quality at specific locations outside boundaries of plant which may have been contaminated as result of historic operations at site

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Table 3.1
Environmental Investigation and Monitoring Programs

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Note:
(1) Major programs implemented by FMC after 1973. Does not include any sampling program implemented by the Agencies.

Table 3.2
Summary of Soil Arsenic Concentrations From Biomonitoring Study

RCRA Facility Investigation Report
Volume 1 - Background Information
FMC Corporation - Middleport, New York

	Area Sampled			Average All Samples	Maximum All Samples
	Yard	Garden (0-6 in.)	Play Area		
All Households					
Number of yards sampled	84	23	28	85	85
Arithmetic mean (±SD) [mg/kg]	28.0 (±37.4)	19.4 (±12.3)	21.7 (±16.3)	27.5 (±37.2)	42.4 (±120)
Geometric mean (±SD) [mg/kg]	21.1 (±1.9)	16.0 (±1.9)	16.9 (±2.1)	20.6 (±2.0)	24.7 (±2.2)
Median [mg/kg]	19.7	15.9	13.2	19.5	22.5
Range [mg/kg]	5.2 to 340	4.6 to 50.2	4.3 to 60.5	4.6 to 340	6.2 to 1,124
Households with Children Under 7					
Number of yards sampled	28	8	21	29	29
Arithmetic mean (±SD) [mg/kg]	22.5 (±12.0)	22.5 (±11.0)	22.3 (±15.2)	22.5 (±11.7)	27.2 (±14.5)
Geometric mean (±SD) [mg/kg]	19.8 (±1.7)	20.3 (±1.6)	18.2 (±1.9)	19.9 (±1.6)	23.8 (±1.7)
Median [mg/kg]	18.9	19.5	13.2	19.1	22.8
Range [mg/kg]	8.2 to 57.7	11.3 to 39.7	6.9 to 58.8	10.4 to 46.4	10.4 to 58.8

Notes:
1. This table is a replication of Table 9 of the report titled Middleport Environmental Exposure Investigation (Exponent, 2004).
2. SD = standard deviation
3. Table summarizes soil arsenic concentrations for all surface soil (i.e., yard, garden, and play area samples up to 6 inches in depth) sampled in each of the 85 yards of participants in the 2003-2004 biomonitoring study.

Table 4.1
Summary of Corrective Measures Implemented Through 2007

RCRA Facility Investigation Report
Volume 1 - Background Information
FMC Corporation - Middleport, New York

Activity	Year	Media Addressed	Purpose	Results
1. Closure of Process Wastewater Basins	Prior to 1978	Surface Water/ Groundwater	Elimination of the use of process wastewater basins by removal (SWMUs 5, 6, 7, 8) and/or regrading (SWMU 3)	Reduced contaminant leaching to groundwater by eliminating a continuing contamination source; however, historical use of the basins have resulted in soil and groundwater contamination at the Site
2. Regrading of Site	1976	Surface Water	Segregated contaminated runoff from the northern half of the Facility for treatment	Reduced off-Site contaminant migration via surface water
3. Water Treatment Plant and Western Surface Water Impoundment Construction	1977	Surface Water	Collection treatment of contaminated surface water runoff	Reduced off-Site contaminant migration via surface water and controlled migration of groundwater in northwest area of Site as a result of underdrain collection and pumping (WSI).
4. Central and Eastern Surface Water Impoundment Constructions	1978	Surface Water	Expanded stormwater retention capacity at the Facility to preclude flooding/overflow of the WSI	Reduced off-Site contaminant migration via surface water
5. Installation of New Sanitary Sewer and Underdrain/Sump	1981	Groundwater	Elimination of groundwater infiltration into the sanitary sewer and off-Site groundwater migration along the sewer bedding	The underdrain installed along new sewer line at the northwest corner of the Facility minimizes off-Site migration of groundwater along sewer bedding and collects contaminated groundwater on-Site and along the northwest property boundary
6. Closure of Hazardous Waste Container Storage Areas	1982 - 1986	NA	Closure/elimination of a SWMU	Minimized generation of hazardous waste to allow for closure of container storage units
7. Deep Well Closure	Oct.-Dec. - 1986	Groundwater	Closure of an unused deep well installed for waste disposal but never used	Prevented any potential cross-communication of bedrock groundwater zones

Reference CRA 2788 (55)

Table 4.1
Summary of Corrective Measures Implemented Through 2007

RCRA Facility Investigation Report
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Activity	Year	Media Addressed	Purpose	Results
8. Groundwater Extraction Well System (First Phase)	1987 - 1988	Groundwater	Containment of off-Site migration of methylene chloride in migration	Reduces potential for off-Site migration of groundwater contaminants and removed contaminated groundwater from the shallow, intermediate, and deep bedrock zones
9. North Site Cover and Swale Underdrain System	1987 - 1988	Surface Water/ Soil	Allow for closure of the RCRA regulated surface impoundments	Reduces migration of surficial contaminants to the surface water. Prevents human exposure to contaminated soil via casual contact or the air pathway. Underdrains reduce off-Site migration of contaminated overburden groundwater and removes contaminated groundwater.
## Northern Ditches IRM Program	1987 - 1988	Sediment/ Surface Water	Prevent exposure of contaminated sediments to the public	Reduced quantity of contaminated soil/sediment in the Northern Ditches. Clay cover in ditches reduces contamination of surface water in the ditches. Excavated soils were placed an encapsulated unit near the former ESI.
## Partial Closure of the WSI and Retrofit as a Non-Hazardous Stormwater Retention Basin and Continued Operation of WSI Underdrains	1988	Surface Water	Partial closure of a RCRA regulated unit	Removed potentially contaminated sediments in WSI. WSI underdrain removes and contains off-Site migration of contaminated groundwater in the overburden and shallow bedrock.
12. Isolation of Eastern Surface Impoundment (ESI)	1988	Surface Water	ESI taken out of service and isolated (i.e., no inflow other than direct precipitation) as part of pre-closure activities	Eliminated active use of RCRA-regulated ESI.
## Closure of the Central Surface Impoundment (CSI)	1989	Soil/Sediment	Closure of a RCRA regulated unit	Contaminated sediment/soil in CSI was removed
## Blast-Fractured Bedrock Groundwater Migration Control Trenches and Pumping Systems Construction and Enhancements	1994 - 1999 2005	Groundwater	Enhance, expand and/or upgrade bedrock groundwater extraction and hydraulic performance	Continual removal of and hydraulic control of contaminated shallow bedrock groundwater.

Reference CRA 2788 (55)

Table 4.1
Summary of Corrective Measures Implemented Through 2007

RCRA Facility Investigation Report
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Activity	Year	Media Addressed	Purpose	Results
## Royalton-Hartland School Bleacher Area Soil Removal	1996	Soil	Address concern over the arsenic presence in the Bleacher Area soil	Removed contaminated soil and precluded any future exposures to the soil. Excavated soils were placed in the ESI Fill Area.
## Interim Corrective Measures Royalton-Hartland School Football Field Area	1999 - 2000	Soil	Address concern over the arsenic presence in the football field area soil	Removed contaminated soil and precluded any future exposures to the soil. Excavated soils were placed in the ESI Fill Area or disposed of off-Site.
## West Properties Soil & Former Sewer Removal Interim Corrective Measures	2003	Soil	Address concern over the arsenic presence in the soils of residential yards that border the northwestern portion of the Facility.	Removal of abandoned former outfall sewer from the FMC Plant. Removal of contaminated soil from 14 residential properties and precluded any future exposures to the soil.
## Phase I Interim Corrective Measures for the North Railroad Property	2005	Soil/Sediment	Address concern over the arsenic presence in the North Railroad and Northwest Conrail soil/ sediment.	Removal of impacted soils and construction of a 2-foot thick engineered cover system which precludes any future exposures to the underlying soil. Re-direction of surface water runoff from the south side of the tracks to the Plant Site. Inspection, moniotoring and maintenance of the cover by FMC to maintain integrity of the cover system.
## 2007 Early Actions for Wooded Parcel of the North Commercial/Industrial Area, Culvert 105 south of Sleeper Street (including Margaret Droman Park) and 10 residential properties with P-Block	2007	Soil	Address concern over the arsenic presence in the soils of the vacant Wooded Parcel and residential yards that border the Wooded Parcel and in impacted soils/sediments within and along open ditch sections of Culvert 105.	Removal of contaminated soil to facilate construction of a 2-foot thick soil cover over the Wooded Parcel and reconstruction of the surface water drainage system on the Wooded Parcel. Removal of impacted soils from 10 P-Block residential properties and properties along the open ditch sections of Culvert 105. Installation of new buried storm sewer sections in the former open ditch sections.

Notes:
CSI Central Surface Impoundment
ESI Eastern Surface Impoundment
WSI Western Surface Impoundment
SWMU Solid Waste Management Unit

Reference CRA 2788 (55)

Table 4.2
Summary of Existing Groundwater Sumps and Shallow Subdrains

RCRA Facility Investigation Report
Volume 1 – Background Information
FMC Corporation – Middleport, New York

Sump/Subdrain Identification [1]	Approximate Location	Purpose
Sump 1 - Sanitary Sewer Interceptor Sump	Northwest corner of WSI (north of Sump 3)	Collects groundwater from approximately 100 feet of perforated collection pipes in the bedding material along the sanitary sewer. Collected groundwater is pumped to and discharged into Sump 3 and then pumped to the WSI.
Sump 2 - Swale Sump #1 Underdrain	North of WSI	Collects groundwater from 500 feet of perforated collection pipe, nominally four feet beneath the invert of the main north asphalt swale to prevent exfiltration of groundwater. Collected water is pumped to Tanks T-1101 and T-1102.
Sump 3 - WSI Sump Underdrain	Northwest corner of WSI	Collects groundwater from overburden and upper bedrock through perforated collection pipes (approximately 1,200 feet total length) located beneath base of WSI (WSI underdrains). Collected water is pumped to Tanks T-1101 and T-1102.
Sump 4 - Swale Sump #2 Underdrain	North of Sump 5	Collects groundwater from approximately 1,000 feet of perforated collection pipe (including two north/south laterals), nominally four feet beneath the invert of the main north swale west of the CSI. Collected water is pumped to the sump at Tanks T-1101 and T-1102.
Sump 5 - Building 67 Swale Underdrain	Sulphur shed	Collects groundwater from 200 feet of shallow buried collection pipe along the north/south sulphur shed swale. Collected water is pumped to the sump at Tanks T-1101 and T-1102.
Sump 6 - Raymond Mill Underdrain	Raymond Mill	Collects groundwater from underdrain piping (estimated 700 feet) situated between buildings 42 and 46. Also collects surface water run-off from between buildings 42 and 46. Sump 6 has two pumping systems. Collected water is pumped to Tanks T-1101 and T-1102.

Reference CRA 2788 (55)

Table 4.2
Summary of Existing Groundwater Sumps and Shallow Subdrains

RCRA Facility Investigation Report
Volume 1 – Background Information
FMC Corporation – Middleport, New York

Sump/Subdrain Identification [1]	Approximate Location	Purpose
Sump 7 - South CSI Swale Underdrain	South of CSI	Collects contaminated groundwater from spur line underdrain between buildings 65 and 70/72 (estimated 300 feet) and approximately 285 feet of perforated collection pipe, nominally four feet beneath the invert of the swales running along southwest and south boundary of the former CSI. Collected water is pumped to Tanks T-1101 and T-1102.
Sump 8 - Rail Unloading	West of Furadan® building	Collects rainwater from the rail spur bedding on west side of Furadan® building. Water is pumped directly to Tank T-8100.
Sump 9 - Truck Loading Dock	Furadan® building truck loading dock (southeast of Furadan® building)	Collects rainwater from concrete trench and steel grate at base of loading dock. Water is pumped to the East Pad Sump (Sump 10).
Sump 10 - East Pad	East of Furadan® building	Collects rainwater from Sump 9 and from concrete pad east of the Furadan® building. Water is pumped directly into Tank T-8100.
Sump 11 - Calgon Manhole	East of Sump 12	Collects rainwater from 150 feet of collection pipe installed at base of gravel slope east of Furadan® building (Building 70). Water is pumped directly into Tank T-8100.
Sump 12 - North Pad	North of Furadan® building	Collects rainwater (roof runoff) from limited area of the Furadan® building roof (Building 70). Water is pumped directly into Tank T-8100.

Reference CRA 2788 (55)

Table 4.2
Summary of Existing Groundwater Sumps and Shallow Subdrains

RCRA Facility Investigation Report
Volume 1 – Background Information
FMC Corporation – Middleport, New York

Sump/Subdrain Identification [1]	Approximate Location	Purpose
Sump 13 - Evaporator Tank Swale Underdrain Sump	West of Tanks T-1101 and T-1102	Collects groundwater and rainwater from shallow buried collection pipe which runs along east side of Building 22 and concrete trench and steel grate which runs between Building 104 and Building 22. Collected water is pumped to evaporator tank (Tanks T-1101 and T-1102) sump.
Sump 14 - Boilerhouse Sump	Boilerhouse	Collects groundwater from boilerhouse basement.
Sump 15 - North CSI Swale Underdrain Sump	Northeast of former CSI	Collects groundwater from 200 feet of perforated collection pipe beneath main north swale running along northern boundary of former CSI. Collected groundwater is pumped to Tanks T-1101 and T-1102.

Notes:
(1) As designated on the figure showing the shallow groundwater sumps and shallow subdrains
CSI Central Surface Impoundment
WSI Western Surface Impoundment

Table 4.3

Historical Summary of Extracted Groundwater Volumes and Contaminant Mass Removed

RCRA Facility Investigation Report
Volume 1 - Background Information
FMC Corporation - Middleport, New York

	Total Volume Pumped (Gallons)	Total Average Well Yields (GPM)	Estimated Contaminant Mass Removed (lbs)			
			Methylene Chloride	Arsenic	ETU	Ammonia
Period 1 [1]						
1987- 1991	NA	NA	NA	NA	NA	NA
1/92 - 12/92	1,176,179	2.9 *	65	NA	NA	NA
1/93 - 12/93	1,271,323	2.6 *	356	NA	NA	NA
Period 2 [2]						
1/94 - 12/94	1,576,667	3.7 *	345	NA	NA	NA
1/95 - 12/95	1,577,256	4.0 *	135	NA	NA	NA
Period 3 [3]						
1/96 - 12/96	3,316,515	7.8 *	2975	766	327	327
1/97 - 12/97	NA	5.9 *	NA	NA	NA	NA
Period 4 [4]						
1/98 - 12/98	2,575,826	5.1 *	3318	1025	1162	867
1/99 - 12/99	4,771,340	10.7 *	1991	1486	955	1670
1/00 - 12/00	9,034,063	13.3 *	2677	2545	739	3175
1/01 - 12/01	7,550,473	12.2 *	2966	2062	633	2523
1/02 - 12/02	6,646,908	8.8 *	1770	869	578	1370
1/03 - 12/03	4,964,230	7.9	1,365	676	644	1,446
1/04 - 12/04	6,548,709	7.9	1,062	1,409	658	1,725
1/05 - 6/05	4,287,601	14.0	361	447	360	753
Period 5 [5]						
7/05 - 12/05	4,517,869	16.5	294	541	297	1,997
1/06 - 12/06	9,062,456	19.8	738	721	652	3,983
1/07 - 12/07	5,363,164	14.6	473	661	525	2,119

Notes:

ETU Ethylene Thiourea.

GPM Gallons Per Minute.

NA Data not available for this time period.

* The combined total average GPM is the sum of the yearly average GPMs for all wells in operation during the referenced time period. The yearly average GPM is the total volume pumped by each well divided by its time (in minutes) in operation during the referenced time period. The combined total average GPM will not equal the total volume pumped if multiplied by minutes per year due to the downtimes of different wells throughout the year.

[1] Four Groundwater Extraction Wells (BC-752X, BC-753X, BC-754, AB-755X)

[2] Three Groundwater Extraction Wells (BC-752X, BC-754, AB-755X) and Fractured Trench A Well (A-756X)

[3] Two Groundwater Extraction Wells (BC-752X, BC-754X), New Extraction Well (A-542X), and Fractured Trenches A, E, and B Wells (A-756X, A-757X, and A-758X)

[4] One Groundwater Extraction Well (BC-752X) and extraction wells for Trenchs A (A-757X), B (A-758X), E extended (A-757X), F (A-542RX), C (A-759X), and D (A-760X). Also includes volumes and loadings for the WSI underdrains (Sump 3). Sump 3 is not included in the combined total average GPM. Overburden groundwater volumes from the underdrain sumps are also not included in the total volume pumped.

[5] One Groundwater Extraction Well (BC-752X) and extraction wells for Trenches A (A-757X), B (A-758X), E extended (A-757X), F (A-542RX), C (A-759X, C-EX1 and C-EX2), D (A-760X, D-EX1 and D-EX2), and G (G-EX1, G-EX2, and G-EX3) . Also includes volumes and loadings for the WSI underdrains (Sump 3). Sump 3 is not included in the combined total average GPM. Overburden groundwater volumes from the underdrain sumps are also not included in the total volume pumped.

Table 5.1
Meteorological Data

RCRA Facility Investigation Report
Volume 1 - Background Information
FMC Corporation - Middleport, New York

Month	Mean Daily Temperature (°F)	Mean Monthly Precipitation (Inches)	Average Precipitation Events >0.01 inch
January	23.6	2.47	15
February	24.8	2.25	13
March	33.8	2.62	12
April	45.8	3.05	14
May	57.1	2.98	12
June	65.9	3.36	11
July	70.9	2.82	10
August	68.8	3.87	11
September	61.5	3.76	11
October	51.1	2.85	13
November	40.9	3.64	15
December	28.9	3.37	16
Annual Average	47.8	37.04	153

Notes:
Data are from the Lockport Weather Station and are averaged over a 30-year period (CRA, 1999).

Reference CRA 2788 (55)