

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name	<u>DUPONT NEWPORT SITE</u>	ProjectID: 03-02
Last Updated:	06/09/01	
City:	Newport	
County:	New Castle	
State:	DE	
Country:	USA	
Bodies of Water:	Christina River	
US EPA Region:	III	
Status (Active, Complete, or Monitoring Only):	Complete	
Date On NPL:	1990	
ROD/ESD Date:	1993	
Operable Unit:	OU-7	
Areas of Concern (length or acres):	1.3-mile sector of the Christina River.	
Other Characteristics of Water Body:	The Christina River Remediation project area is located at the Newport Superfund Site in Newport, New Castle County, Delaware. The Newport Superfund Site encompasses approximately 120 acres along the north and south sides of the Christina River. It includes an operations area consisting of a portion of the Dupont Holly Run plant and the Ciba Newport plant, the North and South Landfills, adjacent wetland areas, and a former ballpark. The 7Q10 flow (lowest seven-day average once every ten years) for the Christina River at this location is 29.4 cfs; the normal daily flow is 275 cfs.	
Contaminants of Concern:	metals (Pb, Cd, Zn); solvents	
Source of Contamination:	The 120-acre site includes land currently occupied by a paint pigment production facility (the Ciba-Geigy plant), a chromium dioxide production facility (the Dupont Holly Run plant), and two industrial landfills separated by the Christina River (the site includes portions of the river in which site-related contamination has been found).	
	Sediments at the site became contaminated reportedly (Reference A-28) in a variety of ways including: precipitation of some of the contaminants from ground water as it discharges to the Christina River or the wetlands; direct discharge from breached dikes at the south landfill; erosion/surface water runoff which in all likelihood carried contamination from the north disposal area to the river during the time the landfill was open; and the incoming tide carrying contamination from the north drainage way to the north wetlands.	
Contaminated Area Physical Characteristics:	The three target areas are discrete nearshore areas along the north shore of the Christina River in a 1.3 mile long river sector. River width varies from 350-525 feet in this sector.	
Type of Regulatory Action:	Superfund. Final.	
Overall Status Summary:	The Christina River Remediation project area is located at the Newport Superfund Site in Newport, New Castle County, Delaware. The Newport Superfund Site encompasses approximately 120 acres along the north and south sides of the Christina River. It includes an operations area consisting of a portion of the Dupont Holly Run plant and the Ciba Newport plant, the North and South Landfills, adjacent wetland areas, and a former ballpark.	
	Five areas of the Christina River targeted for remediation were consolidated into three major areas located in a 1.3 mile stretch of river and designated as Area 1, Area 2/3, and Area 4/5. These areas, which totaled 2.9 acres, were delineated based on several sediment sampling	

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events that identified the extent of river bottom contamination. Constituents of concern were heavy metals (lead, cadmium, and zinc) and volatile organic solvents.

Performance standards and goals in the 1993 ROD were modified by EPA in 1996, and documented in an EPA memo to file (Reference A-769).

Removal was accomplished in 1999 and was accomplished initially using a crane operated Cable Arm Clamshell (for unconsolidated material), however, the great majority of the removal was by use of a backhoe on a barge. Target areas were bounded by sheetpile. Sediments were removed to a minimum depth of two feet or until the relatively impermeable underlying Marsh Deposit Formation was encountered. No confirmation samples were collected. Sediment removal depths ranged from 1.6 to 6.8 feet with a typical depth of 2.9 feet. A total volume of 11,870 cy was removed.

Removed materials were transported to an off-loading facility, located on the South Landfill side of the Christina River, via leak-proof scows. From there, the material was taken to and disposed of within a dedicated holding cell in the existing industrial South Landfill.

Dredged areas were backfilled with clean backfill material and intertidal areas were revegetated. No long-term monitoring is planned, other than periodic evaluation of the condition of the revegetated areas.

Remedial Action Planned: ☒

Risk Assessment: ☒

Remedial Action Implemented: ☒

Status of Dredging ☐

PRPs: ☒

Contacts: ☒

References: ☒

Modeling: ☐

Fishing Advisory: ☐

Key Conditions: capping, dedicated landfill, extended (> 1 mile) river, fish spawning limitations, habitat/streambank restoration, more-harm-than-good, post monitoring, tidal fluctuations, wetlands

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Target Sediment Cleanup Standards (TSCS):	Lead 1,200 ppm; cadmium 60 ppm; zinc 5,600 ppm (all concentrations are normalized to grain size). Refer to the "How TSCS Established" field.	
How TSCS Established:	<p>Site-specific toxicity tests and benthic studies. As stated in the 1993 ROD: "The clean-up criteria for the sediments were set to protect aquatic life only, since there was not expected to be any human exposure by direct contact to the sediments."</p> <p>Further, as described in the 1993 ROD (Reference A-28): "Since contaminant levels at a particular sampling location are very dependent on the physical characteristics of the sediments, grain size and total organic carbon (TOC) analyses were also performed. This physical data of the sediments allowed the chemistry data to be normalized so differences between sampling stations could be ascertained. (Due to the extreme variability that can occur in sediment contaminant levels due to naturally occurring physical/chemical conditions such as deposition rates, sediment types, grain size and organic matter content, comparing sediment chemistry from different sampling stations and sampling events to determine where anthropogenic (manmade) loading has occurred becomes difficult. Normalizing the data allows a more direct comparison of sediment chemistry between different stations to take place. In this case it was determined that the grain size of the sediments was the greatest cause of natural variability.)"</p> <p>And further: "The ROD contains clean-up criteria developed by EPA after thoroughly considering the concerns of DNREC, NOAA, FWS and the comments of Dupont. These criteria include sediment chemistry values (on a normalized to grain size basis) which are slightly below the values presented in the Proposed Plan. Sediments containing normalized contaminant levels above the criteria will be dredged. The criteria also include performing a small number of Hyallela azteca solid phase toxicity tests in each of the north wetlands, the south wetlands, the Christina River, and the south pond to make sure that the sediment chemistry values are protective. The values may be lowered, if necessary to protect the environment, based on the results of the added toxicity tests. The sediment clean-up criteria in the ROD have the support of EPA, FWS, and NOAA. The complete details of the development of the sediment clean-up criteria are contained in the Administrative Record for the Site" (and in Reference A-28).</p> <p>In August 1996, in a memo to file (Reference A-769), EPA documented changes to the performance standards of the 1993 ROD. These changes are summarized in Reference A-648 as follows:</p> <p>"The Christina River cleanup enhancements also included a significant reduction in the site-specific sediment clean-up criteria for the river. The August 26, 1993 ROD site-specific sediment clean-up criteria were developed from a variety of information gathered as part of the ecological risk assessment process (the information included sediment toxicity tests and benthic surveys). Since (1) the data showed that metals levels had to be relatively high before indicating an impact that warranted dredging and (2) some uncertainty existed in regard to the protectiveness of the criteria, the ROD included provisions for collection of more toxicity tests in the Remedial Design in the areas of the river that contained heavy metal contamination but at levels below the clean-up criteria. The results of these toxicity tests could have resulted in the lowering to the sediment clean-up criteria. Once the contaminated areas of the river were delineated, it became apparent that the areas of "marginal" contamination were relatively small. Dupont proposed making the clean-up criteria more stringent and dredging these "marginal" areas and thus eliminating the need for the extra sediment toxicity tests and the extensive long-term monitoring program that was part of the ROD."</p>	
Target Bank and Floodplain Cleanup Levels (if applicable):	Lead 1,200 ppm; cadmium 60 ppm; zinc 5,600 ppm (all concentrations are normalized to grain size). Refer to the "How TSCS Established" field.	

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Other Target:

Environmental Sample Data

References:

- **Sediment:**
- **Water:**
- **Fish:**

Estimated Target Volume:

Planned Disposal Method:

The order of preference for disposal of the dewatered/stabilized sediments is (1) onsite, in either the north or south landfills and (2) offsite in an EPA-approved facility.

Estimated Calendar Time to Implement Remedy:

Estimated Time to Implement Remedy:

Estimated Cost to Implement Remedy:

\$3.1 million for south wetlands; \$4.0 million for Christina River; neither cost includes O&M costs.

Stated Remedial Action Objectives (and Source):

Source: 1993 ROD (Reference A-28): "The remedial action objectives are the following:

1. Prevent exposure to the contaminated ground water (see detailed discussion under "Ground Water" in the "Alternatives Analyzed" section as to why EPA is not proposing to return the ground water to its beneficial use).
2. Prevent further migration of the contaminated ground water.
3. Prevent exposure to contaminated soils.
4. Prevent exposure to contaminated sediments.
5. Prevent further degradation of the environment caused by the discharge of contaminated ground water to the Christina River and to the wetlands adjacent to the north and south landfills."

Measures of Success to be Used:

Planned Monitoring and Restoration:

Source: 1993 ROD:

- "A long-term monitoring plan shall be developed and implemented to monitor the effectiveness of the remedial action in the Christina River and to make sure that the Site-specific clean-up criteria remain protective of the environment."
- "The long-term monitoring plan shall include sediment monitoring stations in the Christina River in both remediated and unremediated areas (and include a Site background station). TAL metals analysis, TOC and grain size tests, acute and chronic toxicity tests (preferably using *Hyallela azteca*), and benthic density and diversity measurements shall be performed at these locations."

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- "The long-term monitoring plan shall determine frequency of monitoring and reporting requirements. The reporting requirements shall include a discussion of the results in addition to data presentation."
- "The monitoring plan for the Christina River shall include the determination of a reference station to be approved by EPA. The reference station shall be representative of natural background conditions in a tidal river environment and, preferably, shall be near the Site. Also, since there is probably no pristine area near the Site, a list of conditions that would be expected in a pristine tidal river environment shall be developed through examination of aquatic conditions at areas in northern Delaware or other appropriate areas."
- "Performance standards are the minimum requirements of the monitoring plan. The monitoring plan shall be submitted to EPA for approval. The discussion of the monitoring results shall also be submitted to EPA for approval. If at some time EPA determines that this monitoring data indicates that the Site-specific clean-up criteria are no longer protective (for example, the metals remaining in the sediments become more bioavailable due to changing conditions and cause a greater impact), additional remedial measures beyond those described in this ROD may be required including further dredging."

In August 1996, in a memo to file (Reference A-749), EPA documented changes to the performance standards of the 1993 ROD. These changes are summarized in Reference A-648 as follows:

"The Christina River cleanup enhancements also included a significant reduction in the site-specific sediment clean-up criteria for the river. The August 26, 1993 ROD site-specific sediment clean-up criteria were developed from a variety of information gathered as part of the ecological risk assessment process (the information included sediment toxicity tests and benthic surveys). Since (1) the data showed that metals levels had to be relatively high before indicating an impact that warranted dredging and (2) some uncertainty existed in regard to the protectiveness of the criteria, the ROD included provisions for collection of more toxicity tests in the Remedial Design in the areas of the river that contained heavy metal contamination but at levels below the clean-up criteria. The results of these toxicity tests could have resulted in the lowering to the sediment clean-up criteria. Once the contaminated areas of the river were delineated, it became apparent that the areas of "marginal" contamination were relatively small. Dupont proposed making the clean-up criteria more stringent and dredging these "marginal" areas and thus eliminating the need for the extra sediment toxicity tests and the extensive long-term monitoring program that was part of the ROD."

***Agency Position on Sediment
Removal (and Source):***

As described in Reference A-28 (the 1993 ROD):

- "Hydraulic dredging of the river shall take place in the areas of unacceptable environmental impact. The dredged area shall then be covered with clean fill to return the river bottom to its original grade."
- "The area of unacceptable environmental impact shall be dredged until the river bottom is below the Site-specific clean-up criteria."
- "Dredging shall only be carried out when the river current velocity is 1.5 feet per second or below (approximately one hour before and after slack tide)."
- "Dredging shall only take place during the period of November to March (inclusive) to avoid

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anadromous fish runs and the time of greatest benthic activity."

- "All available engineering controls shall be used to minimize, to the maximum extent practicable, transport of sediments away from the dredging area. Examples of the types of controls to consider include increasing the percentage water intake at the cutter head, using silt curtains, and/or using hydraulic dredging equipment."
- "Monitoring shall be performed downgradient from the dredging area to monitor sediment transport. The remedial design shall specify unacceptable levels of sediment transport that require dredging to be temporarily halted or be modified."
- "Dredged sediments shall be pumped to a treatment plant at the plant areas. The dredged sediments shall be dewatered and properly disposed of either on-site or off-site."
- "A statistically significant number of samples shall be taken after dredging to ensure that the sediments remaining on the river bottom are below the Site-specific clean-up criteria."
- "The selected remedy described in this ROD contains a number of significant changes from EPA's preferred alternative in the Proposed Plan. The changes were made in response to comments on the Proposed Plan and consultations with the State of Delaware and other federal agencies. The changes are described below."
 - "The cost of the dredging alternative for the Christina River was reduced by approximately \$8,000,000. The cost estimate in the Proposed Plan was based on offsite disposal of the dredged material. The cost estimate in the ROD more accurately reflects the cost of the preferred alternative in the Proposed Plan and the selected remedy for the Christina River which calls for the preference of onsite disposal."
 - "... State SWQSS have been waived in the north wetlands, the south wetlands, and the Christina River. In the river, Federal AWQC were also waived. For both the north wetlands and river, background sources of contaminants prevent Site remedial measures from attaining these ARARs requiring that EPA invoke the "technical impracticability" ARAR waiver. For the south wetlands, substantially more sediments would have to be dredged than appears necessary to protect the wetlands. Stripping the complete south wetland just to attain SWQSS would cause more harm than good, thus EPA is invoking the "greater risk to human health and the environment" ARAR waiver."

Many of the above conditions were revised or relaxed during implementation. Refer to Report 04.

RISK ASSESSMENT

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RA Type: Human Health and Ecological

RA Status: Complete

RA Objectives:

Company Woodward-Clyde

Performing RA:

RA Reference Report:

RA Summary and From the 1993 ROD (Reference A-28):

Conclusions:

"The RI/FS found no evidence that Site-related contaminants result in unacceptable health risks from eating fish in the Christina River because there were no data that showed elevated levels of metals in fish typically consumed by humans caught near the Site relative to those caught upstream and out of the influence of the Site."

"The Environmental Evaluation focused on potential impacts to aquatic life in the wetlands and the river. However, it also examined potential impacts to terrestrial animals and plant life. Sediment chemistry, benthic (macroinvertebrates living in and on the sediments) studies, and sediment toxicity were the main indicators of aquatic impacts. Plant chemistry, literature research, and field observations were used to determine impacts to plant life. Estimates of impacts to terrestrial animals were calculated in a way similar to that used to calculate the non-carcinogenic risks to humans."

"... EPA has determined that review of all available data (especially that of the toxicity tests, the benthic studies, and the chemistry tests) indicates that the several areas of the wetlands and the river warrant remediation. However, due to the broad spacing of samples collected during the RI/FS, the exact areal extent of remediation is currently unknown but will be determined during the remedial design phase."

"In order to make the determination of the exact areal extent of excavation practical, EPA has set Site-specific clean-up criteria for the wetlands and the river based on all available data with an emphasis on the toxicity tests and the benthic studies. The clean-up criteria correspond to the concentration of contaminants found in areas which require remediation based on the results of the bioassessment data. During the remedial design, chemistry tests will have to be done to delineate the exact areas which require remediation. Due to the extreme variability that can occur in sediment contaminant levels due to grain size, it is best to normalize the contaminant levels to grain size in order to compare different sampling stations and sampling events. Therefore, the clean-up criteria are stated as normalized (to grain size) contaminant levels."

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Physical Target:	Five areas of the Christina River targeted for remediation were consolidated into three major areas located in a 1.3 mile stretch of river and designated as Area 1, Area 2/3, and Area 4/5. These areas were delineated based on several sediment sampling events that identified the extent of river bottom contamination. Area 1 is approximately 0.3 acres in size, Area 2/3 is approximately 1.4 acres in size, and Area 4/5 is approximately 1.2 acres in size.	
Goals:	ROD goals were modified based on an EPA memo of August 1996 (Reference A-749). Areas 1, 2, and 3 of the Christina River, as outlined in the August 1996 EPA memo, shall be dredged until the river bottom is below the specified contaminant levels. Areas 4 and 5 shall be dredged to a depth of 2 feet. Areas 2A, 4A, 4B, 5A, and 5B must undergo confirmation sampling to ensure that they are below the criteria. If these areas are above these criteria, they shall be dredged as well. (Apparently the depth of contamination was then measured during the design phase, not the construction phase, according to Reference M- 321.)	
Primary Contractor:	Sevenson Environmental Services, Inc.	
Other Contractors:	Brandywine Nurseries (restoration, landscaping, and planting)	
Generic Remediation Method:	Mechanical dredging; wet excavation	
Equipment:	Removal was by a crane operated Cable Arm Clamshell (for unconsolidated material) and by a backhoe on a barge for the more impermeable underlying material. Target areas were bounded by sheetpile. A total of 2,100 linear feet of sheetpile was installed. Sheets were 27.5-30 feet tall and were embedded typically 15 feet into sediment.	
Material Handling:	<p>As described in Reference M-321 (the Construction Monitoring Report):</p> <p>“Sediments were removed to the required minimum depth of 2 feet or until the marsh deposit was encountered. The Contract Drawings indicate the required depth. The maximum elevation to which excavations were taken was +4.2 feet, which is Mean High Tide. The depth of excavation ranged from 1.6 feet to 6.8 feet with a typical depth of 2.9 feet. . . some excavation areas were terminated at a depth shallower than that required when the Marsh Deposit layer was encountered. The presence of the marsh deposit was the limiting factor in the necessary excavation depth.”</p> <p>“Excavated contaminated materials were transported to the off-loading facility, located on the South Landfill side of the Christina River, via leak-proof scows. From there, the contaminated material was taken to and disposed of within the South Landfill holding cell.”</p> <p>“The South Off-Loading facility consisted of a steel sheetpile retaining wall and soil fill placed along the banks of the Christina River to facilitate off-loading of excavated contaminated water and sediments, as well as on-loading of clean backfill material. In addition to loading and off-loading, the facility also served to protect an existing 72-inch diameter sanitary sewer line, which ran parallel to and about 30 feet from the edge of the river. Steel H-beams were placed longitudinally along the axis (both sides) of the sewer line with timber mats placed over the steel beams. This created a level and firm platform over the sewer line, for construction vehicles to access the off-loading facility.”</p> <p>“A secondary off-loading facility was constructed approximately 0.5 miles downstream from Area 4/5 on the north side of the Christina River. This facility functioned primarily as a support and material staging area for the construction activities required for Area 4/5. This facility was constructed largely from crane mats and a soil embankment.”</p> <p>“All of the excavated materials were directly transferred from leak-proof scows to leak-proof</p>	

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	<p>transport trucks at the off-loading facility via an excavator which was located on the riverbank, with no interim stockpiling of the sediments. The loaded scows were butted against the sheetpile retaining wall of the off-loading structure during off-loading so no contaminated sediments could fall into the river during the off-loading operation. As a further precaution, the area between the scows and the off-loading facility was draped with plastic to capture any contaminated sediment spillage. The side of each transport truck was protected with a geotextile tarp during loading operations. . . Both the scows and the trucks provided adequate freeboard to prevent spillage of materials during transport. In addition, the land-based off-loading area was draped in plastic to contain any contaminated material spillage from the entire materials handling operation.”</p> <p>“Each truck was loaded with excavated, contaminated water and sediments, and transported the material to the South Landfill holding cell. The South Landfill holding cell is located immediately behind the off-loading facility so the operation proved to be very time-efficient. Except for the access road into the South Landfill holding cell, the disposal area was completely surrounded by an earthen berm, which contained any run-off of contaminated water and prevented the run-on of clean rainwater. The sediments were end-dumped into the landfill and worked with a backhoe to promote air drying of the material. Ponding of water in the South Landfill holding cell was prevented by distributing the dumped contaminated fill and spreading with a backhoe as uniformly as possible.”</p> <p>“Final contour grading of the contaminated materials in the holding cell was performed at the completion of the dredging project. An earthen berm was constructed across the entrance to the holding cell to prevent migration of water from the holding cell.”</p> <p>“Backfill operations for an Area commenced (only after dredging was complete). . . The maximum backfill elevation was +4.2 feet, the Mean High Tide elevation. Three soil material components were placed. Starting at the highest elevation closest to the shoreline, the materials consisted of fine-grained soils (soil classification ML, MH, and SM) placed in the vegetated intertidal zone, a gravel berm (soil classification GW and GP), and granular fill (soil classification SW and SP). The gravel berm acted as a separation between the vegetated tidal flat and the non-vegetated tidal flat. The average thickness of fine grained soils was approximately 2 feet, the average gravel berm height was approximately 2 feet, the average thickness of granular fill in the non-vegetated deepwater zone was approximately 6 inches. In areas where the dredged depth exceeded the minimum depth required, additional backfill was used to provide grades consistent with the surrounding dredged areas.”</p> <p>“The backfill operations in the three Areas were undertaken with the perimeter sheetpile wall and silt curtains in place so there was no risk of river siltation occurring during backfill operations. Wherever possible, existing vegetation was left undisturbed to minimize the need for subsequent restoration work.”</p> <p>Backfill volumes were not documented in Reference M- 321 for Areas 1 and 2/3. About 3,840 cy of fill were placed in Area 4/5.</p>	
Volume Removed:	11,870 cy; area breakdown is Area 1 (910 cy), Area 2/3 (6,760 cy), Area 4/5 (4,200 cy)	
Calendar Time:	3/15/99 through 11/11/99; for dredging and backfilling, 5/10/99 through 9/8/99; the contractor’s work schedule was generally 10-12 hours per day, six days per week	
Time To Implement:	8 months	
Total Cost:	\$2.3 million	

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Dredging Cost:	Not available	
Disposal of Sediment:	Into a holding cell in the South Landfill, a nearby existing industrial landfill.	
Volume of Water:	Not measured	
Method of Water Treatment:	None	
Water Discharge Limit:	N/A	
Air Monitoring During Remediation:	None	
Water Monitoring During Remediation:	As described in Reference M-321: <p>“The Contractor was required to prevent the migration of contaminated sediments in the Christina River during the dredging operations. This was accomplished by installing a steel sheetpile wall around the three dredge areas. Turbidity readings were taken, as required, during the dredging operations. The turbidity readings were taken in compliance with the approved Sampling Plan as follows: upstream readings were taken to establish background turbidity levels in the Christina River with corresponding downstream readings being taken as a comparison to determine if contaminated sediments were escaping through the steel sheetpile interlocks. These upstream and downstream turbidity readings were taken approximately 100 yards from any ongoing dredging operation. The effectiveness of the steel sheetpile containment wall was demonstrated further by observing the coloration of the water inside and outside the sheetpile wall on aerial photographs.”</p> <p>“The only exception to the condition of a continuous sheetpile barrier wall was implemented at Area 1, where a silt curtain was substituted for approximately 200 lineal feet of steel sheetpile wall. The silt curtain was required because of the presence of existing overhead power lines, which prohibited the use of construction equipment required to install the steel sheetpiling. The performance of the silt curtain was monitored by turbidity readings as described above, taken whenever dredging operations were occurring in Area 1.”</p>	
Outcome:	A total of 11,870 cy was removed from three nearshore target areas totaling 2.9 acres. Removal was to pre-determined depths based on (a) contaminant concentrations determined during characterization and (b) the goal of not disturbing the underlying Marsh Deposit Formation. No confirmation samples were collected. The dredged areas were backfilled with clean fill and intertidal areas were revegetated. No long-term monitoring is planned, other than periodic evaluation of the condition of the revegetated areas.	
Restoration and Post-Monitoring:	As described in Reference M-321: “Restoration operations commenced on a given Area only after the backfill was acceptably placed. The restoration consisted of installing erosion control matting and “Koir logs,” which consisted of coconut fiber (a 100 percent biodegradable material). The Koir logs function as a temporary barrier to prevent erosion of the fine-grained soils placed in the vegetated tidal flat. In conjunction, herbaceous vegetation was planted in the intertidal zone.”	
Site-Specific Difficulties:	As described in Reference M-321: <ul style="list-style-type: none">• During initial dredging operations in the intertidal zone of Area 4/5, existing riprap was discovered, which had been placed by others to protect Highway I-95 under a previous contract. After discussions with the USEPA and review of the results of previous sampling events in the immediate area, it was agreed that the existing riprap could remain in place and serve as the intertidal limits of dredging.	

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- The backfill/restoration in the intertidal zone of Area 2/3 was deleted as a result of the installation of a steel sheetpile vertical barrier under a subsequent Contract. In lieu of the specified backfill/restoration required for the river dredging project, the slope was armored with a riprap/soil matrix.
- The depth of dredging was less than the 2-foot minimum in two areas in Area 2/3 as a result of encountering the Marsh Deposit Formation. The intent of the design was not to disturb the Marsh Deposit Formation as it functioned as the upper hydraulic seal of the underlying Columbia Formation. (According to Reference A-648, the Marsh Deposit Formation averages 8.5 feet thick underneath the Christina River.)
- Two-hundred lineal feet of silt curtain were installed in lieu of steel sheetpiling in a portion of Area 1 due to the presence of overhead power transmission lines, which precluded use of the crane-operated hammer required for sheetpile installation.

Additionally, it was learned:

- The great majority of the removal work was accomplished by conventional backhoe, since most of the material was not sufficiently unconsolidated to allow efficient use of the specified Cable Arm Bucket.
- The Christina River has 5-6 foot tidal fluctuations. The Contractor built special small-size barges and procured a special small-size tug boat for use at low tide to allow passage beneath an intervening roadway bridge which spanned the river.

Monitoring Data

References:

- *Sediment*
- *Water:*
- *Fish:*

POTENTIALLY RESPONSIBLE PARTIES

Project Name **DUPONT NEWPORT SITE**

ProjectID: 03-02

PRP Name: PRP INFORMATION NOT RELEASED

PRPID:

Street Address:

City:

State:

KEY CONTACTS

Project Name **DUPONT NEWPORT SITE**

ProjectID: 03-02

Last Name: KEY CONTACT INFORMATION NOT RELEASED

Contact ID:

First Name:

Title:

Company:

Address:

City:

State:

Postal Code:

Work Phone # :

Other Phone #:

Fax # :

Email Address:

REFERENCES

Project Name DUPONT NEWPORT SITE

ProjectID: 03-02

Reference Type: A

ReferenceID: 28

Title: *EPA Superfund Record of Decision: E.I. Du Pont, Newport Superfund Site, 8/26/1993
PB94-963924*

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: US EPA Region III

**Preparer/Author
Address:**

Prepared For: E.I. Du Pont, Newport, DE

Date Published: July 26, 1993

**Key Words and
Phrases:** ROD

Reference Type: A

ReferenceID: 648

Title: *Five Year Review Report: E.I. DuPont, Newport Superfund Site, Newport, Delaware*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region III

**Preparer/Author
Address:** 1650 Arch Street
Philadelphia, PA 19103

Prepared For: General Public

Date Published: March 31, 2000

**Key Words and
Phrases:**

REFERENCES

Project Name DUPONT NEWPORT SITE

ProjectID: 03-02

Reference Type: A

ReferenceID: 649

Title: *Christina River Remedial Design: Request for Proposal IP-61412: Newport Superfund Site*

Location: AEM

Category: Bid Package

Prepared by/Author: DuPont Environmental Remediation Services

Preparer/Author Address: Barley Mill Plaza 27
Routes 48 & 141
Wilmington, DE 19880-0027

Prepared For: Eligible Contractors

Date Published: September 29, 1997

Key Words and Phrases:

Reference Type: A

ReferenceID: 658

Title: *Superfund Remedial Action Completion Report: Operable Unit 7 (Christina River)*

Location: AEM

Category: Close-Out Report

Prepared by/Author: US EPA Region III

Preparer/Author Address:

Prepared For: General Public

Date Published: February 18, 2000

Key Words and Phrases:

Reference Type: A

ReferenceID: 769

Title: *Christina River Remedy Modifications: E.I. DuPont, Newport Superfund Site*

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: Randy Sturgeon, Remedial Project Manager

Preparer/Author Address: US EPA Region III

Prepared For: File

Date Published: August 5, 1996

Key Words and Phrases:

REFERENCES

Project Name DUPONT NEWPORT SITE

ProjectID: 03-02

Reference Type: B

ReferenceID: 143

Title: *River and Wetland Remediation Goals (Sediment Clean-up Criteria): Du Pont-Newport Site: Third and Final Edition*

Location: AEM

Category: Cleanup Levels and Risks

Prepared by/Author: Randy Sturgeon, RPM

Preparer/Author Address: US EPA Region III

Prepared For: File (and presented as Attachment B in the 1993 ROD)

Date Published: July 9, 1993

Key Words and Phrases:

Reference Type: B

ReferenceID: 390

Title: *Written Report for Oily Substance Release, 1/4/93.*

Location: AEM

Category: Contaminated Sediments: Investigation/Delineation

Prepared by/Author: CIBA-GEIGY Corporation

Preparer/Author Address: James and Water Streets
Newport, DE 19804

Prepared For: National Response Center (Washington, DC)

Date Published: January 7, 1993

Key Words and Phrases:

Reference Type: B

ReferenceID: 523

Title: *North Landfill Ground Water Barrier: Wall Depth Modification: E.I. DuPont, Newport Superfund Site*

Location: AEM

Category: Remedial Design

Prepared by/Author: Randy Sturgeon, Remedial Project Manager

Preparer/Author Address: US EPA Region III
1650 Arch Street
Philadelphia, PA 19103

Prepared For: File

Date Published: February 26, 1998

Key Words and Phrases:

REFERENCES

Project Name DUPONT NEWPORT SITE

ProjectID: 03-02

Reference Type: B

ReferenceID: 874

Title: *In Delaware, a Site Owner's Cooperation and a Cleanup that Exceeds Expectations*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region III

**Preparer/Author
Address:**

Prepared For: General Public

Date Published: 2002 circa

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 949

Title: *e-mail re: Christina River Remediation*

Location: AEM

Category: Dredging: Remedial (Contaminated Sediments)

Prepared by/Author: Brandt Butler

**Preparer/Author
Address:** URS Corporation

Prepared For: AEM, Inc.

Date Published: June 11, 2001

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 961

Title: *e-mail re: Questions*

Location: AEM

Category: Site Update

Prepared by/Author: Brandt Butler

**Preparer/Author
Address:** DuPont

Prepared For: AEM, Inc.

Date Published: July 11, 2002

**Key Words and
Phrases:**

REFERENCES

Project Name DUPONT NEWPORT SITE

ProjectID: 03-02

Reference Type: C

ReferenceID: 146

Title: *Newport Landfill Gets \$3M Dredging; Capping Work May Come Next Year*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: April 16, 1999

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 156

Title: *PRP to sample sediments for Newport fix*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: August 19, 1994

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 1079

Title: *Del.: Monitoring to Assess Remedy*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Hazardous Waste/Superfund Week

Date Published: October 7, 2002

**Key Words and
Phrases:**

REFERENCES

Project Name **DUPONT NEWPORT SITE**

ProjectID: 03-02

Reference Type: D

ReferenceID: 503

Title: ***River Tales***

Location: AEM

Category: Miscellaneous

Prepared by/Author: Gary Soulsman

**Preparer/Author
Address:**

Prepared For: The Wilmington (DE) News-Journal

Date Published: June 4, 2001

**Key Words and
Phrases:** Christina River

Reference Type: E

ReferenceID: 95

Title: ***Construction of a Unique Riverbank Cover System for the Newport Superfund Site (DuPont-Newport Superfund Site)***

Location: AEM

Category: Capping/Placement

Prepared by/Author: Joel Karmazyn, Edward J. Lutz, and P. Brandt Butler

**Preparer/Author
Address:** DuPont Environmental Remediation Services
Wilmington, DE

Prepared For: Superfund XVI (Washington, DC)

Date Published: November 1995

**Key Words and
Phrases:**

Reference Type: E

ReferenceID: 233

Title: ***The Cable Arm Clamshell: Development and Track Record for Environmental Dredging***

Location: AEM

Category: Dredging: Remedial (Contaminated Sediments)

Prepared by/Author: (1) R.E. Bergeron, (2) B.S. Cushing, (3) M.K. Hammaker

**Preparer/Author
Address:** (1) Cable Arm, Inc.
Trenton, MI 48183
(2), (3) Applied Environmental Management
Malvern, PA 19355

Prepared For: WEDA XX Conference, Warwick, RI

Date Published: June 25-28, 2000

**Key Words and
Phrases:**

REFERENCES

Project Name **DUPONT NEWPORT SITE**

ProjectID: 03-02

Reference Type: M

ReferenceID: 321

Title: ***Construction Monitoring Report: Christina River Remediation***

Location: AEM

Category: Close-Out Report

Prepared by/Author: URS Greiner Woodward Clyde Group Consultants, Inc.

Preparer/Author 282 Delaware Avenue

Address: Buffalo, NY 14202

Prepared For: DuPont Corporate Remediation Group, Wilmington, DE 19805

Date Published: December 1999

***Key Words and
Phrases:***
