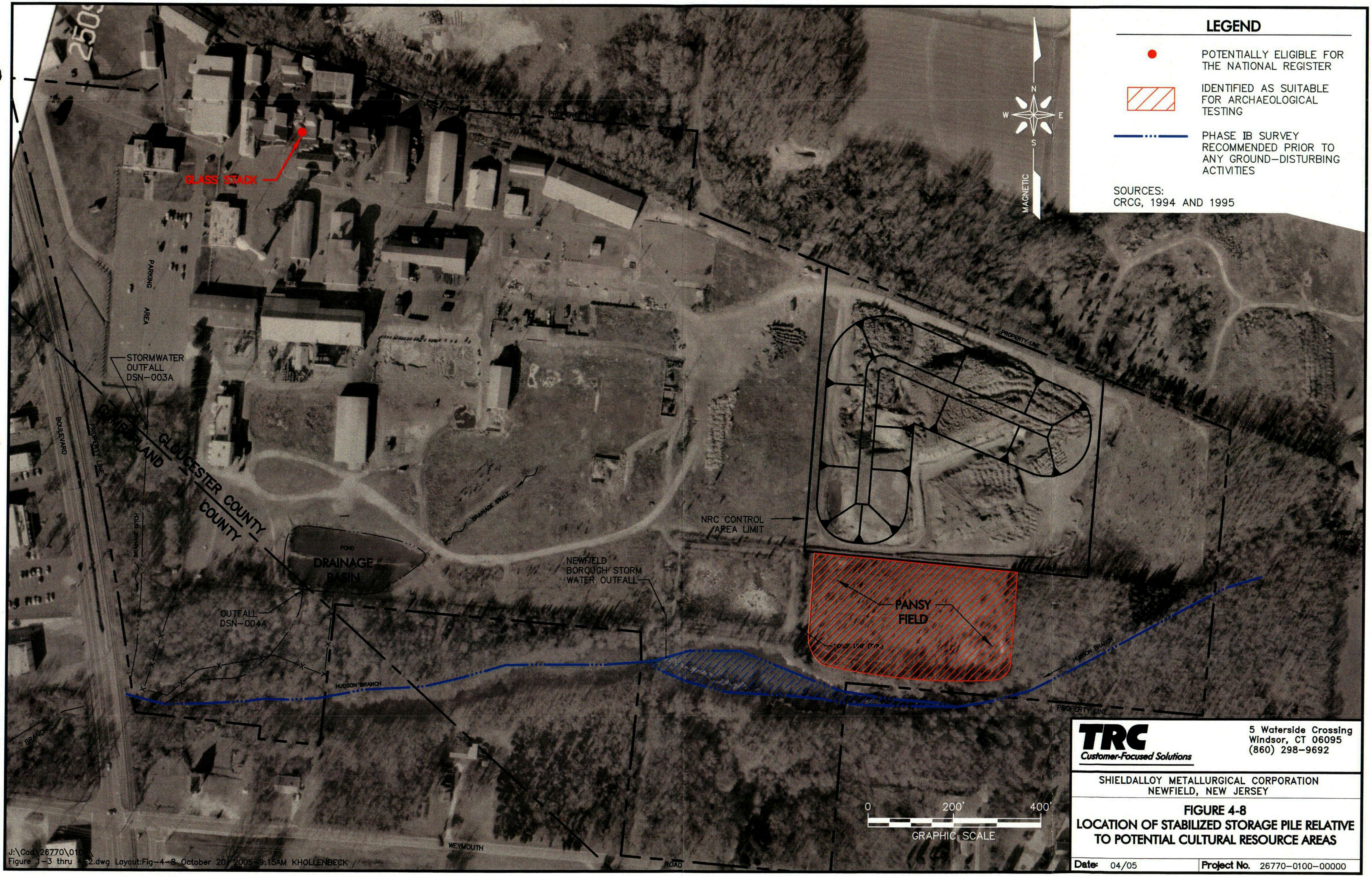

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(860) 298–9692

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NEWFIELD, NEW JERSEY

FIGURE 4-8
LOCATION OF STABILIZED STORAGE PILE RELATIVE TO POTENTIAL CULTURAL RESOURCE AREAS

Date: 04/05 | Project No. 26770–0100–00000

J:\Cad\26770\0100\Fi...1-3 thru 4-2.dwg, Fig-4-8, 10/20/2005 9:15:33 AM

C30

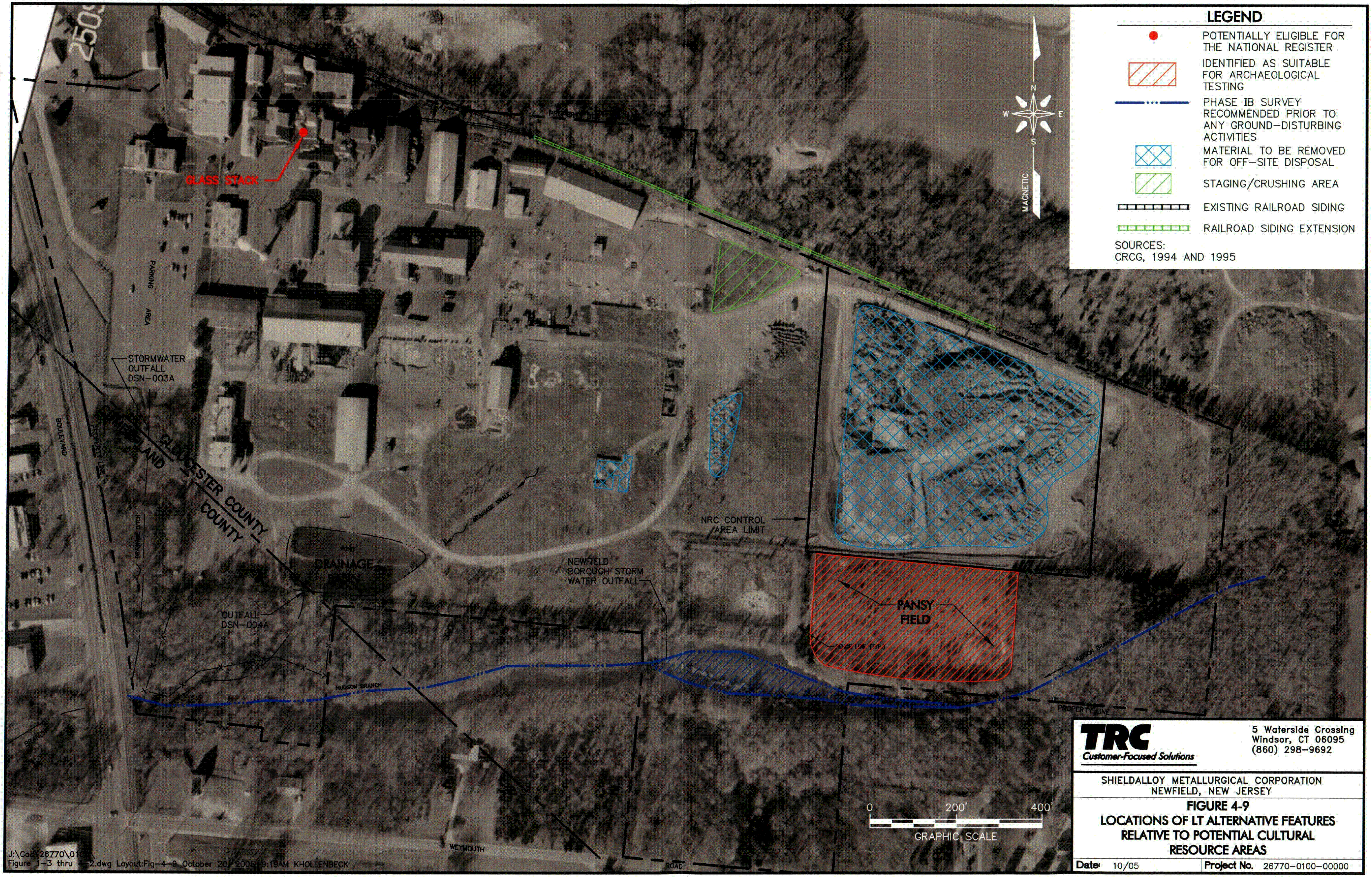

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FIGURE 4-9
LOCATIONS OF LT ALTERNATIVE FEATURES RELATIVE TO POTENTIAL CULTURAL RESOURCE AREAS

Date: 10/05 | Project No. 26770-0100-00000

J:\Cad\26770\0100\...3 thru 4-2.dwg, Fig-4-9, 10/20/2005 9:19:16 AM

C31

New Jersey 2002 High Resolution
February-April, 2002.
The ortho-rectification process achieved a +/-4.0 ft. horizontal accuracy at a 95% confidence level
Publication_Date: 20030731

Miles: 0 | 0.125 | 0.25 | 0.5

POTENTIAL INCREMENTAL CAPPED PILE VIEWSHED
POSITION AND ELEVATION ACQUIRED FROM FIGURE 1-1
ANALYSIS ASSUMED A CAPPED PILE HEIGHT OF 30'

1- MILE RADIUS

Abstract:

Visibility Analysis was produced using a bare earth Digital Elevation Model (DEM) with New Jersey Land Cover Data Set added to compensate for areas with vegetation. Site specific survey information for the proposed and existing footprints was utilized to adjust for elevation differences in this vicinity.

DEM Information: (10- by 10-m data spacing, elevations in decimeters) Elevation_resolution_ is 1 decimeter (0.1 meter). Elevation accuracy is 24,000 contour data, i.e. plus/minus half the contour interval.

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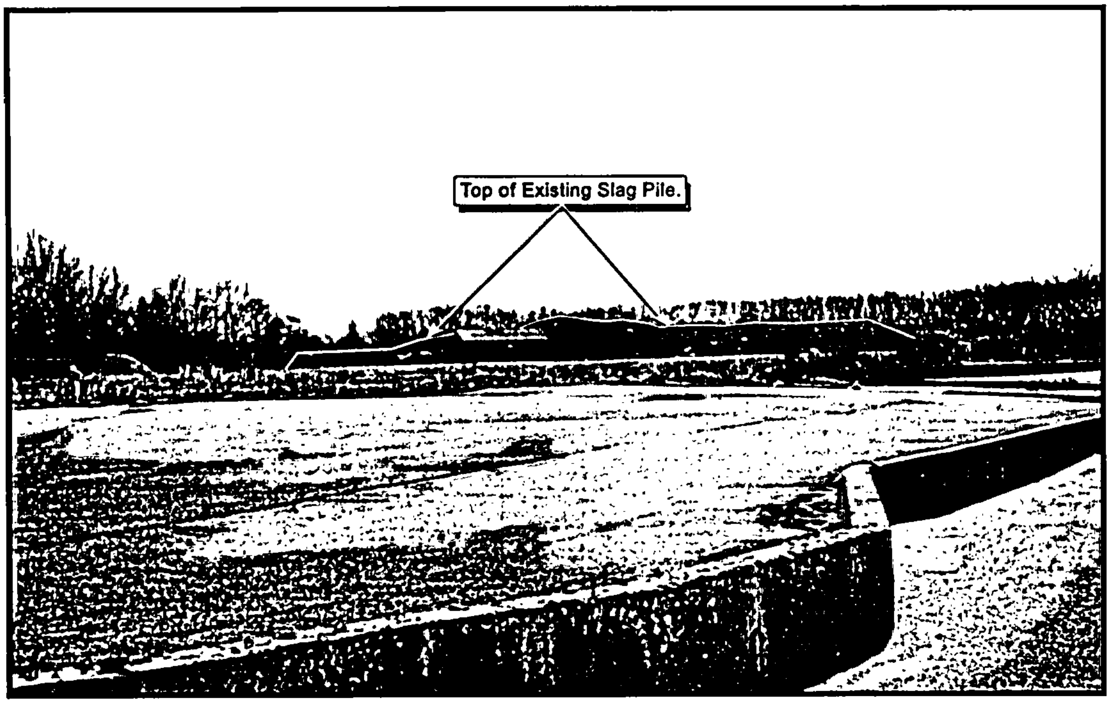
VIEWSHED MAP
PROPOSED ACTION

FIGURE 4-10

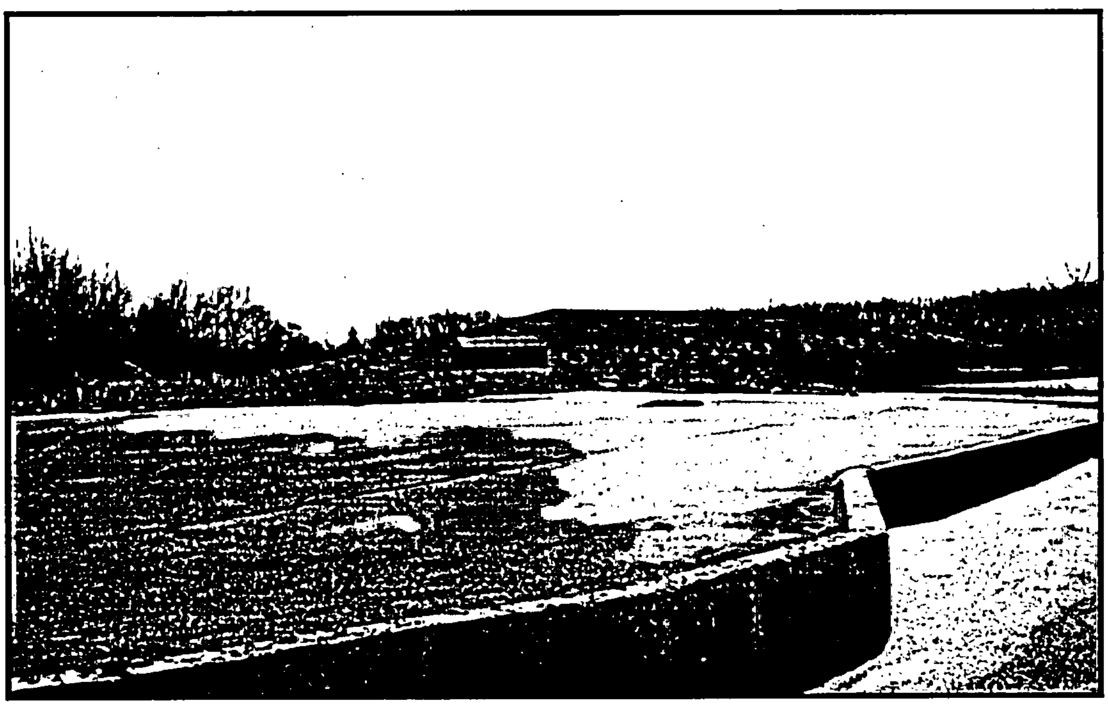
TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
(978)970-5600

PROJ.26770-0100

C32



Existing View - Storage Yard.



Viewpoint Simulation - LTC Alternative.

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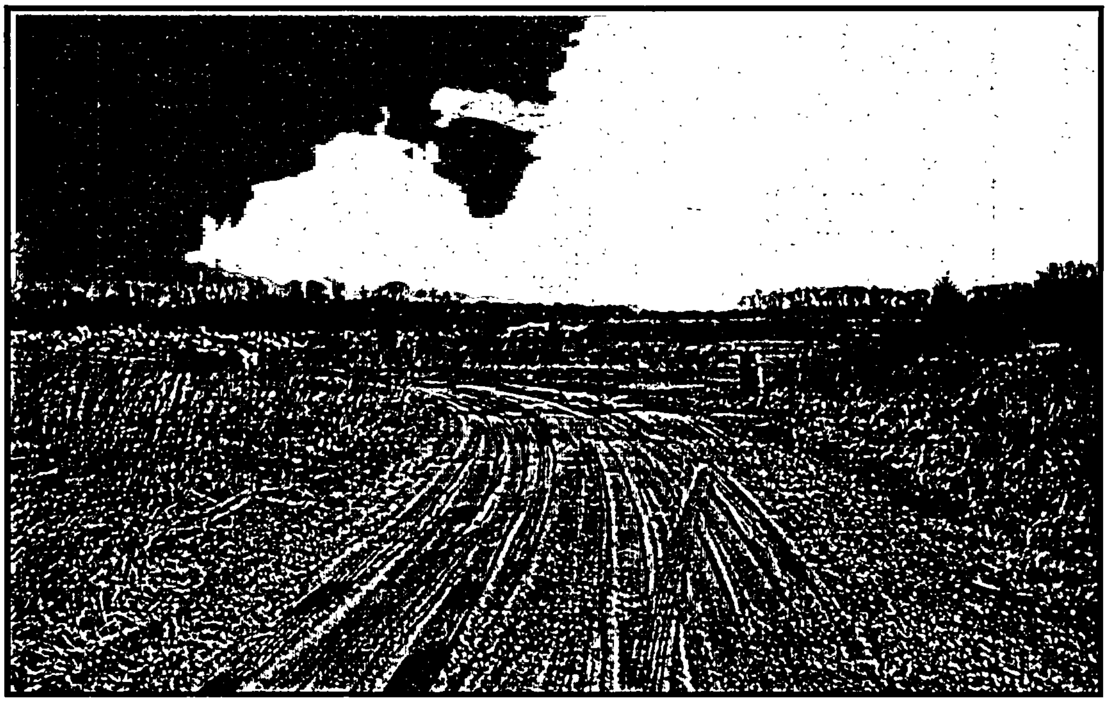
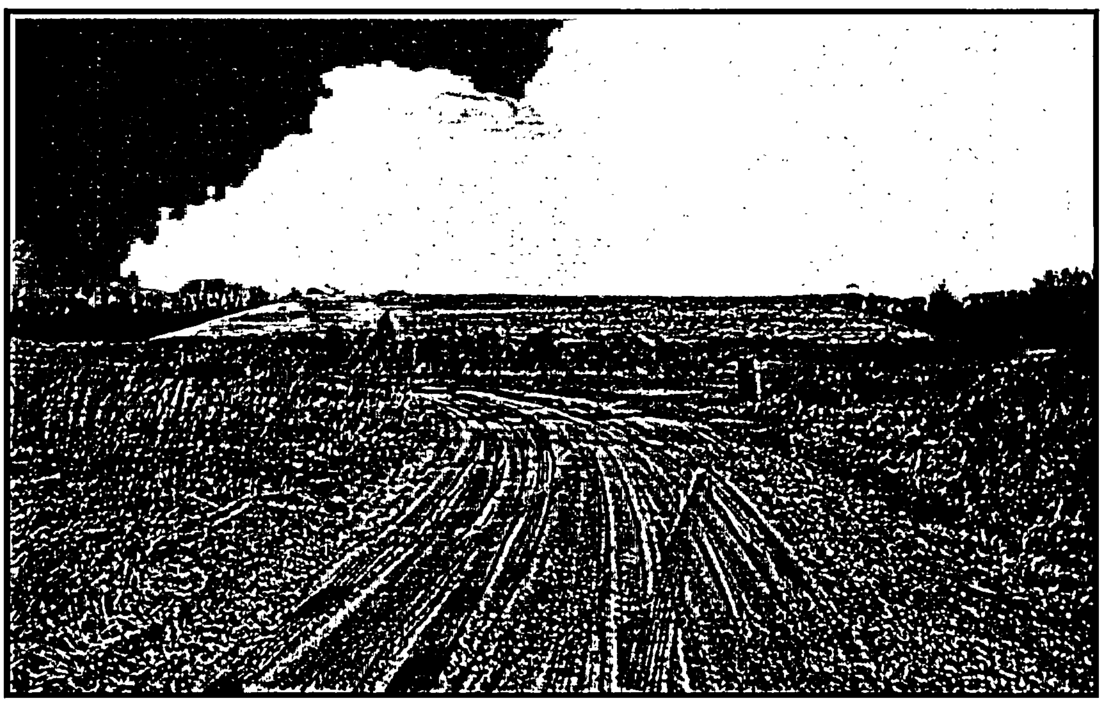
FIGURE 4-11
VIEWPOINT LOCATION 1 -
LTC ALTERNATIVE

Date: 10/05 | Project No. 26770-0100-00000



Existing View - Storage Yard.



Viewpoint Simulation - LTC Alternative.

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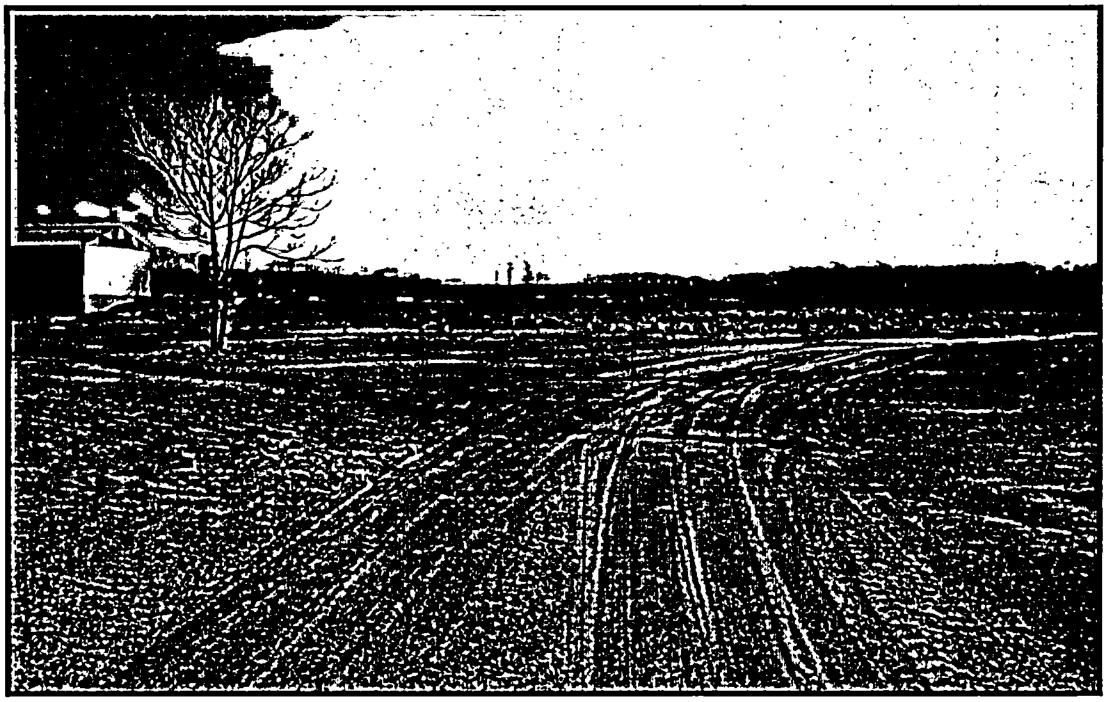
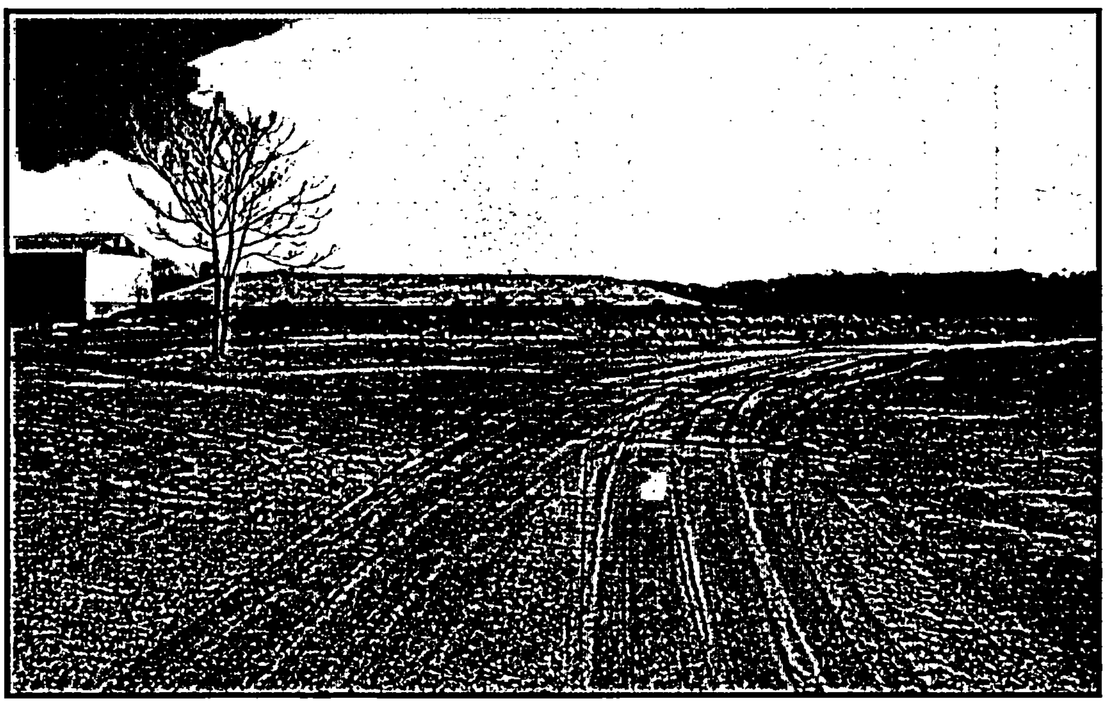
SHIELDALLOY METALLURGICAL CORP. NEWFIELD, NEW JERSEY	
FIGURE 4-12 **VIEWPOINT LOCATION 2 -** **LTC ALTERNATIVE**	
Date: 10/05	**Project No.** 26770-0100-00000



Existing View - Storage Yard.



Viewpoint Simulation - LTC Alternative.

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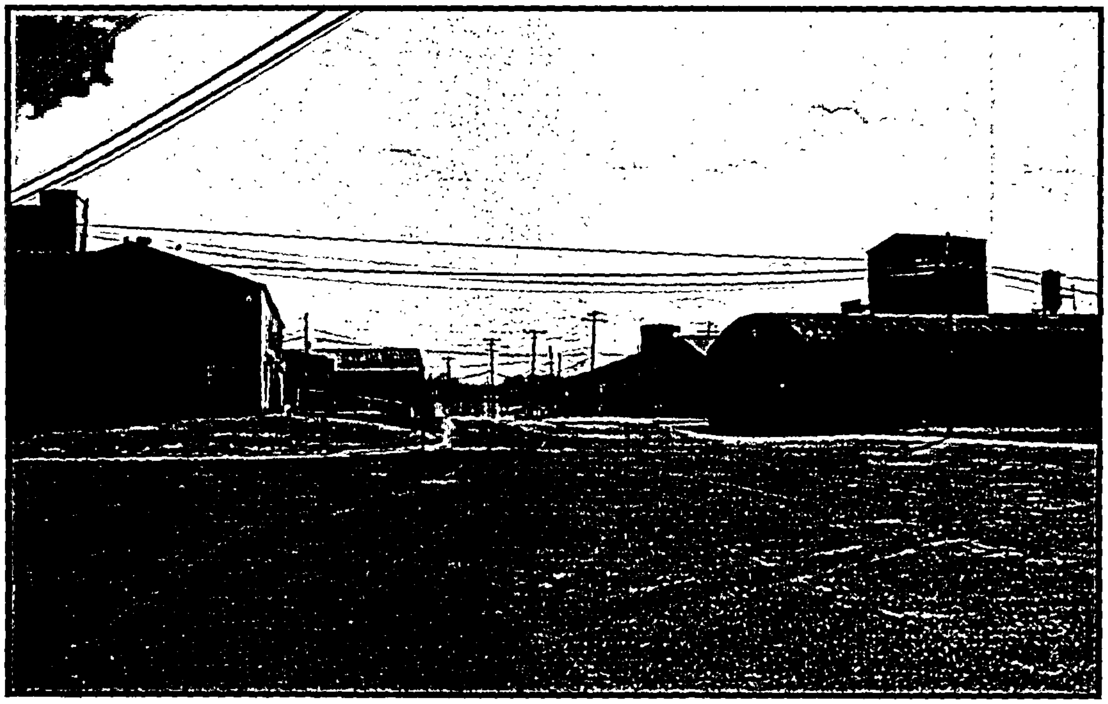
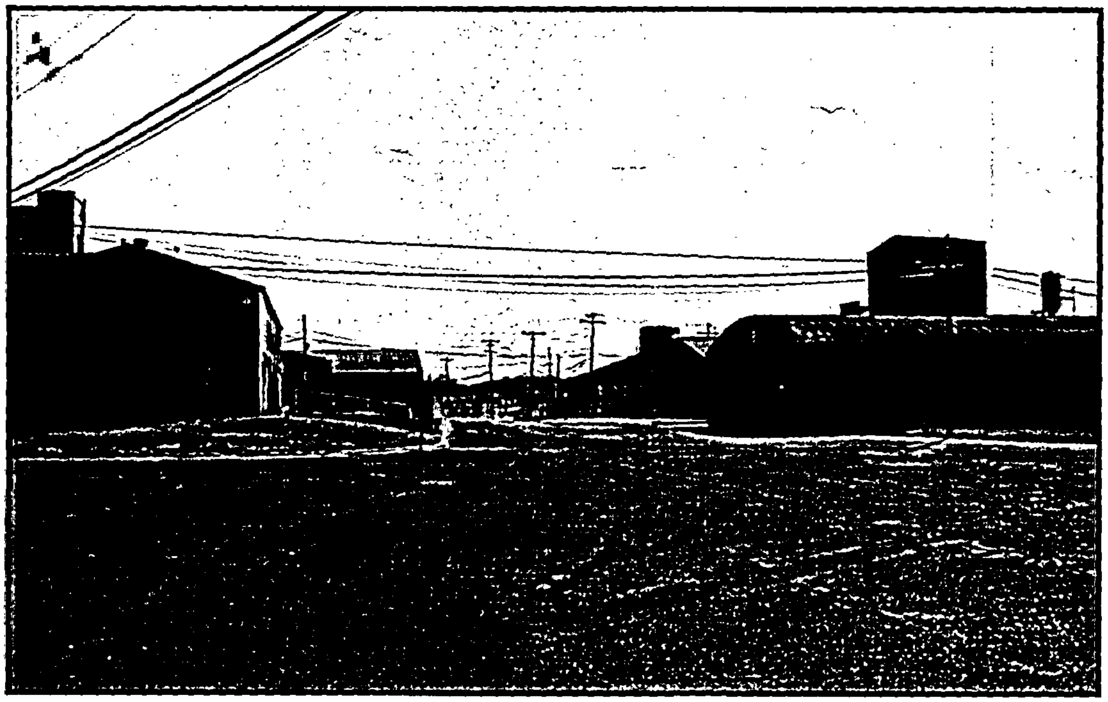
FIGURE 4-13
VIEWPOINT LOCATION 4 -
LTC ALTERNATIVE

Date: 10/05	Project No. 26770-0100-00000



Existing View.



Viewpoint Simulation - LTC Alternative.

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FIGURE 4-14
VIEWPOINT LOCATION 5 -
LTC ALTERNATIVE

Date: 10/05 | Project No. 26770-0100-00000

Existing View.

Viewpoint Simulation with Ghosted Image
(not visible from this location).

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FIGURE 4-15
VIEWPOINT LOCATION 23 -
LTC ALTERNATIVE (Ghosted Image)

Date: 10/05 | Project No. 26770-0100-00000

Existing View.

Viewpoint Simulation with Ghosted Image
(not visible from this location).

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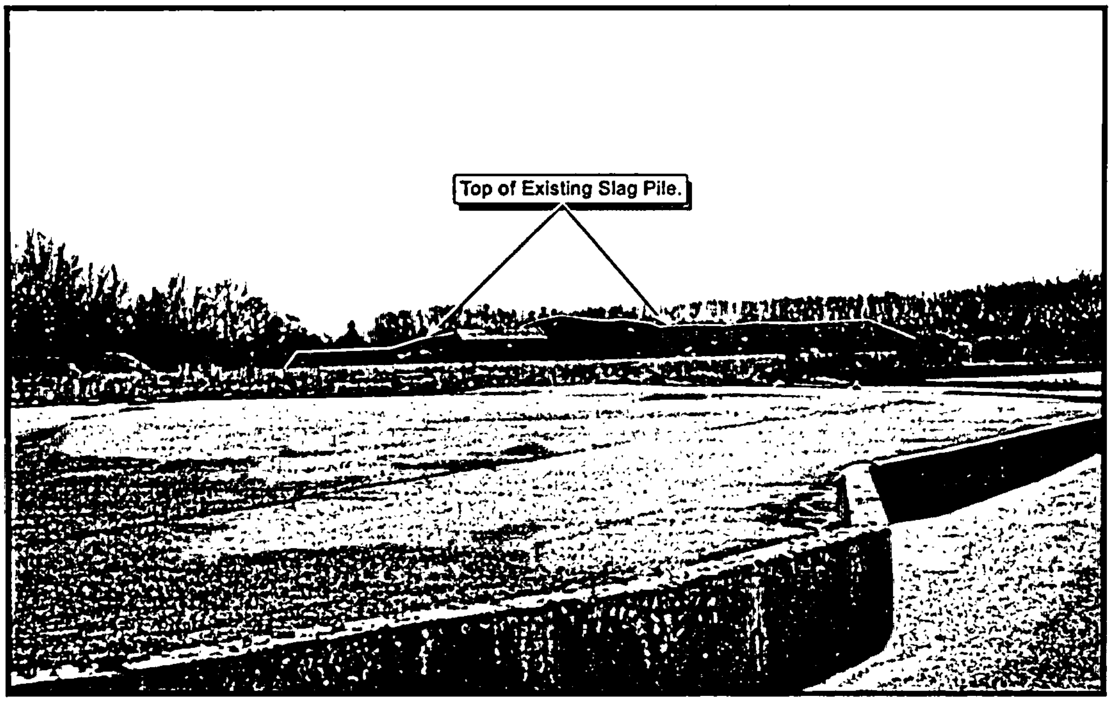
FIGURE 4-16
VIEWPOINT LOCATION 18 -
LTC ALTERNATIVE (Ghosted Image)

Date: 10/05 | Project No. 26770-0100-00000



Existing View - Storage Yard.

Viewpoint Simulation - LT Alternative.

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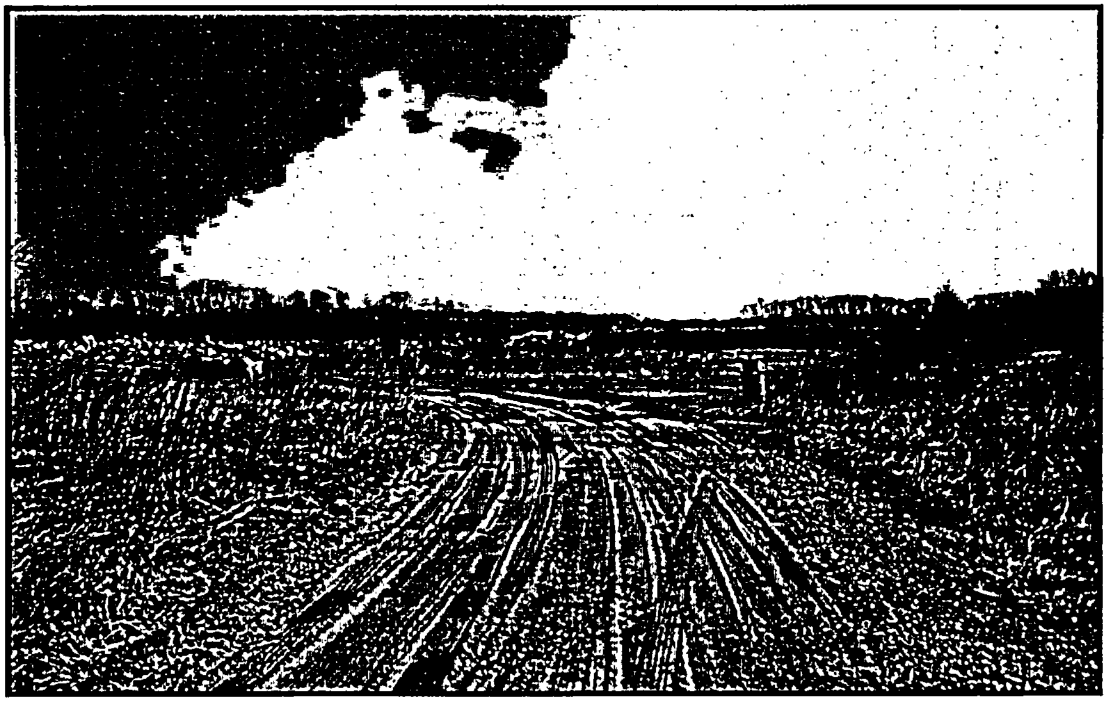
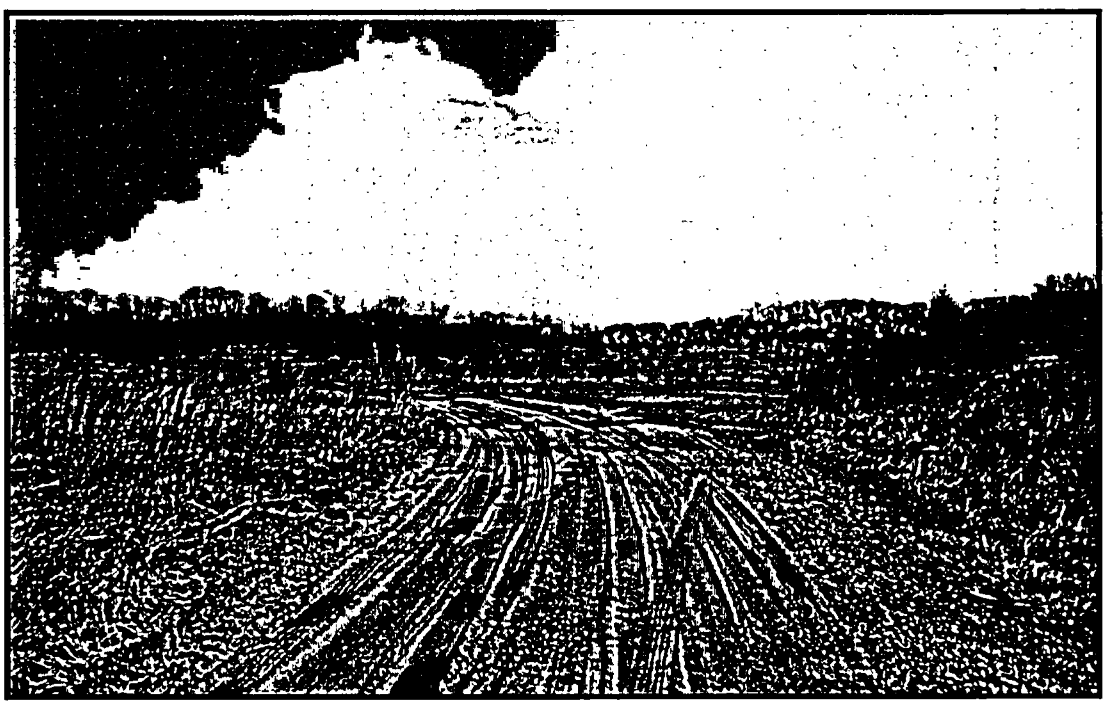
FIGURE 4-17
VIEWPOINT LOCATION 1 -
LT ALTERNATIVE

Date: 10/05 | Project No. 26770-0100-00000



Existing View - Storage Yard.



Viewpoint Simulation - LT Alternative.

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FIGURE 4-18
VIEWPOINT LOCATION 2 - LT ALTERNATIVE

Date: 10/05 | Project No. 26770-0100-00000

Orthophoto Source Information:
Originator: BAE SYSTEMS ADR
Publication Date: 07/31/2003
Title: New Jersey 2002 High Resolution Orthophotography
Geospatial Data Presentation Form: remote-sensing image
Publication Information:
Publication Place: Trenton, New Jersey
Publisher: State of New Jersey, Office of Information Technology
Abstract: Digital color infrared (CIR) orthophotography of New Jersey in State Plane NAD83 Coordinates, U.S. Survey Feet. The digital orthophotography was produced at a scale of 1:2400 (1"=200').

0 1000' 2000'
GRAPHIC SCALE

26770\0100\Figure 4-19

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FIGURE 4-19
LOCATION OF LTC ALTERNATIVE FEATURES RELATIVE TO OFF-SITE SENSITIVE RECEPTORS

Date: 04/05	**Project No.** 26770-0100-00000

J:\Cad\26770\0100\Figure 4-19.dwg, FIGURE 4-19, 10/18/2005 11:03:16 AM

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APPENDIX A - SELECT LAND USE INFORMATION

APPENDIX A - SELECT LAND USE INFORMATION

Soils Defined as Prime and Other Important Farmlands
Gloucester County
Cumberland County

Prime and other Important Farmlands

Gloucester County, New Jersey

Map symbol	Map unit name	Farmland classification
AucB	Aura loamy sand, 0 to 5 percent slopes	All areas are prime farmland
AugA	Aura sandy loam, 0 to 2 percent slopes	All areas are prime farmland
AugB	Aura sandy loam, 2 to 5 percent slopes	All areas are prime farmland
AupB	Aura loam, 2 to 5 percent slopes	All areas are prime farmland
AvsB	Aura-Sassafras loamy sands, 0 to 5 percent slopes	All areas are prime farmland
AvtB	Aura-Sassafras sandy loams, 2 to 5 percent slopes	All areas are prime farmland
BumA	Buddtown-Deptford complex, 0 to 2 percent slopes	All areas are prime farmland
CogB	Collington loamy sand, 0 to 5 percent slopes	All areas are prime farmland
CokA	Collington sandy loam, 0 to 2 percent slopes	All areas are prime farmland
CokB	Collington sandy loam, 2 to 5 percent slopes	All areas are prime farmland
CosB	Colts Neck sandy loam, 2 to 5 percent slopes	All areas are prime farmland
DoeA	Downer sandy loam, 0 to 2 percent slopes	All areas are prime farmland
DoeB	Downer sandy loam, 2 to 5 percent slopes	All areas are prime farmland
FrfB	Freehold loamy sand, 0 to 5 percent slopes	All areas are prime farmland
FrkA	Freehold sandy loam, 0 to 2 percent slopes	All areas are prime farmland
FrkB	Freehold sandy loam, 2 to 5 percent slopes	All areas are prime farmland
KemB	Keyport sandy loam, 2 to 5 percent slopes	All areas are prime farmland
KeoA	Keyport loam, 0 to 2 percent slopes	All areas are prime farmland
MaoB	Marlton sandy loam, 2 to 5 percent slopes	All areas are prime farmland
SacA	Sassafras sandy loam, 0 to 2 percent slopes	All areas are prime farmland
SacB	Sassafras sandy loam, 2 to 5 percent slopes	All areas are prime farmland
WeeB	Westphalia fine sandy loam, 2 to 5 percent slopes	All areas are prime farmland
WoeA	Woodstown sandy loam, 0 to 2 percent slopes	All areas are prime farmland
WoeB	Woodstown sandy loam, 2 to 5 percent slopes	All areas are prime farmland
WokA	Woodstown-Glassboro complex, 0 to 2 percent slopes	All areas are prime farmland
AugC	Aura sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
AvsC	Aura-Sassafras loamy sands, 5 to 10 percent slopes	Farmland of statewide importance
AvtC	Aura-Sassafras sandy loams, 5 to 10 percent slopes	Farmland of statewide importance
CogC	Collington loamy sand, 5 to 10 percent slopes	Farmland of statewide importance
CokC	Collington sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
CosC	Colts Neck sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
DocB	Downer loamy sand, 0 to 5 percent slopes	Farmland of statewide importance
DocC	Downer loamy sand, 5 to 10 percent slopes	Farmland of statewide importance
FamA	Fallsington sandy loam, 0 to 2 percent slopes	Farmland of statewide importance
FapA	Fallsington loam, 0 to 2 percent slopes	Farmland of statewide importance
FrfC	Freehold loamy sand, 5 to 10 percent slopes	Farmland of statewide importance
FrkC	Freehold sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
HbmB	Hammonton loamy sand, 0 to 5 percent slopes	Farmland of statewide importance
JdrA	Jade Run fine sandy loam, 0 to 2 percent slopes	Farmland of statewide importance
KreA	Kresson fine sandy loam, 0 to 2 percent slopes	Farmland of statewide importance
LenA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance
MaoC	Marlton sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
MaoC2	Marlton sandy loam, 5 to 10 percent slopes, eroded	Farmland of statewide importance
MumA	Mullica sandy loam, 0 to 2 percent slopes	Farmland of statewide importance
OTKA	Othello and Fallsington soils, 0 to 2 percent slopes	Farmland of statewide importance
SabB	Sassafras loamy sand, 0 to 5 percent slopes	Farmland of statewide importance
SabC	Sassafras loamy sand, 5 to 10 percent slopes	Farmland of statewide importance
SacC	Sassafras sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
fB	Tinton sand, 0 to 5 percent slopes	Farmland of statewide importance

Prime and other Important Farmlands

Gloucester County, New Jersey

Map symbol	Map unit name	Farmland classification
WeeC	Westphalia fine sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
AtsA	Atsion sand, 0 to 2 percent slopes	Farmland of unique importance
AtsAr	Atsion sand, 0 to 2 percent slopes, rarely flooded	Farmland of unique importance
BerAr	Berryland sand, 0 to 2 percent slopes, rarely flooded	Farmland of unique importance
BEXAS	Berryland and Mullica soils, 0 to 2 percent slopes, occasionally flooded	Farmland of unique importance
MakAt	Manahawkin muck, 0 to 2 percent slopes, frequently flooded	Farmland of unique importance
MamnAv	Mannington-Nanticoke complex, 0 to 1 percent slopes, very frequently flooded	Farmland of unique importance
MamuAv	Mannington-Nanticoke-Udorthents complex, 0 to 1 percent slopes, very frequently flooded	Farmland of unique importance

Prime and other Important Farmlands

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation's food supply.

Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance.

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in this table ("Important Farmlands"). This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table entitled "Acreage and Proportionate Extent of the Soils." The location is shown on the detailed soil maps.

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these special crops when properly managed. The water supply is dependable and of adequate quality. Nearness to markets is an additional consideration. Because it is not based on national criteria, unique farmland can differ from one area to another. Unique farmland commonly is in areas where there is a special microclimate, such as the wine country in California.

In some areas land that does not meet the criteria for prime or unique farmland is considered to be farmland of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

In some areas that are not identified as having national or statewide importance, land is considered to be farmland of local importance for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. Farmland of local importance may include tracts of land that have been designated for agriculture by local ordinance.

Prime and other Important Farmlands

Cumberland County, New Jersey

Map symbol	Map unit name	Farmland classification
AucB	Aura loamy sand, 0 to 5 percent slopes	All areas are prime farmland
AugA	Aura sandy loam, 0 to 2 percent slopes	All areas are prime farmland
AugB	Aura sandy loam, 2 to 5 percent slopes	All areas are prime farmland
AuhB	Aura gravelly sandy loam, 2 to 5 percent slopes	All areas are prime farmland
ChtA	Chillum silt loam, 0 to 2 percent slopes	All areas are prime farmland
ChtB	Chillum silt loam, 2 to 5 percent slopes	All areas are prime farmland
DoeA	Downer sandy loam, 0 to 2 percent slopes	All areas are prime farmland
DoeB	Downer sandy loam, 2 to 5 percent slopes	All areas are prime farmland
HboA	Hammonton sandy loam, 0 to 2 percent slopes	All areas are prime farmland
HboB	Hammonton sandy loam, 2 to 5 percent slopes	All areas are prime farmland
MbrA	Matapeake silt loam, 0 to 2 percent slopes	All areas are prime farmland
MbrB	Matapeake silt loam, 2 to 5 percent slopes	All areas are prime farmland
MbuA	Mattapex silt loam, 0 to 2 percent slopes	All areas are prime farmland
MbuB	Mattapex silt loam, 2 to 5 percent slopes	All areas are prime farmland
SacA	Sassafras sandy loam, 0 to 2 percent slopes	All areas are prime farmland
SacB	Sassafras sandy loam, 2 to 5 percent slopes	All areas are prime farmland
SadA	Sassafras gravelly sandy loam, 0 to 2 percent slopes	All areas are prime farmland
SadB	Sassafras gravelly sandy loam, 2 to 5 percent slopes	All areas are prime farmland
WoeA	Woodstown sandy loam, 0 to 2 percent slopes	All areas are prime farmland
WoeB	Woodstown sandy loam, 2 to 5 percent slopes	All areas are prime farmland
DocB	Downer loamy sand, 0 to 5 percent slopes	Farmland of statewide importance
DocC	Downer loamy sand, 5 to 10 percent slopes	Farmland of statewide importance
[illegible]mA	Fallsington sandy loam, 0 to 2 percent slopes	Farmland of statewide importance
FodB	Fort Mott loamy sand, 0 to 5 percent slopes	Farmland of statewide importance
GamB	Galloway loamy sand, 0 to 5 percent slopes	Farmland of statewide importance
HbmB	Hammonton loamy sand, 0 to 5 percent slopes	Farmland of statewide importance
MbrC	Matapeake silt loam, 5 to 10 percent slopes	Farmland of statewide importance
OthA	Othello silt loam, 0 to 2 percent slopes	Farmland of statewide importance
OTKA	Othello and Fallsington soils, 0 to 2 percent slopes	Farmland of statewide importance
OTMA	Othello, Fallsington, and Trussum soils, 0 to 2 percent slopes	Farmland of statewide importance
SacC	Sassafras sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
SadC	Sassafras gravelly sandy loam, 5 to 10 percent slopes	Farmland of statewide importance
AptAv	Appoquinimink-Transquaking-Mispillion complex, 0 to 1 percent slopes, very frequently flooded	Farmland of unique importance
AtsAr	Atsion sand, 0 to 2 percent slopes, rarely flooded	Farmland of unique importance
BEXAS	Berryland and Mullica soils, 0 to 2 percent slopes, occassionally flooded	Farmland of unique importance
BrvAv	Broadkill silt loam, 0 to 1 percent slopes, very frequently flooded	Farmland of unique importance
MakAt	Manahawkin muck, 0 to 2 percent slopes, frequently flooded	Farmland of unique importance
MmtAv	Mispillion-Transquaking-Appoquinimink complex, 0 to 1 percent slopes, very frequently flooded	Farmland of unique importance
PdwAv	Pawcatuck-Transquaking complex, 0 to 1 percent slopes, very frequently flooded	Farmland of unique importance
TrkAv	Transquaking mucky peat, 0 to 1 percent slopes, very frequently flooded	Farmland of unique importance

Prime and other Important Farmlands

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested ›deral, State, and local government organizations, has inventoried land that can be used for the production of the Nation's food supply.

Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance.

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in this table ("Important Farmlands"). This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table entitled "Acreage and Proportionate Extent of the Soils." The location is shown on the detailed soil maps.

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these special crops when properly managed. The water supply is dependable and of adequate quality. Nearness to markets is an additional consideration. Because it is not based on national criteria, unique farmland can differ from one area to another. Unique farmland commonly is in areas where there is a special microclimate, such as the wine country in California.

some areas land that does not meet the criteria for prime or unique farmland is considered to be farmland of statewide importance for the production /food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

In some areas that are not identified as having national or statewide importance, land is considered to be farmland of local importance for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. Farmland of local importance may include tracts of land that have been designated for agriculture by local ordinance.

APPENDIX B - SELECTED GEOLOGIC/SOIL DATA

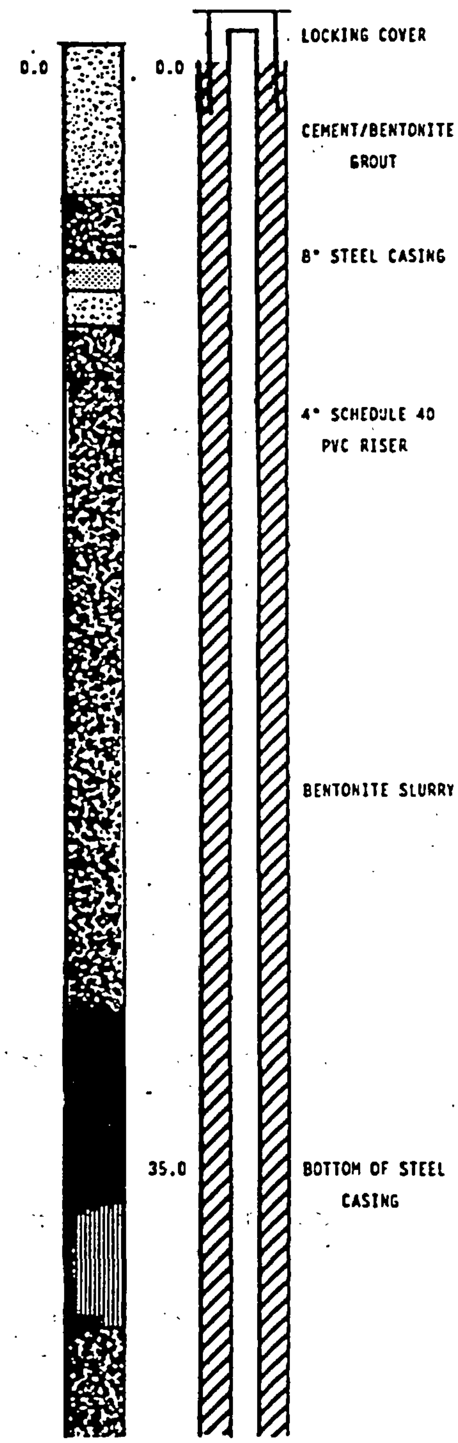
APPENDIX B - SELECTED GEOLOGIC/SOIL DATA

Select SMC Soil Borings
Hudson's Branch Exposure Rates (uR/hour)
Uranium-238 Concentrations in Soil, Sediment and Water Samples
Thorium-232 Concentrations in Soil and Water Samples
Radium-226 Concentrations in Soil, Sediment and Water Samples

BORING NO.:	SC-12D	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/16/90
PROJECT NO.:	7650-N51	DRILLERS:	KENNEY, EDWARDS	DATE COMPLETED:	11/19/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MCMORROW	WATER TABLE LEVEL:	9.0 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	LOCATION:	N 258008.45
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	102.16		E 1901049.83
BORING DEPTH:	142 FT	INNER CASING ELEVATION:	103.19	NJDEP PERMIT NUMBER:	3135226-0

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	9 11	DARK BROWN, FINE TO MEDIUM SAND, TRACE SILT, MOIST
	5 7	RECOVERY = 22"
2 - 4	7 6	BROWN FINE TO MEDIUM SAND, MOIST
	6 6	RECOVERY = 18"
4 - 6	5 8	BROWN/ORANGE FINE TO COARSE SAND, TRACE GRAVEL, MOIST
	9 8	RECOVERY = 22"
6 - 8	6 5	0-12" BROWN FINE SAND, LITTLE SILT, TRACE CLAY, MOIST
	10 15	12-20" BROWN/ORANGE FINE TO MEDIUM SAND, MOIST
8 - 10	13 11	BROWN/ORANGE FINE TO COARSE SAND, TRACE SILT, WET
	8 8	RECOVERY = 24"
15 - 17	4 5	BROWN FINE TO COARSE SAND, TRACE GRAVEL, WET
	4 6	RECOVERY = 8"
20 - 22	8 7	BROWN/ORANGE FINE TO COARSE SAND
	7 6	RECOVERY = 10"
25 - 27	10 9	BROWN/ORANGE FINE TO COARSE SAND, LITTLE GRAVEL
	8 11	RECOVERY = 6"
30 - 32	6 1	0-3" SAME AS ABOVE
	1 3	3-10" DARK GRAY CLAY, VERY STIFF
35 - 37	3 4	0-12" LT. GRAY CLAY, LITTLE SILT
	5 8	12-18" BROWN SILT, SOME FINE SAND, TRACE CLAY, MOIST
40 - 42	2 3	BROWN FINE TO COARSE SAND
	3 5	RECOVERY = 8"

LITHOLOGY WELL CONSTRUCTION



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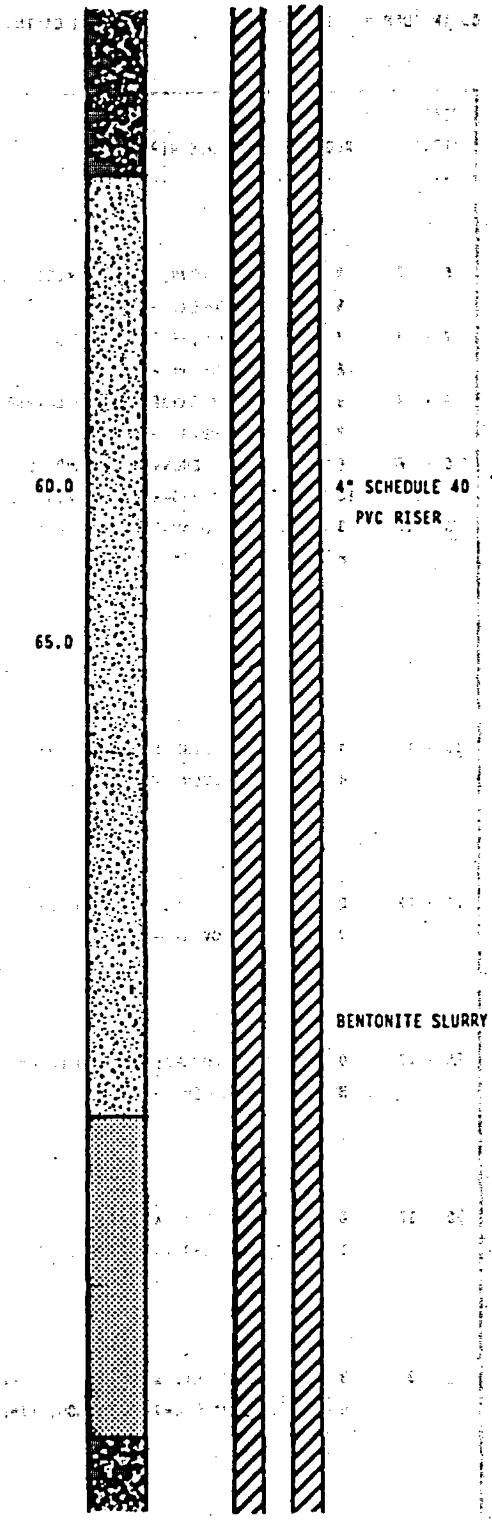
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
45 - 47	2 8 9 13	BROWN FINE TO COARSE SAND RECOVERY - 12"
50 - 52	3 5 30 30	LT. BROWN FINE TO MEDIUM SAND, TRACE SILT RECOVERY - 4"
55 - 57	5 11 15 20	SAME AS ABOVE WITH THIN WHITE LAYERS OF SILT THROUGHOUT RECOVERY - 14"
60 - 62	10 15 20 20	LT. BROWN TO WHITE FINE TO MEDIUM SAND RECOVERY - 14"
65 - 67	9 15 21 21	LT. BROWN FINE TO MEDIUM SAND RECOVERY - 12"
70 - 72	10 15 33 37	SAME AS ABOVE RECOVERY - 8"
75 - 77	22 24 28 32	SAME AS ABOVE RECOVERY - 12"
80 - 82	20 19 17 18	BROWN FINE SAND, TRACE SILT RECOVERY - 2"
85 - 87	10 12 11 20	LT. BROWN FINE SAND, TRACE SILT RECOVERY - 22"
90 - 92	15 29 16 18	LT. BROWN FINE TO COARSE SAND RECOVERY - 12"

LITHOLOGY WELL CONSTRUCTION



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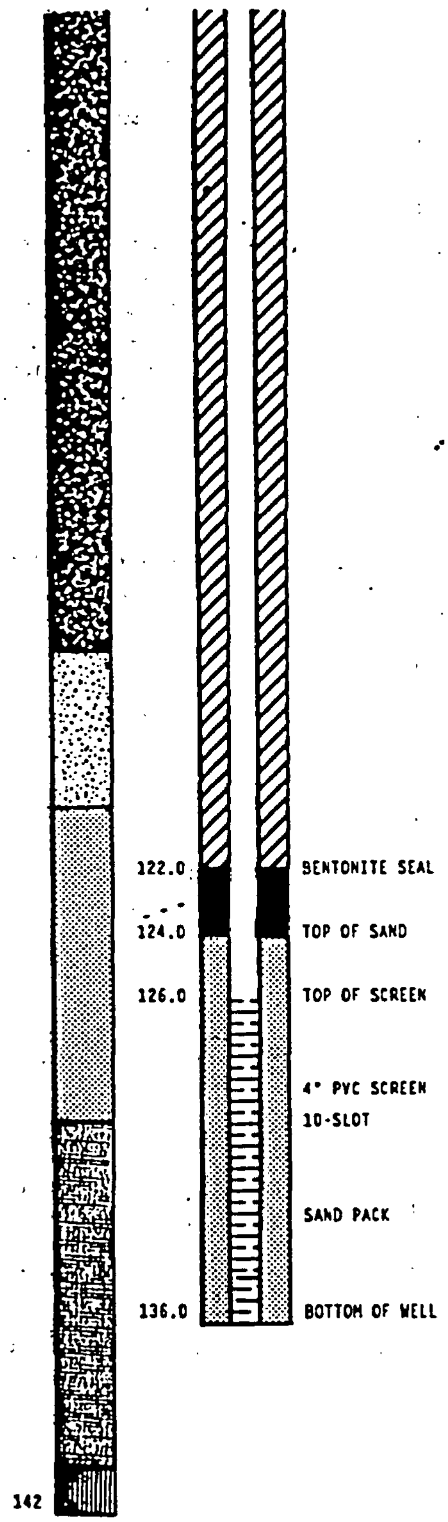
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
95 - 97	19 21 32 29	LT. BROWN FINE TO COARSE SAND RECOVERY - 12"
100 - 102	35 42 67 65	BROWN/ORANGE FINE TO COARSE SAND, TRACE SILT RECOVERY - 8"
105 - 107	25 52 67 100	SAME AS ABOVE RECOVERY - 14"
110 - 112	34 100/5"	SAME AS ABOVE RECOVERY - 8"
115 - 117	100/5"	BROWN/RED FINE TO MEDIUM SAND, TRACE SILT RECOVERY - 3"
120 - 122	12 11 19 28	BROWN FINE SAND, LITTLE SILT RECOVERY - 10"
125 - 127	12 22 20 18	LT. BROWN FINE SAND, LITTLE SILT RECOVERY - 12"
130 - 132	6 6 9 9	DARK GRAY FINE SAND AND SILT RECOVERY - 14"
135 - 137	5 6 5 8	SAME AS ABOVE RECOVERY - 20"
140 - 142	3 5 12 16	0-18" SAME AS ABOVE 18-24" DARK GRAY SILT, SOME CLAY END OF BORING - 142 FT

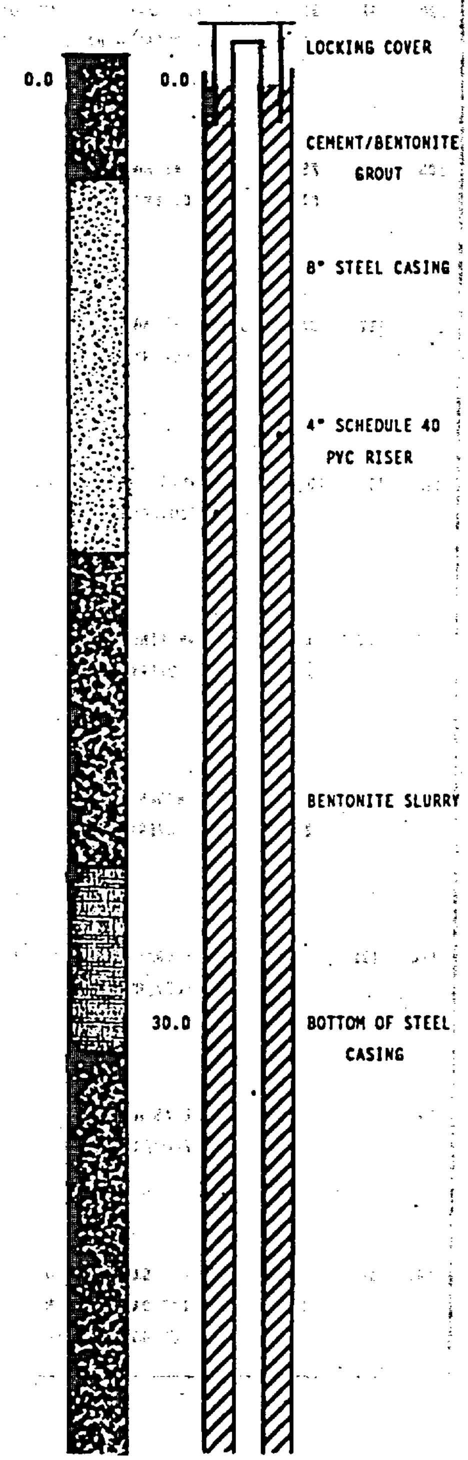
LITHOLOGY WELL CONSTRUCTION



BORING NO.:	SC-13D	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/20/90
PROJECT NO.:	7650-N51	DRILLERS:	KENNEY, EDWARDS	DATE COMPLETED:	11/21/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MCMORROW	WATER TABLE LEVEL:	5.5 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	LOCATION:	N 257662.57
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	99.67		E 1901067.82
BORING DEPTH:	142 FT	INNER CASING ELEVATION:	101.99	NJDEP PERMIT NUMBER:	3135227-8

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	2 3	BROWN/ORANGE FINE TO COARSE SAND, TRACE GRAVEL, MOIST
	3 3	RECOVERY = 18"
2 - 4	4 1	0-8" SAME AS ABOVE
	2 3	8-12" DARK BROWN FINE TO MEDIUM SAND, TRACE SILT
4 - 6	4 2	0-12" SAME AS 8-12" ABOVE
	2 2	12-24" GRAY FINE TO MEDIUM SAND, TRACE SILT, WET
10 - 12	10 8	BROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE GRAVEL
	15 12	RECOVERY = 8"
15 - 17	4 4	BROWN/ORANGE FINE TO COARSE SAND, TRACE GRAVEL
	4 4	RECOVERY = 6"
20 - 22	3 4	LT. BROWN FINE TO COARSE SAND, TRACE SILT
	4 6	RECOVERY = 8"
25 - 27	1 1	0-4" BLACK FINE TO MEDIUM SAND, TRACE SILT
	1 2	4-8" DARK GRAY SILT AND FINE SAND
30 - 32	3 7	0-12" GRAY SILT, LITTLE FINE SAND, LITTLE CLAY
	12 15	12-24" BROWN FINE TO COARSE SAND, TRACE SILT
35 - 37	7 8	LT. BROWN FINE TO COARSE SAND, TRACE SILT
	13 16	RECOVERY = 12"
40 - 42	7 13	LT. BROWN FINE TO COARSE SAND
	11 12	RECOVERY = 8"

LITHOLOGY WELL CONSTRUCTION



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DEPTH (FT)	BLOWS	SOIL DESCRIPTION
45 - 47	10 14 17 25	LT. BROWN FINE TO COARSE SAND RECOVERY = 8"
50 - 52	8 19 21 24	LT. BROWN FINE TO COARSE SAND, TRACE SILT RECOVERY = 10"
55 - 57	8 14 21 25	SAME AS ABOVE RECOVERY = 10"
60 - 62	5 15 18 19	SAME AS ABOVE, COLORS RANGE FROM REDDISH BROWN, TO WHITE, TO LT. BROWN 60.0 BACK TO REDDISH BROWN. RECOVERY = 8"
65 - 67	15 20 30 30	REDDISH BROWN FINE TO MEDIUM SAND, TRACE COARSE SAND, TRACE SILT 65.0 RECOVERY = 12"
70 - 72	21 44 64 62	SAME AS ABOVE RECOVERY = 18"
75 - 77	23 36 34 39	SAME AS ABOVE RECOVERY = 14"
80 - 82	23 30 50/5"	SAME AS ABOVE RECOVERY = 14"
85 - 87	20 30 33 37	SAME AS ABOVE RECOVERY = 12"
90 - 92	17 35 32 30	RED FINE TO MEDIUM SAND, TRACE SILT RECOVERY = 12"

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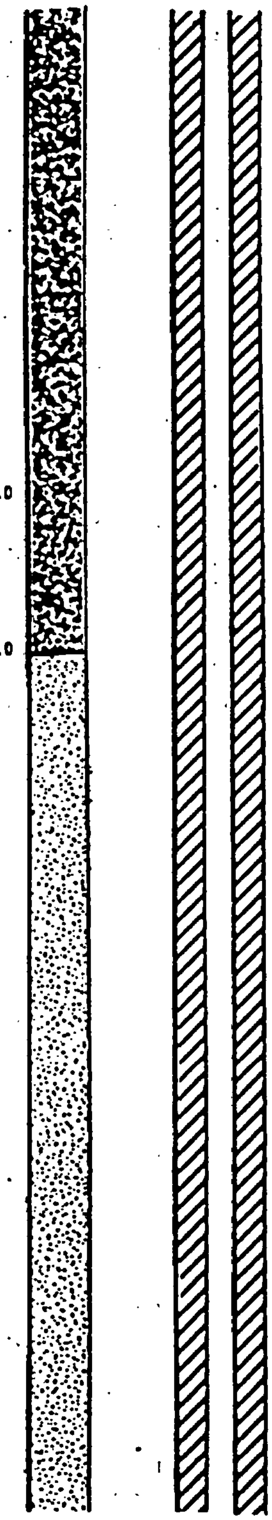
LITHOLOGY / WELL CONSTRUCTION



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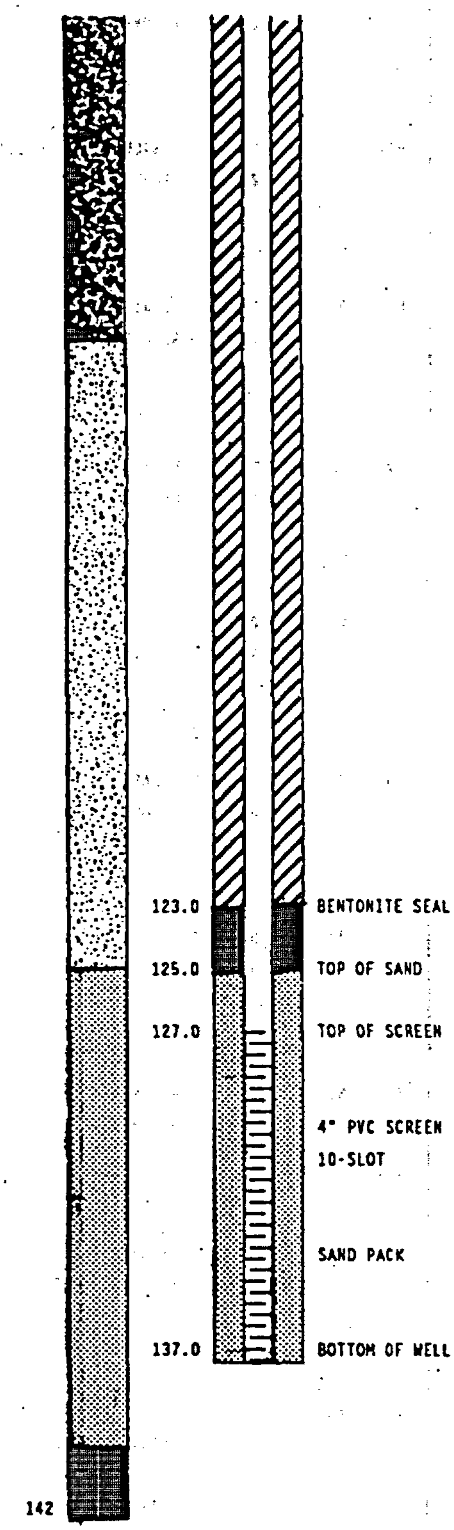
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
95 - 97	22 30 16 30	0-12" RED/BROWN FINE TO COARSE SAND, TRACE SILT 12-18" RED/BROWN FINE SAND, LITTLE SILT, TRACE CLAY
100 - 102	13 20 24 36	RED/BROWN FINE TO COARSE SAND, TRACE SILT RECOVERY - 14"
105 - 107	21 63 53 69	BROWN/ORANGE FINE TO MEDIUM SAND, TRACE SILT RECOVERY - 16"
110 - 112	15 29 45 50/1"	SAME AS ABOVE RECOVERY - 18"
115 - 117	17 80 100/5"	BROWN/ORANGE FINE TO MEDIUM SAND, TRACE SILT RECOVERY - 12"
120 - 122	8 20 22 22	LT. BROWN FINE TO MEDIUM SAND WITH STRINGS OF GRAY CLAY AT 2" RECOVERY - 8"
125 - 127	13 23 33 30	LT. BROWN FINE SAND, TRACE SILT RECOVERY - 12"
130 - 132	WOR 17 25 24	DARK GRAY FINE SAND, TRACE SILT RECOVERY - 14"
135 - 137	5 8 17 16	SAME AS ABOVE RECOVERY - 20"
140 - 142	6 6 10 9	DARK GRAY SILT AND CLAY RECOVERY - 24" END OF BORING - 142 FT

LITHOLOGY WELL CONSTRUCTION

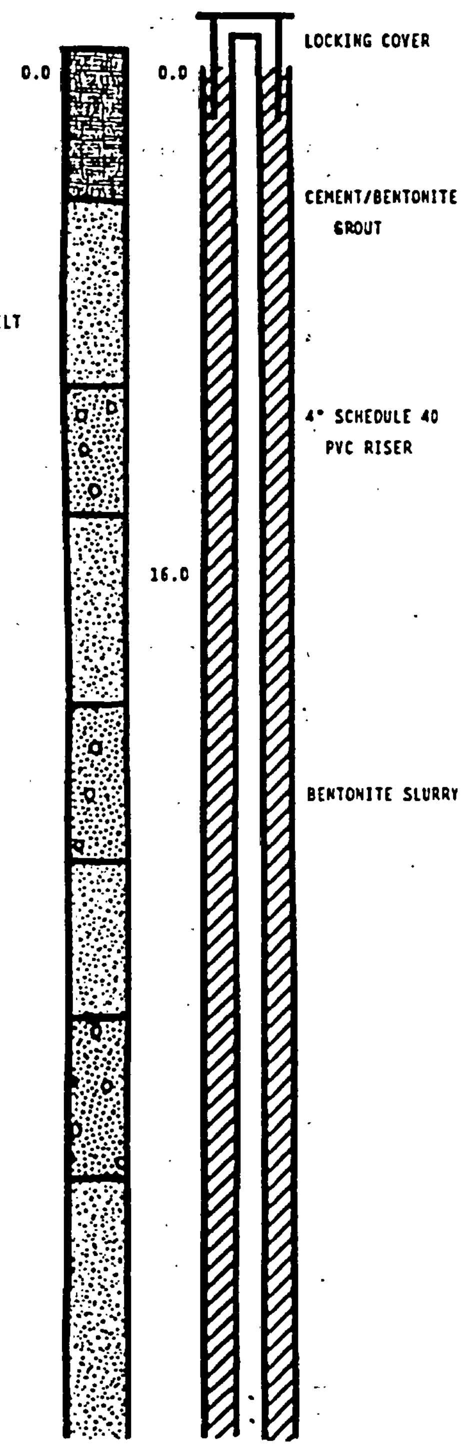


'/,

BORING NO.:	SC-17D	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/14/90
PROJECT NO.:	7650-N51	DRILLERS:	EMPSON, SNYDER	DATE COMPLETED:	11/28/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	GLEZEN	WATER TABLE LEVEL:	16.0 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	LOCATION:	N 257933.78
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	106.48		E 1899201.04
BORING DEPTH:	155 FT	INNER CASING ELEVATION:	108.07	NJDEP PERMIT NUMBER:	3135223-5

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 1	ORANGE/BROWN SILT AND FINE SAND, SOME WOOD FRAGMENTS IN TIP
	2 5	RECOVERY = 3"
2 - 4	6 10	ORANGE FINE SAND AND SILT, TRACE MEDIUM SAND, TRACE GRAVEL
	8 11	RECOVERY = 12"
4 - 6	14 22	ORANGE FINE TO MEDIUM SAND AND GRAVEL, TRACE COBBLES
	24 28	RECOVERY = 12"
6 - 8	17 26	ORANGE FINE TO MEDIUM SAND, SOME GRAVEL, TRACE COBBLES
	28 28	RECOVERY = 18"
8 - 10	17 24	ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, LITTLE GRAVEL, TRACE SILT
	26 27	RECOVERY = 22"
10 - 12	6 5	ORANGE MEDIUM TO COARSE SAND, SOME GRAVEL
	9 12	RECOVERY = 18"
12 - 14	12 7	SAME AS ABOVE
	13 13	RECOVERY = 18"
14 - 16	16 22	ORANGE FINE TO MEDIUM SAND, TRACE SILT, MOIST
	20 27	RECOVERY = 19"
16 - 18		ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE SILT, WET
		RECOVERY = 18"
20 - 22	11 18	LT. BROWN MEDIUM TO COARSE SAND, LITTLE GRAVEL
	22 29	RECOVERY = 18"
25 - 27	10 12	LT. TAN FINE TO MEDIUM SAND, TRACE COARSE SAND, 1" OF WHITE SILTY
	11 26	CLAY IN TIP OF SPOON. RECOVERY = 8"
30 - 32	10 16	BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE CLAY
	16 21	RECOVERY = 14"
35 - 37		LT. BROWN/PINK FINE TO MEDIUM SAND
		RECOVERY = 12"
40 - 42	28 54	LT. TAN/PINK FINE TO MEDIUM SAND, TRACE COARSE SAND, TIGHT
	73 78	RECOVERY = 12"

LITHOLOGY / WELL CONSTRUCTION



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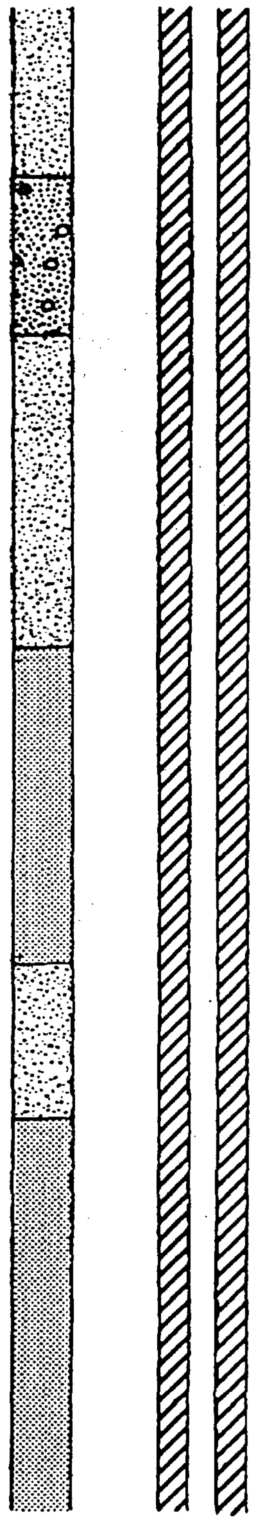
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
45 - 47	15 35 65 65	LT. TAN/PINK FINE TO MEDIUM SAND, TRACE COARSE SAND, TIGHT RECOVERY - 5"
50 - 52	12 14 25 32	LT. BROWN MEDIUM TO COARSE SAND, LITTLE GRAVEL RECOVERY - 12"
55 - 57	21 35 100/6"	TAN/PINK FINE TO MEDIUM SAND, TRACE COARSE SAND RECOVERY - 4"
60 - 62	22 43 44 59	LT. TAN/PINK FINE TO MEDIUM SAND, TRACE COARSE SAND, TIGHT RECOVERY - 12"
65 - 67	18 60 71 60	LT. TAN/PINK FINE SAND, TRACE MEDIUM SAND, TIGHT RECOVERY - 8"
70 - 72	24 26 35 32	SAME AS ABOVE, SOME COARSE SAND RECOVERY - 8"
75 - 77	35 22 28 28	LT. TAN/PINK FINE TO MEDIUM SAND, SOME COARSE SAND, LITTLE GRAVEL RECOVERY - 8"
80 - 82	18 22 26 26	LT. TAN/PINK FINE SAND, SOME SILT, WITH FINE LAMINATIONS OF WHITE SILT RECOVERY - 14"
85 - 87	6 13 16 35	LT. TAN FINE TO VERY FINE SAND, SOME SILT, WITH SMALL WHITE SILT LAYERS RECOVERY - 14"
88 - 90	18 35 75/6"	PINK/TAN FINE TO VERY FINE SAND, LITTLE SILT RECOVERY - 8"

LITHOLOGY | WELL CONSTRUCTION



4" SCHEDULE 40 PVC RISER

BENTONITE SLURRY

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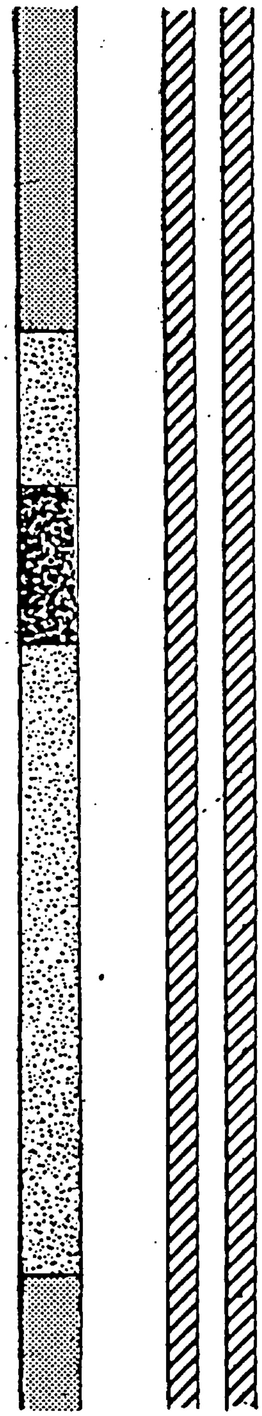
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
93 - 95	14 26 34 35	BROWN/ORANGE FINE SAND, TRACE SILT, SOME SMALL WHITE SILTY CLAY LAMINATIONS. RECOVERY - 18"
98 - 100	30 50 75/6"	LT. TAN FINE SAND, LITTLE MEDIUM SAND, TRACE SILT, SOME SMALL VARVED CLAY LAYERS. RECOVERY - 14"
103 - 105	35 75/6"	BROWN/ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE CLAY RECOVERY - 12"
108 - 110	32 55 75/6"	LT. TAN FINE TO COARSE SAND, LITTLE FINE GRAVEL RECOVERY - 12"
113 - 115	38 75/6"	BROWN/ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE GRAVEL RECOVERY - 6"
118 - 120	38 75/6"	BROWN/ORANGE FINE TO MEDIUM SAND, LITTLE SILT RECOVERY - 4"
123 - 125	46 62 48 30	LT. TAN FINE TO MEDIUM SAND, SOME COARSE SAND, LITTLE GRAVEL RECOVERY - 14"
128 - 130	46 26 16 10	NO RECOVERY
133 - 135	15 22 24 30	LT. TAN FINE TO VERY FINE SAND, SOME MEDIUM SAND, LITTLE SILT RECOVERY - 12"

LITHOLOGY WELL CONSTRUCTION



4" SCHEDULE 40 PVC RISER

BENTONITE SLURRY

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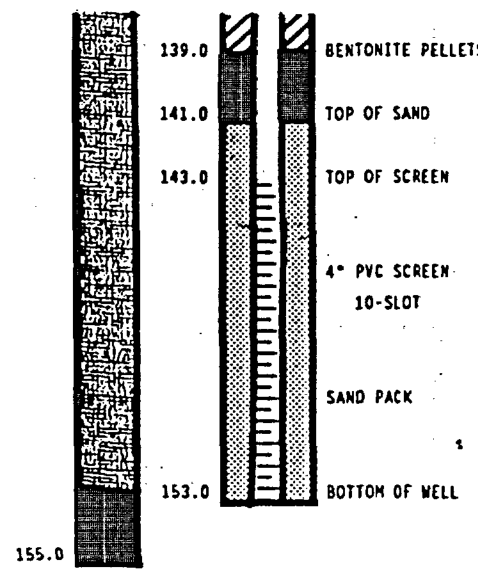
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
138 - 140	26 16 15 10	LT. TAN/GRAY FINE TO VERY FINE SAND AND SILT, TRACE CLAY RECOVERY = 12"
143 - 145	12 27 27 23	SAME AS ABOVE
148 - 150	69 92 29 30	0-8" LT. TAN FINE TO COARSE SAND AND GRAVEL 8-12" LT. TAN FINE SAND AND SILT, LITTLE CLAY
153 - 155	8 10 17 23	VARVED DARK GRAY SILTY CLAY, WITH SMALL SILT LAYERS
		END OF BORING = 155 FT

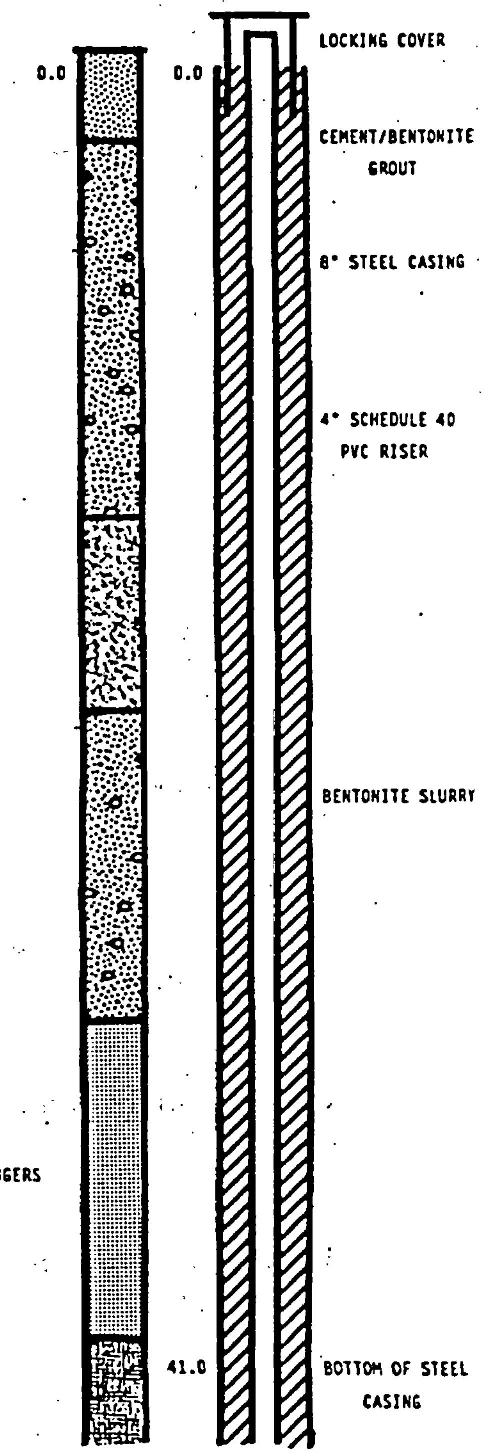
LITHOLOGY WELL CONSTRUCTION



BORING NO.:	SC-22D	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/16/90
PROJECT NO.:	7650-N51	DRILLERS:	EMPSON, SNYDER	DATE COMPLETED:	
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	GLEZEN	WATER TABLE LEVEL:	5.0 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	LOCATION:	N 257593.05
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	96.18		E 1900417.75
BORING DEPTH:	122 FT	INNER CASING ELEVATION:	98.72	NJDEP PERMIT NUMBER:	3135222-7

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 3	BROWN MEDIUM SAND, SOME GRAVEL, MOIST
	2 2	RECOVERY - 10"
2 - 4	1 1	BROWN COARSE TO MEDIUM SAND, SOME GRAVEL, MOIST
	2 2	RECOVERY - 10"
4 - 6	3 3	SAME AS ABOVE, WET
	5 6	RECOVERY - 10"
9 - 11	2 2	SAME AS ABOVE
	4 3	RECOVERY - 16"
14 - 16	2 2	TAN/ORANGE COARSE SAND, TRACE GRAVEL
	4 6	
20 - 22	13 17	ORANGE MEDIUM TO COARSE SAND, TRACE GRAVEL
	17 21	RECOVERY - 5"
25 - 27	16 18	BROWN/ORANGE MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE GRAVEL
	17 15	RECOVERY - 12"
30 - 32	5 4	0-4" LT. BROWN/RED SILT AND CLAY, SOME FINE SAND
	6 7	4-20" BROWN/RED FINE SAND, SOME SILT, SOME CLAY
		NOTE: CLAY OCCURS IN WHITE/PINK LAYERS
35 - 37	7 7	ORANGE/PINK FINE TO VERY FINE SAND, SOME SILT, SOME CLAY WITH STRINGERS
	8 7	RECOVERY - 16"
40 - 42	2 2	ORANGE SILT AND FINE SAND WITH WHITE/GRAY CLAY LAYERS
	3 2	RECOVERY - 24"

LITHOLOGY WELL CONSTRUCTION



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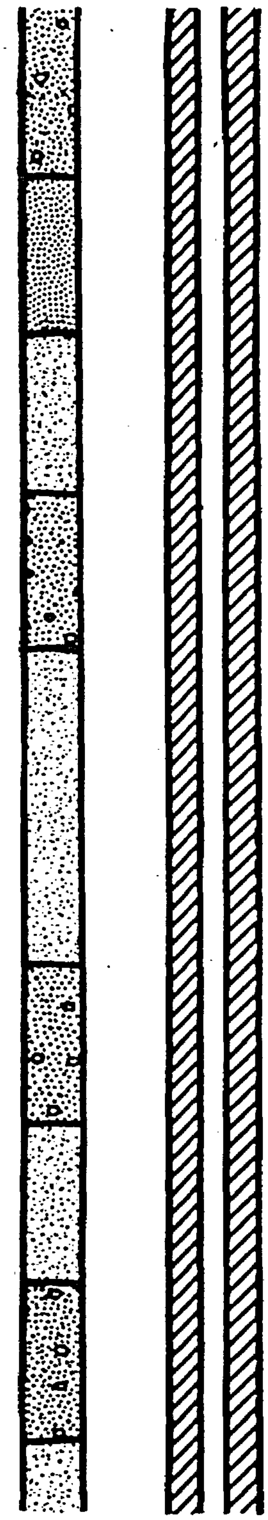
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
45 - 47	33 33 48 42	RED/ORANGE MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE GRAVEL RECOVERY - 18"
50 - 52	34 43 48 53	ORANGE MEDIUM SAND, SOME COARSE SAND, LITTLE FINE SAND, TRACE GRAVEL RECOVERY - 14"
55 - 57	8 12 19 24	LT. TAN/PINK FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE GRAVEL RECOVERY - 18"
60 - 62	18 23 26 30	ORANGE MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE SILT RECOVERY - 14"
65 - 67	13 25 28 28	LT. TAN FINE TO MEDIUM SAND, TRACE COARSE SAND, TRACE SILT RECOVERY - 12"
70 - 72	8 12 13 13	TAN FINE TO MEDIUM SAND, LITTLE SILT RECOVERY -12"
75 - 77	24 43 38 50	TAN/PINK MEDIUM TO COARSE SAND, SOME FINE SAND, LITTLE GRAVEL RECOVERY - 14"
80 - 82	15 9 7 7	ORANGE FINE TO MEDIUM SAND, TRACE CLAY RECOVERY - 7"
85 - 87	60 100/6"	BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, LITTLE FINE SAND RECOVERY - 12"
90 - 92	43 100/6"	BROWN/PINK FINE TO MEDIUM SAND, SOME COARSE SAND RECOVERY - 12"

LITHOLOGY WELL CONSTRUCTION



4" SCHEDULE 40 PVC RISER

BENTONITE SLURRY

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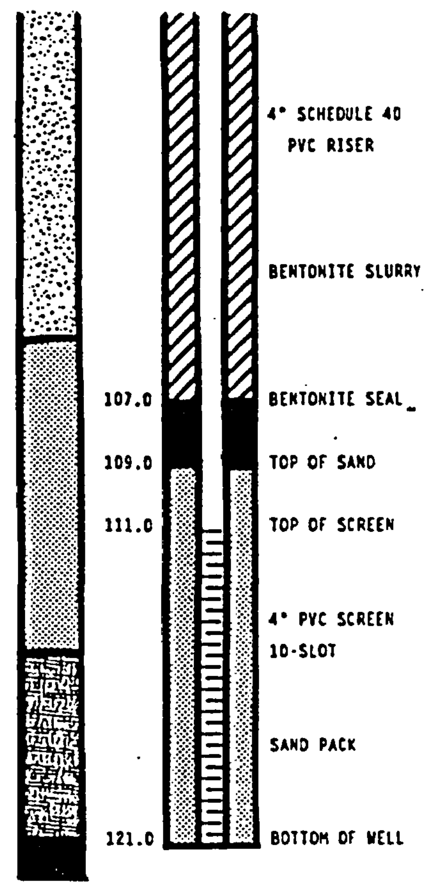
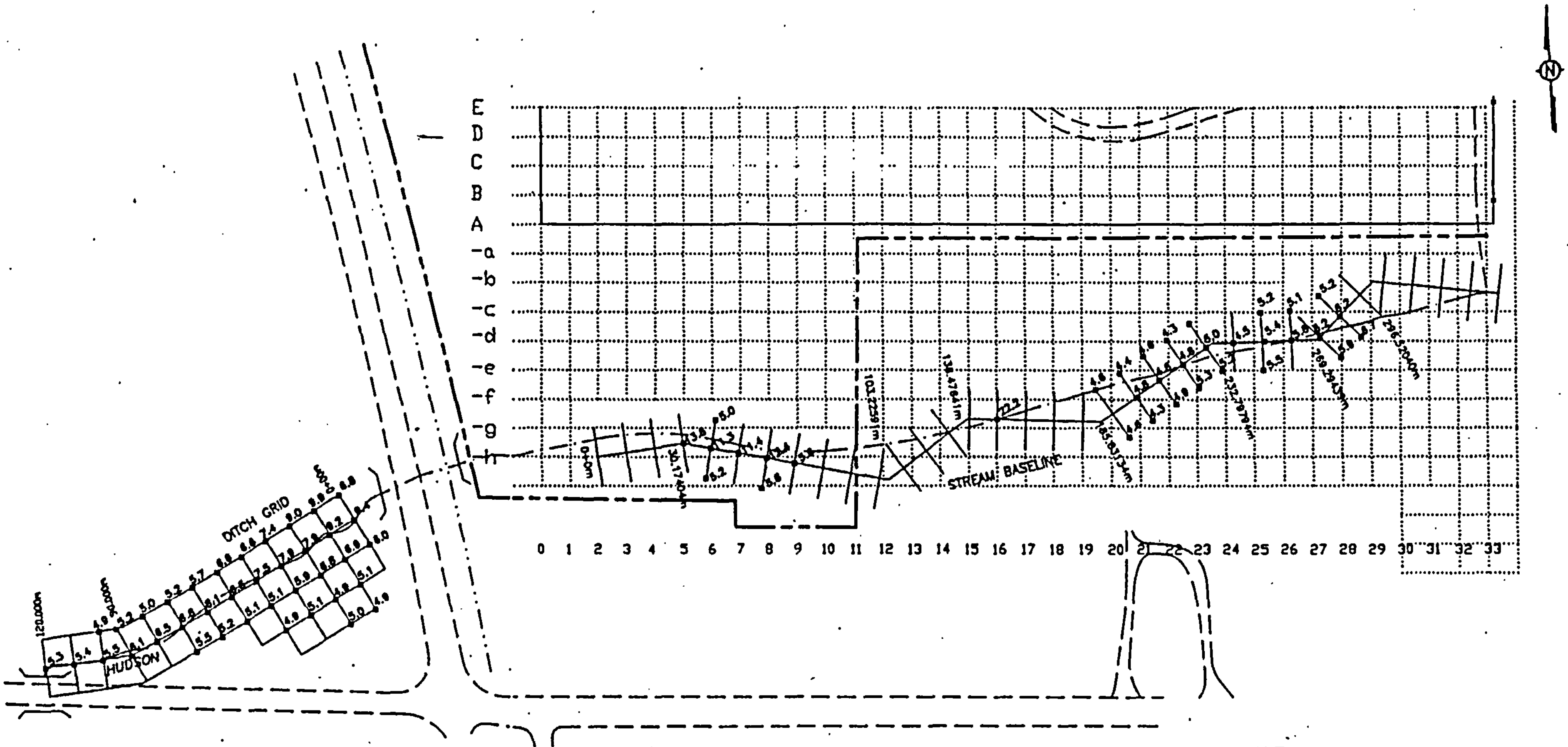
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
95 - 97	100/6"	LT. BROWN/ORANGE FINE TO MEDIUM SAND, TRACE3 COARSE SAND RECOVERY - 6"
100 - 102	43 100/6"	LT. BROWN FINE TO MEDIUM SAND, LITTLE COARSE SAND, TRACE GRAVEL RECOVERY - 12"
105 - 107	100/6"	LT. BROWN FINE SAND, LITTLE MEDIUM SAND, TRACE SILT RECOVERY - 6"
110 - 112	22 30 75/6"	LT. TAN/ORANGE FINE TO VERY FINE SAND, LITTLE SILT RECOVERY - 12"
115 - 117	50 60 75/6"	ORANGE/RED VERY FINE SAND AND SILT, DENSE RECOVERY - 6"
120 - 122	20 23 25 27	0-12" LT. TAN FINE TO VERY FINE SAND WITH LIGHT GRAY CLAY INTERBEDS 12-14" DARK GRAY SILTY CLAY, STIFF

LITHOLOGY | WELL CONSTRUCTION



END OF BORING - 122 FT



SCALE:

0 120 240 FEET

MAP 4

HUDSON'S BRANCH EXPOSURE RATES (μR/hr)

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD TOWNSHIP, NEW JERSEY

INTERNATIONAL TECHNOLOGY CORPORATION

NOTE: THIS MAP IS BASED ON DATA TRANSMITTED ELECTRONICALLY FROM SMC TO IT CORPORATION IN FEBRUARY, 1992

STARTING DATE: 03/17/92 | DATE LAST REV.: | DRAFT. CHCK. BY: J. HUBBARD | INITIATOR: H. PRICHARD | DWG. NO.: 484409-B-03
DRAWN BY: G. PACHECO | DRAWN BY: | ENGR. CHCK. BY: H. PRICHARD | PROJ. MGR.: C. BERGER | PROJ. NO.: 484409

48440905 03/18/92 2:58pm CWB

DRAWING NO.: 4644090-D-04

PROJECT NO.: 4644090

INITIATOR: H. PRICHARD

PROJECT MGR.: C. BERGER

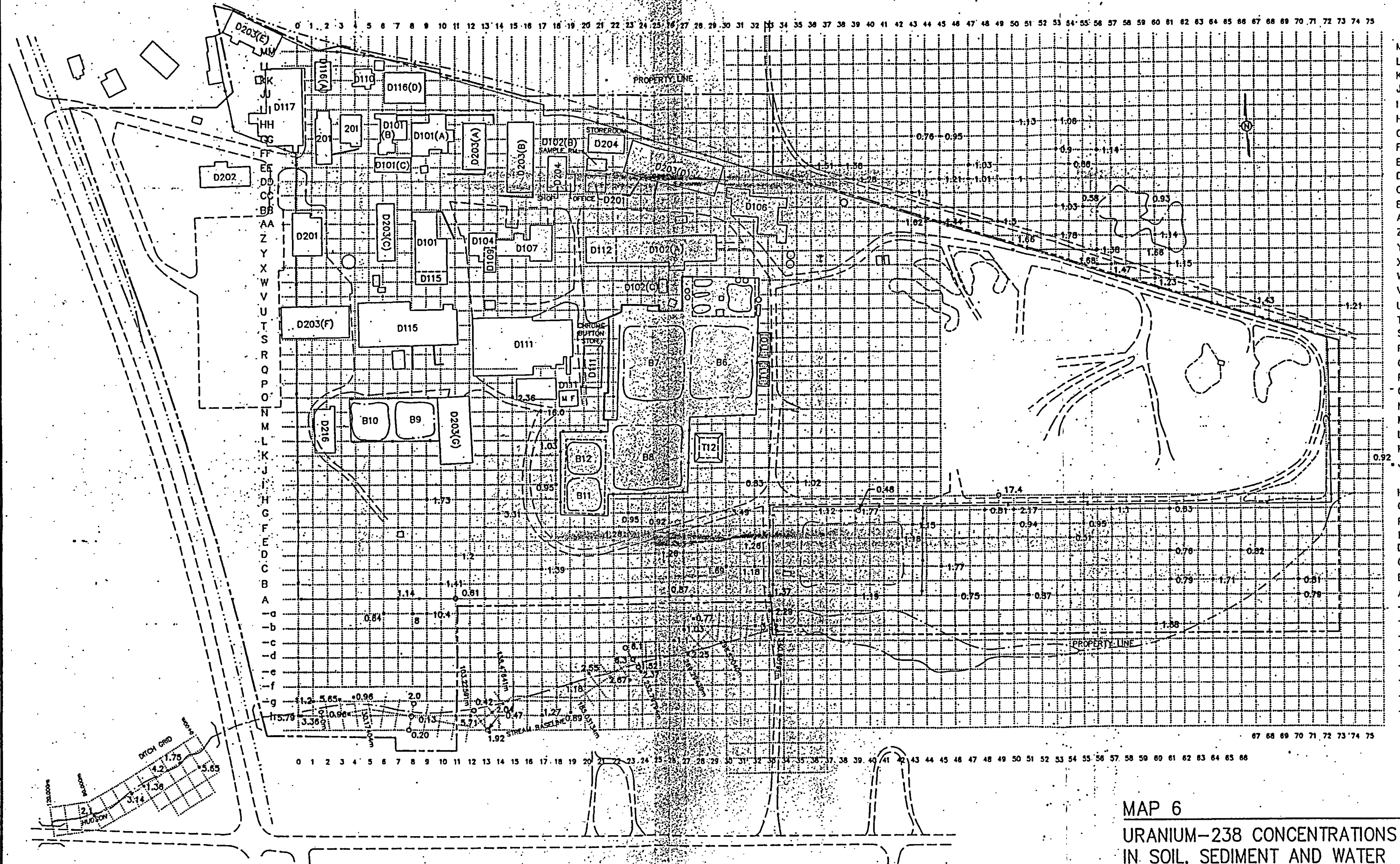
DATE LAST REV.:

DRAWN BY:

STARTING DATE: 03/04/92

DRAWN BY: J. TABLER

46440904 03/30/92 2:52pm DJH



GRID SPACING ON 10 METER CENTERS
SEMI PERMANENT POINTS SET ON
20 METER CENTERS

SCALE: 0 100 200 FEET

LEGEND:
- • SOIL AND SEDIMENT (pCi/g)
- o WATER (pCi/l)

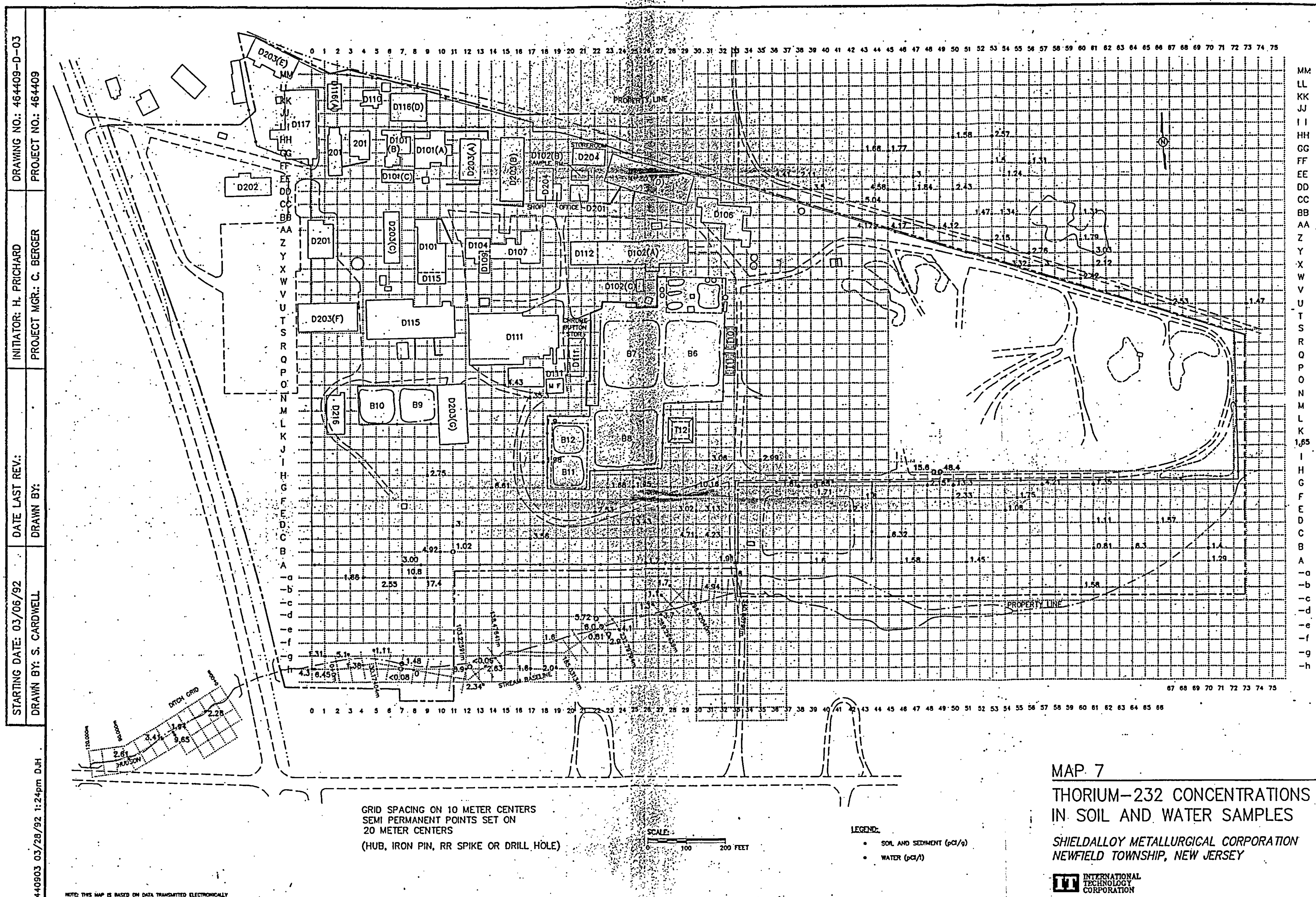
MAP 6

URANIUM-238 CONCENTRATIONS IN SOIL, SEDIMENT AND WATER SAMPLES

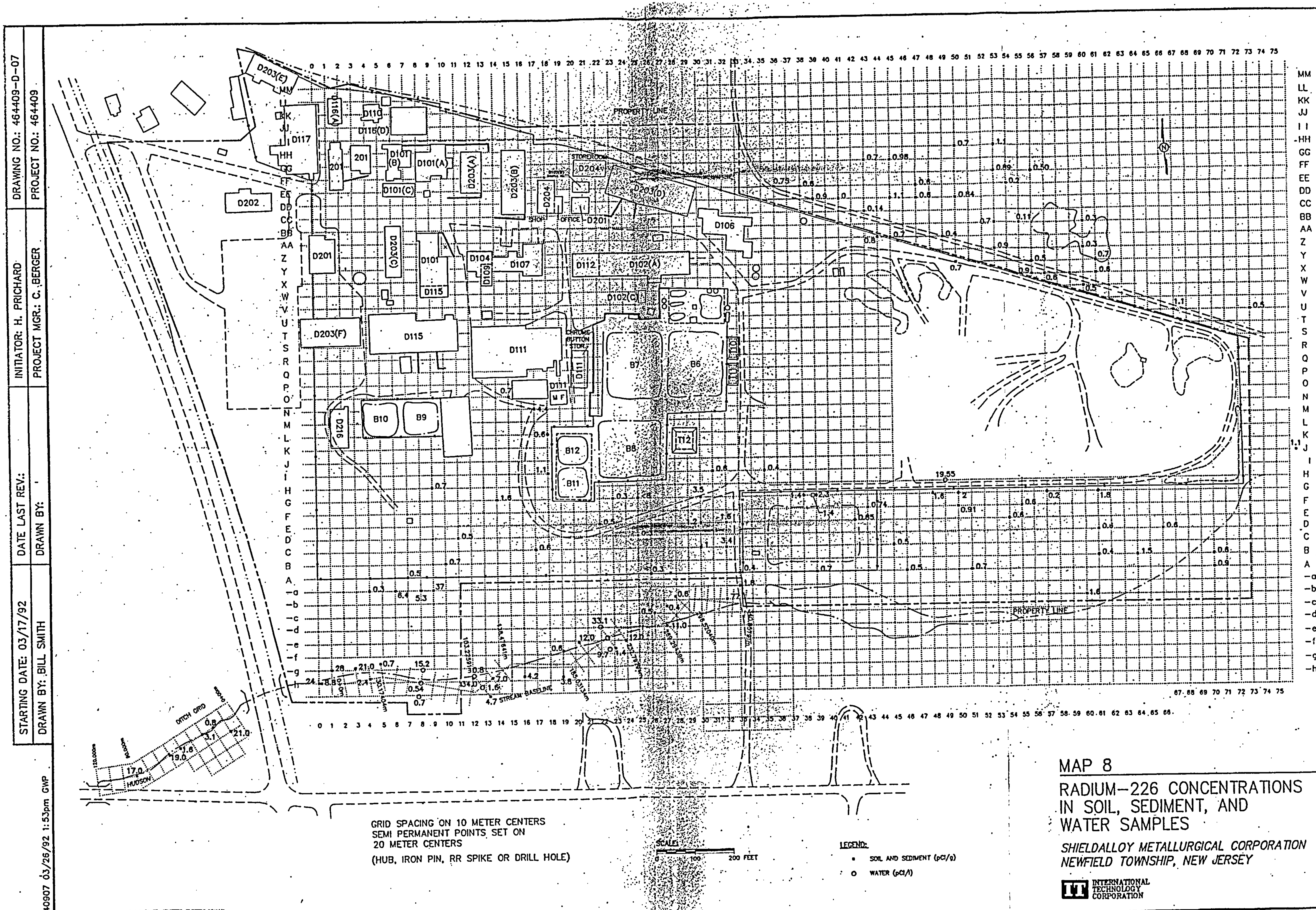
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD TOWNSHIP, NEW JERSEY

INTERNATIONAL TECHNOLOGY CORPORATION

NOTE: THIS MAP IS BASED ON DATA TRANSMITTED ELECTRONICALLY FROM SMC TO IT CORPORATION IN FEBRUARY, 1992



MAP 7
THORIUM-232 CONCENTRATIONS IN SOIL AND WATER SAMPLES
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD TOWNSHIP, NEW JERSEY
INTERNATIONAL TECHNOLOGY CORPORATION
DRAWING NO.: 464409-D-03
PROJECT NO.: 464409
INITIATOR: H. PRICHARD
PROJECT MGR.: C. BERGER
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 03/06/92
DRAWN BY: S. CARDWELL
6440903 03/28/92 1:24pm DJH
GRID SPACING ON 10 METER CENTERS
SEMI PERMANENT POINTS SET ON
20 METER CENTERS
(HUB, IRON PIN, RR SPIKE OR DRILL HOLE)
SCALE:
0
100
200 FEET
LEGEND:
SOIL AND SEDIMENT (pCi/g)
WATER (pCi/l)
NOTE: THIS MAP IS BASED ON DATA TRANSMITTED ELECTRONICALLY FROM SMC TO IT CORPORATION IN FEBRUARY, 1992
PROPERTY LINE
STREAM BASELINE
DITCH GRID
HUDSON
STOREROOM
SAMPLE RM.
SHOP
OFFICE
CHROME BUTTON STORE
D203(E)
D116(A)
D110
D116(D)
D117
201
D101(B)
D101(A)
D203(A)
D203(B)
D102(B)
D204
D101(C)
D202
D201
D203(C)
D101
D104
D109
D107
D112
D102(A)
D106
D115
D102(C)
D203(F)
D111
B7
B6
B10
B9
D203(G)
D216
B12
B8
T12
B11


MAP 8
RADIUM-226 CONCENTRATIONS IN SOIL, SEDIMENT, AND WATER SAMPLES
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD TOWNSHIP, NEW JERSEY
INTERNATIONAL TECHNOLOGY CORPORATION
GRID SPACING ON 10 METER CENTERS
SEMI PERMANENT POINTS SET ON 20 METER CENTERS
(HUB, IRON PIN, RR SPIKE OR DRILL HOLE)
SCALE
0 100 200 FEET
LEGEND:
SOIL AND SEDIMENT (pCi/g)
WATER (pCi/l)
PROPERTY LINE
STREAM BASELINE
DITCH GRID
HUDSON
DRAWING NO.: 464409-D-07
PROJECT NO.: 464409
INITIATOR: H. PRICHARD
PROJECT MGR.: C. BERGER
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 03/17/92
DRAWN BY: BILL SMITH
440907 03/26/92 1:53pm GWP

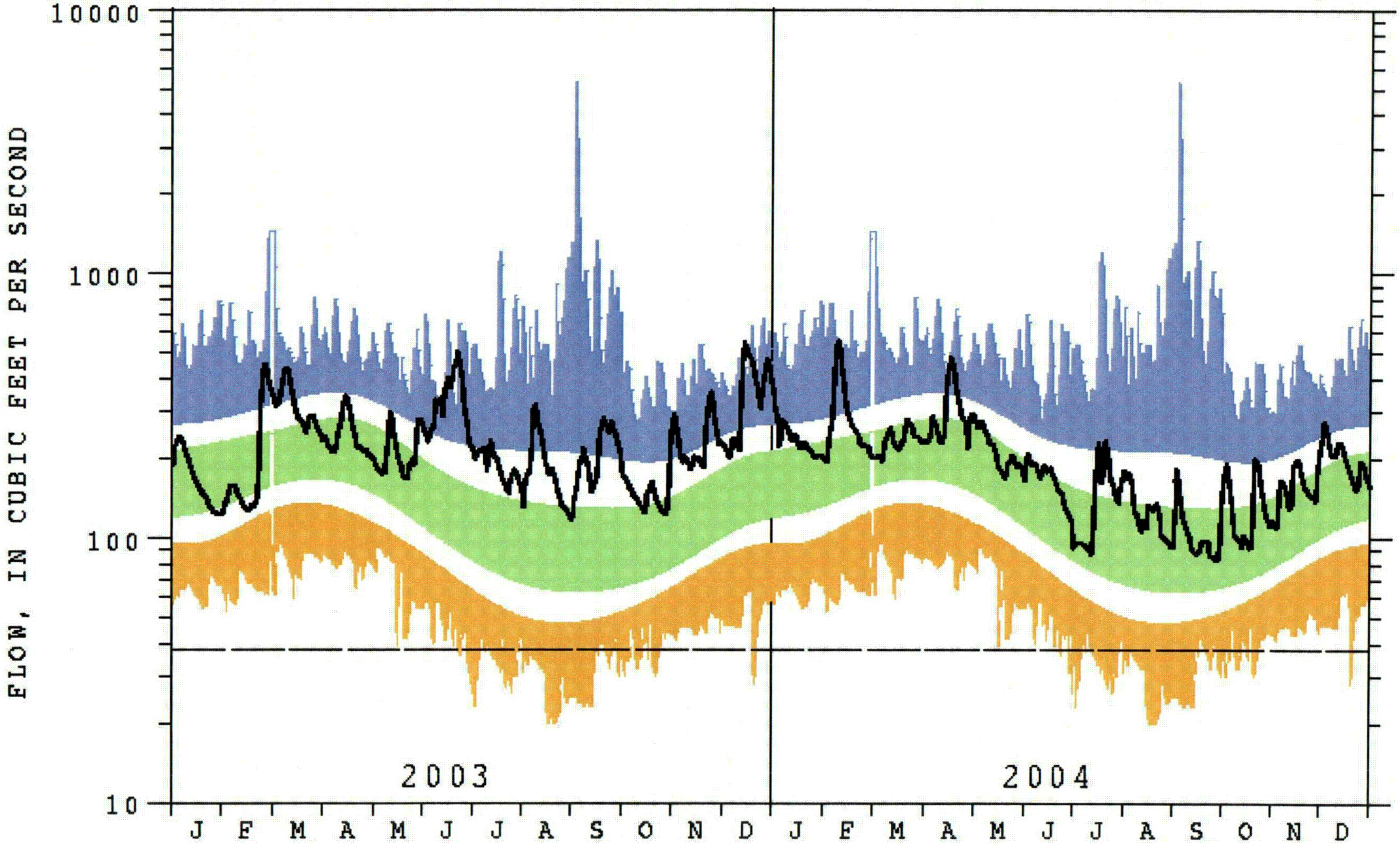
APPENDIX C - HYDROLOGIC DATA FOR THE MAURICE RIVER BASIN

APPENDIX C - HYDROLOGIC DATA FOR THE MAURICE RIVER BASIN

Average Monthly Discharges at the Maurice River Gauging Station (1/2003-12/2004)
Average Monthly Streamflows between 1932 and 2003
Water Quality Data for the Maurice River Basin
Low-Flow Characteristics and Flow Duration of New Jersey Streams – Maurice River Data

STATION 01411500 MAURICE RIVER AT NORMA, NJ

US GEOLOGICAL SURVEY PROVISIONAL DATA - SUBJECT TO CHANGE
UNREGULATED FLOW
DRAINAGE AREA = 112 SQUARE MILES
NUMBER OF YEARS=73.0 DATE OF PLOT=02/28/05 7Q10=38.0



SOLID LINE = CURRENT DAILY VALUE FLOW
DASHED LINE = 7-DAY MINIMUM FLOW WITH A RECURRENCE INTERVAL OF 10 YEARS

BLUE (UPPER) BAND = 90- TO 100-PERCENTILE FLOWS (VERY WET CONDITIONS)
GREEN (MIDDLE) BAND = 25- TO 75-PERCENTILE FLOWS (NORMAL CONDITIONS)
GOLD (LOWER) BAND = 0- TO 10-PERCENTILE FLOWS (VERY DRY CONDITIONS)

Daily flows less than or equal to zero are set to 0.01 cubic feet per second. C34
The 10- to 90-percentiles are smoothed.

Water Resources

Data Category: Surface Water

Geographic Area: United States

go

Monthly Streamflow Statistics for the Nation

USGS 01411500 MAURICE RIVER AT NORMA NJ

Available data for this site Surface-water: Monthly streamflow statistics GO

Salem County, New Jersey
Hydrologic Unit Code 02040206
Latitude 39°29'44", Longitude 75°04'37" NAD83
Drainage area 112.00 square miles
Contributing drainage area 112.00 square miles
Gage datum 46.94 feet above sea level NGVD29

Output formats

- HTML table of all data
- Tab-separated data
- Reselect output format

YEAR	Monthly mean streamflow, in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1932										88.5	251	166
1933	219	247	263	306	241	126	164	250	246	138	144	156
1934	183	118	229	219	206	130	117	194	148	153	149	171
1935	214	270	258	247	184	152	91.8	80.1	270	121	219	197
1936	380	333	358	300	147	125	100	62.2	117	101	80.7	161
1937	254	242	226	207	210	148	91.6	92.6	95.2	139	203	178
1938	155	171	172	141	110	130	293	230	298	252	212	248
1939	209	418	393	398	231	149	95.8	195	125	110	143	101
1940	101	143	219	276	250	184	96.7	133	591	157	208	187
1941	216	200	241	188	121	156	114	74.5	50.7	50.4	72.0	106
1942	94.6	145	190	161	93.6	77.5	90.5	140	78.8	128	129	159
1943	195	219	221	207	202	141	89.3	56.1	46.2	93.8	162	98.0
1944	193	139	243	286	199	134	71.8	76.1	122	92.9	111	198
1945	173	172	214	169	172	106	170	184	128	118	133	252
1946	277	222	220	189	228	239	204	152	99.0	97.3	97.4	118
1947	172	145	189	175	226	174	95.7	94.6	77.6	65.5	130	112
1948	204	200	227	248	308	277	167	225	102	98.7	134	237
1949	328	371	330	272	249	129	101	70.8	87.6	81.7	119	111
1950	106	161	186	156	153	118	108	68.5	140	90.8	138	196
1951	159	208	216	257	171	131	129	94.8	68.8	87.5	177	261

1952	280	304	323	290	304	227	134	254	149	105	166	216
1953	249	239	331	334	271	230	132	114	65.7	76.4	137	174
1954	149	142	181	153	153	71.3	52.0	54.8	117	67.2	115	138
1955	133	144	176	145	87.1	121	56.9	180	103	116	118	86.4
1956	94.6	181	206	187	141	119	140	106	106	102	233	200
1957	170	190	186	163	101	86.7	46.2	36.2	68.3	72.5	94.2	164
1958	209	223	401	361	387	185	224	327	234	262	220	186
1959	183	186	200	202	150	146	183	154	112	103	150	156
1960	172	193	200	201	169	123	94.4	118	345	222	186	170
1961	263	310	377	337	233	163	132	121	97.3	103	92.3	123
1962	155	145	255	266	146	128	96.7	87.7	72.5	85.4	137	127
1963	129	147	247	140	115	105	55.8	67.4	67.6	67.8	145	132
1964	192	211	195	241	189	96.1	74.4	47.5	44.8	83.3	63.2	116
1965	130	152	143	152	91.1	73.7	59.7	39.9	40.6	48.6	46.7	57.1
1966	64.7	109	106	90.9	96.0	57.7	35.6	34.6	64.7	137	110	122
1967	159	156	236	185	187	109	126	322	171	159	138	274
1968	291	183	259	178	186	247	133	75.8	55.9	63.4	112	113
1969	109	134	149	142	115	75.0	219	224	150	111	111	234
1970	238	208	174	341	193	158	106	99.6	46.3	77.8	142	138
1971	155	235	249	202	184	116	68.0	188	247	198	264	280
1972	240	277	278	269	253	247	234	120	101	140	330	385
1973	289	415	288	346	272	236	169	93.5	93.0	79.4	92.1	184
1974	213	160	184	243	163	114	81.7	112	117	96.5	86.6	178
1975	215	200	278	240	264	212	333	183	220	223	223	179
1976	303	272	199	164	130	82.9	77.0	86.5	55.1	115	103	104
1977	100	102	145	138	79.5	59.8	46.5	57.4	53.6	70.1	165	251
1978	376	229	282	225	287	178	185	169	108	80.6	85.5	158
1979	313	327	427	281	264	291	172	218	225	264	230	204
1980	202	159	211	282	200	156	127	97.5	66.0	88.6	96.8	85.3
1981	71.8	95.7	97.2	118	155	129	104	86.3	76.2	77.3	84.3	125
1982	141	178	148	179	163	161	98.8	72.6	57.2	58.5	86.9	118
1983	107	124	234	412	322	264	123	75.7	75.3	95.7	173	241
1984	199	239	350	437	268	259	290	160	117	117	119	123
1985	101	147	108	91.8	145	99.9	85.8	115	110	138	121	160
1986	148	211	178	187	124	76.0	69.6	63.9	63.1	79.2	122	239
1987	242	196	212	254	197	117	136	86.3	79.4	97.7	114	120
1988	138	208	169	173	166	90.1	74.0	65.7	73.2	68.0	112	120
1989	115	143	170	203	318	242	243	275	260	266	222	160

1990	232	204	187	220	243	191	126	155	110	108	99.1	137
1991	280	173	217	229	157	118	103	92.1	82.4	94.3	77.8	132
1992	111	108	129	110	93.5	144	86.5	98.5	80.5	74.0	113	171
1993	156	161	283	278	176	129	81.6	71.5	60.4	75.0	87.4	173
1994	197	243	371	311	186	101	107	142	88.1	73.5	81.3	104
1995	124	107	127	96.7	113	69.3	57.3	50.3	56.1	90.4	119	127
1996	204	201	205	266	215	140	183	158	127	179	138	348
1997	241	282	290	282	214	136	95.8	145	82.3	78.7	141	124
1998	171	224	339	239	238	170	96.2	82.0	55.9	55.1	56.2	61.7
1999	166	137	185	167	124	95.6	66.9	67.3	162	122	119	147
2000	126	176	260	220	140	114	95.2	114	100	84.7	89.4	149
2001	158	200	214	221	140	154	77.6	60.3	54.3	58.8	54.8	68.7
2002	79.5	69.4	89.9	92.7	104	111	57.6	32.1	53.8	77.4	151	173
2003	169	196	311	244	214	331	185	182	210			
Mean of monthly streamflows	187	198	230	224	188	148	122	123	120	111	136	164

Questions about data Water Webserver Team Top
Feedback on this website NWISWeb Support Team Explanation of terms
Surface Water data for USA: Monthly Streamflow Statistics
http://waterdata.usgs.gov/nwis/monthly?

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Department of the Interior, U.S. Geological Survey
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1.37 1.12 nadww01

01411466 INDIAN BRANCH NEAR MALAGA, NJ

LOCATION.--Lat 39°35'27", long 75°03'35", Gloucester County, Hydrologic Unit 02040206, at bridge on U.S. Route 47 (Delsea Drive), 0.4 mi upstream of Malaga Lake, and 1.4 mi north of Malaga.

DRAINAGE AREA.--6.50 mi^2.

PERIOD OF RECORD.--Water years 1998 to current year.

REMARKS.--Total nitrogen (00600) equals the sum of dissolved ammonia plus organic nitrogen (00623), dissolved nitrite plus nitrate nitrogen (00631), and total particulate nitrogen (49570).

COOPERATION.--Determination of dissolved ammonia, total ammonia, dissolved nitrite, dissolved orthophosphate, biochemical oxygen demand, total suspended solids, fecal coliform, E. coli, and enterococcus bacteria was performed by the New Jersey Department of Health and Senior Services, Public Health and Environmental Laboratories, Environmental and Chemical Laboratory Services. Determination of chlorophyll a was performed by the New Jersey Department of Environmental Protection, Bureau of Freshwater and Biological Monitoring Laboratory.

COOPERATIVE NETWORK SITE DESCRIPTOR.--Undeveloped Land Use Indicator, New Jersey Department of Environmental Protection Watershed Management Area 17.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Instantaneous discharge, cfs (00061)	Turbidity, water, unfltrd field, NTU (61028)	UV absorbance, 254 nm, wat flt units /cm (50624)	UV absorbance, 280 nm, wat flt units /cm (61726)	Barometric pressure, mm Hg (00025)	Dissolved oxygen, mg/L (00300)	Dissolved oxygen, percent of saturation (00301)	pH, water, unfltrd field, std units (00400)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Temperature, air, deg C (00020)	Temperature, water, deg C (00010)	Hardness, water, unfltrd mg/L as CaCO3 (00900)
NOV													
25...	1010	7.3	0.7	0.728	0.552	762	8.6	70	3.7	93	15.0	6.5	11
MAR													
05...	0940	19	0.6	0.658	0.502	750	10.4	80	3.3	76	12.0	3.4	9
MAY													
13...	0950	13	0.6	0.935	0.726	748	5.3	52	3.7	63	15.5	13.3	7
AUG													
12...	1000	11	0.8	1.64	1.29	762	3.8	42	4.1	60	23.1	19.7	8

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Calcium water, fltrd, mg/L (00915)	Magnesium, water, fltrd, mg/L (00925)	Potassium, water, fltrd, mg/L (00935)	Sodium, water, fltrd, mg/L (00930)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Chloride, water, fltrd, mg/L (00940)	Fluoride, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Sulfate water, fltrd, mg/L (00945)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue total at 105 deg. C, suspended, mg/L (00530)	Ammonia + org-N, water, fltrd, mg/L as N (00623)	Ammonia water, fltrd, mg/L as N (00608)
NOV													
25...	1.75	1.49	0.73	3.26	--	5.38	<0.17	8.3	12.6	70	2	0.44	<0.030
MAR													
05...	1.50	1.16	0.85	2.92	<2	5.13	<0.17	5.9	11.5	57	1	0.37	<0.030
MAY													
13...	1.24	0.939	0.86	3.08	--	6.41	<0.17	5.6	7.1	59	1	0.46	<0.030
AUG													
12...	1.42	0.995	0.86	3.33	--	6.53	<0.17	8.0	4.4	74	1	0.84	0.036

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Ammonia water, unfltrd mg/L as N (00610)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Nitrite water, fltrd, mg/L as N (00613)	Orthophosphate, water, fltrd, mg/L as P (00671)	Particulate nitrogen, susp, water, mg/L (49570)	Phosphorus, water, fltrd, mg/L (00666)	Phosphorus, water, unfltrd mg/L (00665)	Total nitrogen, water, fltrd, mg/L (00602)	Total nitrogen, water, unfltrd mg/L (00600)	Total carbon, suspnd sedimnt total, mg/L (00694)	Inorganic carbon, suspnd sedimnt total, mg/L (00688)	Organic carbon, suspnd sedimnt total, mg/L (00689)	Organic carbon, water, fltrd, mg/L (00681)
NOV													
25...	<0.030	0.34	E.003	--	0.03	0.006	0.007	0.78	0.81	0.2	<0.1	0.2	17.0
MAR													
05...	0.030	0.50	0.004	<0.020	0.03	0.004	0.016	0.88	0.90	0.3	<0.1	0.3	13.1
MAY													
13...	0.037	0.35	<0.003	<0.020	<0.02	0.005	0.008	0.81	--	0.2	<0.1	0.2	17.9
AUG													
12...	0.033	0.21	0.004	<0.020	0.03	0.011	0.013	1.0	1.1	0.2	<0.1	0.2	30.0

01411466 INDIAN BRANCH NEAR MALAGA, NJ—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	BOD, water, unfltrd 5 day, 20 degC mg/L (00310)	Chlorophyll a fluorometric method, corrctd ug/L (32209)	Boron, water, fltrd, ug/L (01020)	Iron, water, fltrd, ug/L (01046)
NOV				
25...	<1.0	--	19	--
MAR				
05...	<1.0	--	15	--
MAY				
13...	<1.0	1.60	13	--
AUG				
12...	<1.0	0.400	13	1,330

Remark codes used in this table:
< -- Less than
E -- Estimated value

WATER-COLUMN BACTERIA ANALYSES

Samples were collected synoptically over a 30-day period during the summer.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Enterococci, m-E MF, water, col/100 mL (31649)	E coli, m-TEC MF, water, col/100 mL (31633)	Fecal coliform, ECbroth water, MPN/100 mL (31615)
JUL				
09...	1005	<10	<100	40
16...	1030	30	200	20
23...	1030	--	700	1,100
30...	1035	20	200	40
AUG				
06...	1045	180	500	230

Remark codes used in this table:
< -- Less than

01411500 MAURICE RIVER AT NORMA, NJ

LOCATION.--Lat 39°29'44", long 75°04'37", Salem County, Hydrologic Unit 02040206, at bridge on Almond Road (County Route 540) in Norma, 0.8 mi downstream from Blackwater Branch, and 2.9 mi west of Vineland.

DRAINAGE AREA.--112.0 mi^2.

PERIOD OF RECORD.--Water years 1953, 1962-63, 1965 to September 1997, December 1998 to current year.

REMARKS.--Total nitrogen (00600) equals the sum of dissolved ammonia plus organic nitrogen (00623), dissolved nitrite plus nitrate nitrogen (00631), and total particulate nitrogen (49570).

COOPERATION.--Field data and samples for laboratory analyses were provided by the New Jersey Department of Environmental Protection. Determination of dissolved ammonia, total ammonia, dissolved nitrite, dissolved orthophosphate, biochemical oxygen demand, total suspended solids, fecal coliform, E. coli, and enterococcus bacteria was performed by the New Jersey Department of Health and Senior Services, Public Health and Environmental Laboratories, Environmental and Chemical Laboratory Services. Determination of chlorophyll a was performed by the New Jersey Department of Environmental Protection, Bureau of Freshwater and Biological Monitoring Laboratory.

COOPERATIVE NETWORK SITE DESCRIPTOR.--Watershed Integrator, New Jersey Department of Environmental Protection Watershed Management Area 17.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Instantaneous discharge, cfs (00061)	Turbidity, water, unfltrd field, NTU (61028)	UV absorbance, 254 nm, wat flt units /cm (50624)	UV absorbance, 280 nm, wat flt units /cm (61726)	Barometric pressure, mm Hg (00025)	Dissolved oxygen, mg/L (00300)	Dissolved oxygen, percent of saturation (00301)	pH, water, unfltrd field, std units (00400)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Temperature, air, deg C (00020)	Temperature, water, deg C (00010)	Hardness, water, unfltrd mg/L as CaCO3 (00900)
NOV 13...	1000	146	1.7	0.402	0.319	762	7.3	68	6.2	105	8.0	12.0	25
FEB 10...	1000	143	1.9	0.185	0.141	758	11.8	88	6.1	116	1.4	2.8	23
MAY 21...	1000	166	2.2	0.500	0.389	764	7.6	75	6.3	99	12.8	15.1	22
AUG 19...	0900	178	5.2	0.956	0.753	765	5.8	67	6.3	90	23.4	22.3	20

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Calcium water, fltrd, mg/L (00915)	Magnesium, water, fltrd, mg/L (00925)	Potassium, water, fltrd, mg/L (00935)	Sodium, water, fltrd, mg/L (00930)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Chloride, water, fltrd, mg/L (00940)	Fluoride, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Sulfate water, fltrd, mg/L (00945)	Residue water, fltrd, sum of constituents mg/L (70301)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue total at 105 deg. C, suspended, mg/L (00530)	Ammonia + org-N, water, fltrd, mg/L as N (00623)
NOV 13...	5.40	2.92	3.18	7.31	E6	12.8	<0.17	6.6	15.2	--	82	3	0.33
FEB 10...	4.62	2.78	1.78	8.40	5	13.8	<0.17	6.6	10.9	61	71	3	0.24
MAY 21...	4.69	2.55	2.07	7.62	7	13.0	<0.17	4.9	7.8	54	80	3	0.49
AUG 19...	4.15	2.37	2.20	7.13	10	12.7	<0.17	8.1	4.5	52	88	5	0.86

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Ammonia water, fltrd, mg/L as N (00608)	Ammonia water, unfltrd mg/L as N (00610)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Nitrite water, fltrd, mg/L as N (00613)	Orthophosphate, water, fltrd, mg/L as P (00671)	Particulate nitrogen, susp, water, mg/L (49570)	Phosphorus, water, fltrd, mg/L (00666)	Phosphorus, water, unfltrd mg/L (00665)	Total nitrogen, water, fltrd, mg/L (00602)	Total nitrogen, water, unfltrd mg/L (00600)	Total carbon, suspnd sedimnt total, mg/L (00694)	Inorganic carbon, suspnd sedimnt total, mg/L (00688)	Organic carbon, suspnd sedimnt total, mg/L (00689)
NOV 13...	<0.030	0.048	0.97	<0.003	<0.020	0.05	0.005	0.014	1.3	1.4	0.5	<0.1	0.5
FEB 10...	0.030	0.036	1.93	<0.003	<0.020	0.04	0.006	0.010	2.2	2.2	0.3	<0.1	0.3
MAY 21...	<0.030	0.054	1.50	0.003	<0.020	0.07	0.010	0.018	2.0	2.0	0.7	<0.1	0.7
AUG 19...	0.066	0.065	0.87	0.007	<0.020	0.19	0.020	0.040	1.7	1.9	2.0	<0.1	1.9

01411500 MAURICE RIVER AT NORMA, NJ—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Organic carbon, water, fltrd, mg/L (00681)	BOD, water, unfltrd 5 day, 20 degC mg/L (00310)	Chloro-phyll a fluoro-metric method, corrctd ug/L (32209)	Boron, water, fltrd, ug/L (01020)	Iron, water, fltrd, ug/L (01046)
NOV					
13...	10.7	E1.2	--	95	--
FEB					
10...	4.4	<1.0	--	25	--
MAY					
21...	9.4	<1.0	1.00	32	--
AUG					
19...	17.0	<1.0	1.90	30	1,080

Remark codes used in this table:
< -- Less than
E -- Estimated value

WATER-COLUMN BACTERIA ANALYSES

Samples were collected synoptically over a 30-day period during the summer.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Entero-cocci, m-E MF, water, col/ 100 mL (31649)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Fecal coli-form, ECbroth water, MPN/ 100 mL (31615)
AUG				
06...	1057	490	<100	800
18...	1155	110	100	20
20...	1030	60	<100	110
27...	1040	90	<100	<20
SEP				
03...	1015	100	200	110

Remark codes used in this table:
< -- Less than

01411955 GRAVELLY RUN AT LAUREL LAKE, NJ

LOCATION.--Lat 39°20'14", long 75°03'03", Cumberland County, Hydrologic Unit 02040206, at culvert on Battle Lane, 0.3 mi upstream from mouth and Buckshutem Creek, 1.1 mi west of community of Laurel Lake, and 2.5 mi southeast of Millville Municipal Airport.

DRAINAGE AREA.--3.19 mi^2.

PERIOD OF RECORD.--Water years 1998 to current year.

REMARKS.--For definition of the type of quality-control data listed under SAMPLE TYPE, refer to "Water-Quality Control Data" in the Explanation of Water-Quality Records section of this report. Total nitrogen (00600) equals the sum of dissolved ammonia plus organic nitrogen (00623), dissolved nitrite plus nitrate nitrogen (00631), and total particulate nitrogen (49570).

COOPERATION.--Determination of dissolved ammonia, total ammonia, dissolved nitrite, dissolved orthophosphate, biochemical oxygen demand, total suspended solids, total ammonia + organic nitrogen in bed sediment, total phosphorus in bed sediment, fecal coliform, E. coli, and enterococcus bacteria was performed by the New Jersey Department of Health and Senior Services, Public Health and Environmental Laboratories, Environmental and Chemical Laboratory Services. Determination of chlorophyll a was performed by the New Jersey Department of Environmental Protection, Bureau of Freshwater and Biological Monitoring Laboratory.

COOPERATIVE NETWORK SITE DESCRIPTOR.--Background, New Jersey Department of Environmental Protection Watershed Management Area 17.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Instantaneous discharge, cfs (00061)	Turbidity, water, unfltrd field, NTU (61028)	UV absorbance, 254 nm, wat flt units /cm (50624)	UV absorbance, 280 nm, wat flt units /cm (61726)	Barometric pressure, mm Hg (00025)	Dissolved oxygen, mg/L (00300)	Dissolved oxygen, percent of saturation (00301)	pH, water, unfltrd field, std units (00400)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Temperature, air, deg C (00020)	Temperature, water, deg C (00010)	Hardness, water, unfltrd mg/L as CaCO3 (00900)
NOV 05...	1520	0.71	0.6	0.150	0.119	765	9.3	79	4.2	36	8.5	8.5	6
FEB 25...	1120	4.4	1.1	0.374	0.281	771	12.6	92	3.9	59	5.0	2.7	6
MAY 22...	1240	1.4	0.7	0.170	0.134	764	8.6	80	4.5	28	14.0	12.5	4
AUG 21...	1130	0.69	0.8	0.187	0.151	764	7.3	77	4.2	26	28.0	18.1	3

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Calcium water, fltrd, mg/L (00915)	Magnesium, water, fltrd, mg/L (00925)	Potassium, water, fltrd, mg/L (00935)	Sodium, water, fltrd, mg/L (00930)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Chloride, water, fltrd, mg/L (00940)	Fluoride, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Sulfate water, fltrd, mg/L (00945)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue total at 105 deg. C, suspended, mg/L (00530)	Ammonia + org-N, water, fltrd, mg/L as N (00623)	Ammonia water, fltrd, mg/L as N (00608)
NOV 05...	0.80	0.867	0.44	2.49	<2	4.16	<0.17	7.7	4.8	26	2	E.10	<0.030
FEB 25...	0.82	0.881	0.53	2.96	--	4.52	<0.17	5.4	8.5	46	<1	0.23	<0.030
MAY 22...	0.52	0.540	0.52	2.29	<2	4.39	<0.17	5.6	2.7	27	1	0.11	<0.030
AUG 21...	0.56	0.479	0.42	2.21	<2	4.22	<0.17	7.5	1.5	32	7	0.17	0.036

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Ammonia water, unfltrd mg/L as N (00610)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Nitrite water, fltrd, mg/L as N (00613)	Orthophosphate, water, fltrd, mg/L as P (00671)	Particulate nitrogen, susp, water, mg/L (49570)	Phosphorus, water, fltrd, mg/L (00666)	Phosphorus, water, unfltrd mg/L (00665)	Total nitrogen, water, fltrd, mg/L (00602)	Total nitrogen, water, unfltrd mg/L (00600)	Total carbon, suspnd sedimnt total, mg/L (00694)	Inorganic carbon, suspnd sedimnt total, mg/L (00688)	Organic carbon, suspnd sedimnt total, mg/L (00689)	Organic carbon, water, fltrd, mg/L (00681)
NOV 05...	<0.030	0.10	<0.003	<0.020	<0.02	<0.004	E.003	--	--	<0.1	<0.1	<0.1	4.1
FEB 25...	<0.030	0.10	0.003	0.024	<0.02	E.002	0.005	0.33	--	0.3	<0.1	0.3	8.7
MAY 22...	<0.030	0.09	<0.003	<0.020	<0.02	<0.004	E.003	0.20	--	0.2	<0.1	0.2	4.0
AUG 21...	0.032	0.14	<0.003	<0.020	0.03	0.005	0.007	0.30	0.33	0.3	<0.1	0.3	3.4

01411955 GRAVELLY RUN AT LAUREL LAKE, NJ—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	BOD, water, unfltrd 5 day, 20 degC mg/L (00310)	Chloro-phyll a fluoro-metric method, corrctd ug/L (32209)	Boron, water, fltrd, ug/L (01020)
NOV			
05...	E1.9	--	E9.0
FEB			
25...	E2.0	--	16
MAY			
22...	2.3	6.50	E9.9
AUG			
21...	E1.7	0.200	14

Remark codes used in this table:
< -- Less than
E -- Estimated value

WATER-COLUMN AND BED-MATERIAL TRACE-ELEMENT ANALYSES

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Sample type	pH bed sedimnt std units (70310)	Ammonia + org-N, bed sed total, mg/kg as N (00626)	Phos-phorus, bed sedimnt total, mg/kg (00668)	Total carbon, bed sedimnt total, g/kg (00693)	Inor-ganic carbon, bed sedimnt total, g/kg (00686)	Arsenic water unfltrd ug/L (01002)	Barium, water, unfltrd recover -able, ug/L (01007)	Beryll-ium, water, unfltrd recover -able, ug/L (01012)	Boron, water, unfltrd recover -able, ug/L (01022)
AUG											
21...	*1128*	*Sampler Blank*	--	--	--	--	--	--	--	--	--
21...	*1129*	*Field Blank*	--	--	--	--	--	--	--	--	--
21...	1130	Environmental	--	--	--	--	--	<2	15.0	E.06	10
21...	1130	Bed material	3.98	240	770	2.3	<0.2	--	--	--	--

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Cadmium water, unfltrd ug/L (01027)	Chrom-ium, water, unfltrd recover -able, ug/L (01034)	Copper, water, fltrd, ug/L (01040)	Copper, water, unfltrd recover -able, ug/L (01042)	Iron, water, unfltrd recover -able, ug/L (01045)	Lead, water, fltrd, ug/L (01049)	Lead, water, unfltrd recover -able, ug/L (01051)	Mangan-ese, water, unfltrd recover -able, ug/L (01055)	Mercury water, fltrd, ug/L (71890)	Mercury water, unfltrd recover -able, ug/L (71900)	Nickel, water, fltrd, ug/L (01065)	Nickel, water, unfltrd recover -able, ug/L (01067)	Selen-ium, water, unfltrd ug/L (01147)
AUG													
21...	--	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	*<0.2*	--	--	*<0.08*	--	--	*<0.02*	--	*<0.06*	--	--
21...	<0.04	<0.8	--	E.3	170	--	0.87	3.3	--	<0.02	--	0.53	E.4
21...	--	--	--	--	--	--	--	--	--	--	--	--	--

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Silver, water, unfltrd recover -able, ug/L (01077)	Zinc, water, fltrd, ug/L (01090)	Zinc, water, unfltrd recover -able, ug/L (01092)	Arsenic bed sedimnt total, ug/g (01003)	Cadmium bed sedimnt recover -able, ug/g (01028)	Chrom-ium, bed sedimnt recover -able, ug/g (01029)	Cobalt bed sedimnt recover -able, ug/g (01038)	Copper, bed sedimnt recover -able, ug/g (01043)	Iron, bed sedimnt total, ug/g (01170)	Lead, bed sedimnt recover -able, ug/g (01052)	Mangan-ese, bed sedimnt recover -able, ug/g (01053)	Mercury bed sedimnt recover -able, ug/g (71921)	Nickel, bed sedimnt recover -able, ug/g (01068)
AUG													
21...	--	*<1*	--	--	--	--	--	--	--	--	--	--	--
21...	--	2	--	--	--	--	--	--	--	--	--	--	--
21...	<0.16	--	5	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	<1	0.010	2.4	0.320	<2	1,600	5.1	5.8	<0.01	1.1

01411955 GRAVELLY RUN AT LAUREL LAKE, NJ—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Selenium, bed sedimnt total, ug/g (01148)	Zinc, bed sedimnt recover -able, ug/g (01093)	1,2-Dimethylnaphthalene, bed sed <2 mm, ug/kg (49403)	1,6-Dimethylnaphthalene, bed sed <2 mm, ug/kg (49404)	1Methyl -9H-fluorene, bed sed <2 mm, ug/kg (49398)	1-Methylphenanthrene, bed sed <2 mm, ug/kg (49410)	1-Methylpyrene, bed sed <2 mm, wsv nat ug/kg (49388)	236Trimethylnaphthalene, bed sed <2 mm, ug/kg (49405)	2,6-Dimethylnaphthalene, bed sed <2 mm, ug/kg (49406)	2-Ethylnaphthalene bed sed <2 mm wsv nat ug/kg (49948)	2-Methylanthracene, bed sed <2 mm, ug/kg (49435)	Cyclopentaphenanthrene, bed sed <2 mm, ug/kg (49411)	9H-Flourene, bed sed <2 mm, wsv nat ug/kg (49399)
AUG													
21...	--	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	--	--	--	--	--
21...	<1	4.5	<50	<50	<50	<50	<50	<50	E13	<50	<50	<50	<50

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Acenaphthene, bed sed <2 mm, wsv nat ug/kg (49429)	Acenaphthylene, bed sed <2 mm, wsv nat ug/kg (49428)	Anthracene, bed sed <2 mm, wsv nat field, ug/kg (49434)	Benzo-[a]-anthracene, bed sed <2 mm, ug/kg (49436)	Benzo-[a]-pyrene, bed sed <2 mm, wsv nat ug/kg (49389)	Benzo-[b]-fluoranthene bed sed <2 mm ug/kg (49458)	Benzo-[ghi]-perylene, bed sed <2 mm, ug/kg (49408)	Benzo-[k]-fluoranthene bed sed <2 mm ug/kg (49397)	Chrysene, bed sed <2 mm, wsv nat field, ug/kg (49450)	Dibenzo -[a,h]-anthracene, bed sed <2 mm, ug/kg (49461)	Fluoranthene bed sed <2 mm wsv nat field, ug/kg (49466)	Indeno-[1,2,-3-cd]-pyrene, bed sed <2 mm ug/kg (49390)	Isophorone bed sed <2 mm, wsv nat field, ug/kg (49400)
AUG													
21...	--	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	--	--	--	--	--
21...	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	E11	<50	<50

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Naphthalene, bed sed <2 mm wsv nat ug/kg (49402)	PCBs, bed sedimnt ug/kg (39519)	p-Cresol, bed sed <2 mm, wsv nat field, ug/kg (49451)	Phenanthrene, bed sed <2 mm, wsv nat field, ug/kg (49409)	Phenanthridine, bed sed <2 mm, wsv nat ug/kg (49393)	Pyrene, bed sed <2 mm, wsv nat field, ug/kg (49387)	Bed sediment, dry svd sve dia percent <.063mm (80164)	Bed sediment falldia dst wat percent <.002mm (80294)	Bed sediment, falldia dst wat percent <.004mm (80157)	Bed sediment falldia dst wat percent <.008mm (80293)	Bed sediment, falldia dst wat percent <.016mm (80282)	Bed sediment, falldia dst wat percent <.031mm (80283)
AUG												
21...	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	--	--	--	--
21...	<50	<5	<50	<50	<50	E10	9.3	2.8	3.5	4.6	6.3	8.1

Remark codes used in this table:
< -- Less than
E -- Estimated value

WATER-COLUMN VOLATILE ORGANIC COMPOUND ANALYSES

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	1,1,1-Trichloroethane, water, unfltrd ug/L (34506)	CFC-113 water unfltrd ug/L (77652)	1,1-Dichloroethane, water unfltrd ug/L (34496)	1,1-Dichloroethene, water, unfltrd ug/L (34501)	1,2-Dichlorobenzene water unfltrd ug/L (34536)	1,2-Dichloroethane, water, unfltrd ug/L (32103)	1,2-Dichloropropane water unfltrd ug/L (34541)	1,3-Dichlorobenzene water unfltrd ug/L (34566)	1,4-Dichlorobenzene water unfltrd ug/L (34571)	Benzene water unfltrd ug/L (34030)	Bromodichloromethane water unfltrd ug/L (32101)	Chlorobenzene water unfltrd ug/L (34301)
FEB													
25...	1120	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	cis-1,2-Dichloroethene, water, unfltrd ug/L (77093)	Dibromochloromethane water unfltrd ug/L (32105)	Dichlorodifluoromethane wat unf ug/L (34668)	Dichloromethane water unfltrd ug/L (34423)	Diethyl ether, water, unfltrd ug/L (81576)	Diisopropyl ether, water, unfltrd ug/L (81577)	Ethylbenzene water unfltrd ug/L (34371)	Methyl tert-pentyl ether, water, unfltrd ug/L (50005)	meta- + para-Xylene, water, unfltrd ug/L (85795)	o-Xylene, water, unfltrd ug/L (77135)	Styrene water unfltrd ug/L (77128)	t-Butyl ethyl ether, water, unfltrd ug/L (50004)	Methyl t-butyl ether, water, unfltrd ug/L (78032)
FEB													
25...	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.2	<0.1	<0.1	<0.1	<0.2

01411955 GRAVELLY RUN AT LAUREL LAKE, NJ—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Tetra-chloro-ethene, water, unfltrd ug/L (34475)	Tetra-chloro-methane water unfltrd ug/L (32102)	Toluene water unfltrd ug/L (34010)	trans-1,2-Di-chloro-ethene, water, unfltrd ug/L (34546)	Tri-bromo-methane water unfltrd ug/L (32104)	Tri-chloro-ethene, water, unfltrd ug/L (39180)	Tri-chloro-fluoro-methane water unfltrd ug/L (34488)	Tri-chloro-methane water unfltrd ug/L (32106)	Vinyl chlor-ide, water, unfltrd ug/L (39175)
FEB									
25...	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.2	0.2	<0.2

Remark codes used in this table:
< -- Less than

WATER-COLUMN PESTICIDE ANALYSES

The following were determined using laboratory schedule 2001 (listed in its entirety, with laboratory reporting levels, in "Laboratory Measurements" in the Explanation of Water-Quality Records section of this report). Only pesticides detected in one or more surface-water samples are listed in the following table.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	2,6-Di-ethyl-aniline water fltrd 0.7u GF ug/L (82660)	CIAT, water, fltrd, ug/L (04040)	Aceto-chlor, water, fltrd, ug/L (49260)	Ala-chlor, water, fltrd, ug/L (46342)	alpha-HCH, water, fltrd, ug/L (34253)	Atra-zine, water, fltrd, ug/L (39632)	Azin-phos-methyl, water, fltrd 0.7u GF ug/L (82686)	Ben-flur-alin, water, fltrd 0.7u GF ug/L (82673)	Butyl-ate, water, fltrd, ug/L (04028)	Car-baryl, water, fltrd 0.7u GF ug/L (82680)	Carbo-furan, water, fltrd 0.7u GF ug/L (82674)	cis-Per-methrin water fltrd 0.7u GF ug/L (82687)
MAY													
22...	1240	<0.006	<0.006	<0.006	<0.004	<0.005	<0.007	<0.050	<0.010	<0.002	<0.041	<0.020	<0.006

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	DCPA, water fltrd 0.7u GF ug/L (82682)	Desulf-inyl fipro-nil, water, fltrd, ug/L (62170)	Diazi-non, water, fltrd, ug/L (39572)	Diel-drin, water, fltrd, ug/L (39381)	EPTC, water, fltrd 0.7u GF ug/L (82668)	Desulf-inyl-fipro-nil amide, wat flt ug/L (62169)	Fipro-nil sulfide water, fltrd, ug/L (62167)	Fipro-nil sulfone water, fltrd, ug/L (62168)	Fipro-nil, water, fltrd, ug/L (62166)	Mala-thion, water, fltrd, ug/L (39532)	Metola-chlor, water, fltrd, ug/L (39415)	Metri-buzin, water, fltrd, ug/L (82630)	Naprop-amide, water, fltrd 0.7u GF ug/L (82684)
MAY													
22...	<0.003	<0.004	<0.005	<0.005	<0.002	<0.009	<0.005	<0.005	<0.007	<0.027	<0.013	<0.006	<0.007

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Pendi-meth-alin, water, fltrd 0.7u GF ug/L (82683)	Prome-ton, water, fltrd, ug/L (04037)	Sima-zine, water, fltrd, ug/L (04035)	Tebu-thiuron water fltrd 0.7u GF ug/L (82670)	Terba-cil, water, fltrd 0.7u GF ug/L (82665)	Tri-flur-alin, water, fltrd 0.7u GF ug/L (82661)
MAY						
22...	<0.022	<0.01	<0.005	<0.02	<0.034	<0.009

Remark codes used in this table:
< -- Less than

WATER-COLUMN BACTERIA ANALYSES

Samples were collected synoptically over a 30-day period during the summer.

01411955 GRAVELLY RUN AT LAUREL LAKE, NJ—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Entero-cocci, m-E MF, water, col/ 100 mL (31649)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Fecal coli-form, ECbroth water, MPN/ 100 mL (31615)
AUG				
06...	0940	220	<100	110
19...	1120	110	100	130
20...	0935	50	<100	40
27...	0935	110	<100	20
SEP				
03...	0914	230	<100	170

Remark codes used in this table:
< -- Less than

01412005 MENANTICO CREEK AT ROUTE 49, AT MILLVILLE, NJ

LOCATION.--Lat 39°23'11", long 74°59'21", Cumberland County, Hydrologic Unit 02040206, at bridge on State Route 49, 1.1 mi upstream of Menantico Ponds, 2.8 mi east of Millville, and 4.5 mi west of Cumberland.

DRAINAGE AREA.-- 26.32 mi^2.

PERIOD OF RECORD.--December 2002 to September 2003.

REMARKS.--Total nitrogen (00600) equals the sum of dissolved ammonia plus organic nitrogen (00623), dissolved nitrite plus nitrate nitrogen (00631), and total particulate nitrogen (49570).

COOPERATION.--Field data and samples for laboratory analyses were provided by the New Jersey Department of Environmental Protection. Determination of dissolved ammonia, total ammonia, dissolved nitrite, dissolved orthophosphate, biochemical oxygen demand, total suspended solids, total ammonia + organic nitrogen in bed sediment, total phosphorus in bed sediment, fecal coliform, E. coli, and enterococcus bacteria was performed by the New Jersey Department of Health and Senior Services, Public Health and Environmental Laboratories, Environmental and Chemical Laboratory Services. Determination of chlorophyll a was performed by the New Jersey Department of Environmental Protection, Bureau of Freshwater and Biological Monitoring Laboratory.

COOPERATIVE NETWORK SITE DESCRIPTOR.--Statewide Status, New Jersey Department of Environmental Protection Watershed Management Area 17.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Turbidity, water, unfltrd field, NTU (61028)	UV absorbance, 254 nm, wat flt units /cm (50624)	UV absorbance, 280 nm, wat flt units /cm (61726)	Barometric pressure, mm Hg (00025)	Dissolved oxygen, mg/L (00300)	Dissolved oxygen, percent of saturation (00301)	pH, water, unfltrd field, std units (00400)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Temperature, air, deg C (00020)	Temperature, water, deg C (00010)	Hardness, water, unfltrd mg/L as CaCO3 (00900)	Calcium water, fltrd, mg/L (00915)
DEC 04...	1000	2.6	0.121	0.092	772	11.6	85	7.0	143	4.7	3.1	46	10.4
MAR 06...	1030	4.4	0.295	0.225	752	10.3	84	6.5	161	8.5	6.1	46	10.2
MAY 20...	1000	3.4	0.155	0.119	768	7.2	66	6.5	149	22.4	11.9	42	9.50
AUG 26...	0900	1.8	0.165	0.129	760	7.2	76	6.8	147	23.3	18.1	50	11.1

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Magnesium, water, fltrd, mg/L (00925)	Potassium, water, fltrd, mg/L (00935)	Sodium, water, fltrd, mg/L (00930)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Chloride, water, fltrd, mg/L (00940)	Fluoride, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Sulfate water, fltrd, mg/L (00945)	Residue water, fltrd, sum of constituents mg/L (70301)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue total at 105 deg. C, suspended, mg/L (00530)	Ammonia + org-N, water, fltrd, mg/L as N (00623)	Ammonia water, fltrd, mg/L as N (00608)
DEC 04...	4.93	4.25	5.39	5	12.6	<0.17	10.5	20.0	94	101	9	0.25	0.035
MAR 06...	4.87	4.77	8.40	4	18.5	<0.17	6.6	19.1	99	113	4	0.42	<0.030
MAY 20...	4.34	4.33	5.48	6	13.2	<0.17	9.0	15.0	88	108	4	0.32	<0.030
AUG 26...	5.42	5.07	6.12	11	14.5	<0.17	9.1	14.5	95	93	11	0.33	<0.020

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Ammonia water, unfltrd mg/L as N (00610)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Nitrite water, fltrd, mg/L as N (00613)	Orthophosphate, water, fltrd, mg/L as P (00671)	Particulate nitrogen, susp, water, mg/L (49570)	Phosphorus, water, fltrd, mg/L (00666)	Phosphorus, water, unfltrd mg/L (00665)	Total nitrogen, water, fltrd, mg/L (00602)	Total nitrogen, water, unfltrd mg/L (00600)	Total carbon, suspnd sedimnt total, mg/L (00694)	Inorganic carbon, suspnd sedimnt total, mg/L (00688)	Organic carbon, suspnd sedimnt total, mg/L (00689)	Organic carbon, water, fltrd, mg/L (00681)
DEC 04...	0.062	5.24	0.005	0.032	0.03	0.010	0.037	5.5	5.5	0.4	<0.1	0.4	3.4
MAR 06...	<0.030	5.38	0.004	0.025	0.13	0.021	0.055	5.8	5.9	0.7	<0.1	0.7	6.6
MAY 20...	<0.030	5.22	0.006	<0.020	0.12	0.015	0.049	5.5	5.7	0.7	<0.1	0.7	3.6
AUG 26...	<0.020	5.17	0.006	<0.020	0.05	0.017	0.036	5.5	5.6	0.2	<0.1	0.1	3.8

01412005 MENANTICO CREEK AT ROUTE 49, AT MILLVILLE, NJ—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	BOD, water, unfltrd 5 day, 20 degC mg/L (00310)	Chlorophyll a fluorometric method, corrctd ug/L (32209)	Boron, water, fltrd, ug/L (01020)
DEC			
04...	<1.0	--	19
MAR			
06...	<1.0	--	23
MAY			
20...	E1.9	1.30	15
AUG			
26...	E1.3	0.900	24

Remark codes used in this table:
< -- Less than
E -- Estimated value

WATER-COLUMN AND BED-MATERIAL TRACE-ELEMENT ANALYSES

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	pH bed sedimnt std units (70310)	Ammonia + org-N, bed sed total, mg/kg as N (00626)	Phosphorus, bed sedimnt total, mg/kg (00668)	Total carbon, bed sedimnt total, g/kg (00693)	Inorganic carbon, bed sedimnt total, g/kg (00686)	Arsenic water unfltrd ug/L (01002)	Barium, water, unfltrd recover -able, ug/L (01007)	Beryllium, water, unfltrd recover -able, ug/L (01012)	Boron, water, unfltrd recover -able, ug/L (01022)	Cadmium water, unfltrd ug/L (01027)	Chromium, water, unfltrd recover -able, ug/L (01034)	Copper, water, unfltrd recover -able, ug/L (01042)
AUG													
26...	0900	--	--	--	--	--	<2	89.0	E.05	19	0.05	<0.8	0.6
26...	0900	6.34	20	900	1.0	<0.2	--	--	--	--	--	--	--

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Iron, water, unfltrd recover -able, ug/L (01045)	Lead, water, unfltrd recover -able, ug/L (01051)	Manganese, water, unfltrd recover -able, ug/L (01055)	Mercury water, unfltrd recover -able, ug/L (71900)	Nickel, water, unfltrd recover -able, ug/L (01067)	Selenium, water, unfltrd ug/L (01147)	Silver, water, unfltrd recover -able, ug/L (01077)	Zinc, water, unfltrd recover -able, ug/L (01092)	Arsenic bed sedimnt total, ug/g (01003)	Cadmium bed sedimnt recover -able, ug/g (01028)	Chromium, bed sedimnt recover -able, ug/g (01029)	Cobalt bed sedimnt recover -able, ug/g (01038)	Copper, bed sedimnt recover -able, ug/g (01043)
AUG													
26...	300	0.28	14.1	E.01	2.16	0.5	<0.16	6	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	<1	0.020	0.5	0.070	<2

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Iron, bed sedimnt total, ug/g (01170)	Lead, bed sedimnt recover -able, ug/g (01052)	Manganese, bed sedimnt recover -able, ug/g (01053)	Mercury bed sedimnt recover -able, ug/g (71921)	Nickel, bed sedimnt recover -able, ug/g (01068)	Selenium, bed sedimnt total, ug/g (01148)	Zinc, bed sedimnt recover -able, ug/g (01093)	1,2-Dimethylnaphthalene, bed sed <2 mm, ug/kg (49403)	1,6-Dimethylnaphthalene, bed sed <2 mm, ug/kg (49404)	1Methyl -9H-fluorene, bed sed <2 mm, ug/kg (49398)	1-Methylphenanthrene, bed sed <2 mm, ug/kg (49410)	1-Methylpyrene, bed sed <2 mm, wsv nat ug/kg (49388)	236Trimethylnaphthalene, bed sed <2 mm, ug/kg (49405)
AUG													
26...	--	--	--	--	--	--	--	--	--	--	--	--	--
26...	150	1.5	<0.3	<0.01	0.157	<1	<3.1	<50	<50	<50	<50	<50	<50

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	2,6-Dimethylnaphthalene, bed sed <2 mm, ug/kg (49406)	2-Ethyl naphthalene bed sed <2 mm wsv nat ug/kg (49948)	2-Methylanthracene, bed sed <2 mm, ug/kg (49435)	Cyclopentaphenanthrene, bed sed <2 mm, ug/kg (49411)	9H-Flourene, bed sed <2 mm, wsv nat ug/kg (49399)	Acenaphthene, bed sed <2 mm, wsv nat ug/kg (49429)	Acenaphthylene, bed sed <2 mm, wsv nat ug/kg (49428)	Anthracene, bed sed <2 mm, wsv nat field, ug/kg (49434)	Benzo-[a]-anthracene, bed sed <2 mm, ug/kg (49436)	Benzo-[a]-pyrene, bed sed <2 mm, wsv nat ug/kg (49389)	Benzo-[b]-fluoranthene bed sed <2 mm ug/kg (49458)	Benzo-[ghi]-perylene, bed sed <2 mm, ug/kg (49408)	Benzo-[k]-fluoranthene bed sed <2 mm ug/kg (49397)
AUG													
26...	--	--	--	--	--	--	--	--	--	--	--	--	--
26...	E13	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50

01412005 MENANTICO CREEK AT ROUTE 49, AT MILLVILLE, NJ—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Chrysene, bed sed <2 mm, wsv nat field, ug/kg (49450)	Dibenzo-[a,h]-anthracene, bed sed <2 mm, ug/kg (49461)	Fluoranthene bed sed <2 mm wsv nat field, ug/kg (49466)	Indeno-[1,2,-3-cd]-pyrene, bed sed <2 mm ug/kg (49390)	Isophorone bed sed <2 mm, wsv nat field, ug/kg (49400)	Naphthalene, bed sed <2 mm wsv nat ug/kg (49402)	PCBs, bed sedimnt ug/kg (39519)	p-Cresol, bed sed <2 mm, wsv nat field, ug/kg (49451)	Phenanthrene, bed sed <2 mm, wsv nat field, ug/kg (49409)	Phenanthridine, bed sed <2 mm, wsv nat ug/kg (49393)	Pyrene, bed sed <2 mm, wsv nat field, ug/kg (49387)	Bed sediment, dry svd sve dia percent <.063mm (80164)
AUG												
26...	--	--	--	--	--	--	--	--	--	--	--	--
26...	<50	<50	<50	<50	<50	<50	<5	<50	<50	<50	E11	<1.0

Remark codes used in this table:
< -- Less than
E -- Estimated value

WATER-COLUMN VOLATILE ORGANIC COMPOUND ANALYSES

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	1,1,1-Trichloroethane, water, unfltrd ug/L (34506)	CFC-113 water unfltrd ug/L (77652)	1,1-Dichloroethane, water unfltrd ug/L (34496)	1,1-Dichloroethene, water, unfltrd ug/L (34501)	1,2-Dichlorobenzene water unfltrd ug/L (34536)	1,2-Dichloroethane, water, unfltrd ug/L (32103)	1,2-Dichloropropane water unfltrd ug/L (34541)	1,3-Dichlorobenzene water unfltrd ug/L (34566)	1,4-Dichlorobenzene water unfltrd ug/L (34571)	Benzene water unfltrd ug/L (34030)	Bromodichloromethane water unfltrd ug/L (32101)	Chlorobenzene water unfltrd ug/L (34301)
MAR													
06...	1030	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	cis-1,2-Dichloroethene, water, unfltrd ug/L (77093)	Dibromochloromethane water unfltrd ug/L (32105)	Dichlorodifluoromethane wat unf ug/L (34668)	Dichloromethane water unfltrd ug/L (34423)	Diethyl ether, water, unfltrd ug/L (81576)	Diisopropyl ether, water, unfltrd ug/L (81577)	Ethylbenzene water unfltrd ug/L (34371)	Methyl tert-pentyl ether, water, unfltrd ug/L (50005)	meta- + para-Xylene, water, unfltrd ug/L (85795)	o-Xylene, water, unfltrd ug/L (77135)	Styrene water unfltrd ug/L (77128)	t-Butyl ethyl ether, water, unfltrd ug/L (50004)	Methyl t-butyl ether, water, unfltrd ug/L (78032)
MAR													
06...	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.2	<0.1	<0.1	<0.1	<0.2

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Tetrachloroethene, water, unfltrd ug/L (34475)	Tetrachloromethane water unfltrd ug/L (32102)	Toluene water unfltrd ug/L (34010)	trans-1,2-Dichloroethene, water, unfltrd ug/L (34546)	Tribromomethane water unfltrd ug/L (32104)	Trichloroethene, water, unfltrd ug/L (39180)	Trichlorofluoromethane water unfltrd ug/L (34488)	Trichloromethane water unfltrd ug/L (32106)	Vinyl chloride, water, unfltrd ug/L (39175)
MAR									
06...	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.2	<0.1	<0.2

Remark codes used in this table:
< -- Less than

01412005 MENANTICO CREEK AT ROUTE 49, AT MILLVILLE, NJ—Continued

WATER-COLUMN PESTICIDE ANALYSES

The following were determined using laboratory schedule 2001 (listed in its entirety, with laboratory reporting levels, in "Laboratory Measurements" in the Explanation of Water-Quality Records section of this report). Only pesticides detected by the analyses in one or more surface-water samples are listed in the following table.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	2,6-Diethylaniline water fltrd 0.7u GF ug/L (82660)	CIAT, water, fltrd, ug/L (04040)	Acetochlor, water, fltrd, ug/L (49260)	Alachlor, water, fltrd, ug/L (46342)	alpha-HCH, water, fltrd, ug/L (34253)	Atrazine, water, fltrd, ug/L (39632)	Azinphos-methyl, water, fltrd 0.7u GF ug/L (82686)	Benfluralin, water, fltrd 0.7u GF ug/L (82673)	Butylate, water, fltrd, ug/L (04028)	Carbaryl, water, fltrd 0.7u GF ug/L (82680)	Carbofuran, water, fltrd 0.7u GF ug/L (82674)	cis-Permethrin water fltrd 0.7u GF ug/L (82687)
MAY													
20...	1000	<0.006	<0.006	<0.006	<0.004	<0.005	<0.007	<0.050	<0.010	<0.002	E.029	<0.020	<0.006

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	DCPA, water fltrd 0.7u GF ug/L (82682)	Desulfinyl fipronil, water, fltrd, ug/L (62170)	Diazinon, water, fltrd, ug/L (39572)	Dieldrin, water, fltrd, ug/L (39381)	EPTC, water, fltrd 0.7u GF ug/L (82668)	Desulfinyl-fipronil amide, wat flt ug/L (62169)	Fipronil sulfide water, fltrd, ug/L (62167)	Fipronil sulfone water, fltrd, ug/L (62168)	Fipronil, water, fltrd, ug/L (62166)	Malathion, water, fltrd, ug/L (39532)	Metolachlor, water, fltrd, ug/L (39415)	Metribuzin, water, fltrd, ug/L (82630)	Napropamide, water, fltrd 0.7u GF ug/L (82684)
MAY													
20...	<0.003	<0.004	<0.005	<0.005	<0.002	<0.009	<0.005	<0.005	<0.007	<0.027	0.022	<0.006	<0.007

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Pendimethalin, water, fltrd 0.7u GF ug/L (82683)	Prometon, water, fltrd, ug/L (04037)	Simazine, water, fltrd, ug/L (04035)	Tebuthiuron water fltrd 0.7u GF ug/L (82670)	Terbacil, water, fltrd 0.7u GF ug/L (82665)	Trifluralin, water, fltrd 0.7u GF ug/L (82661)
MAY						
20...	<0.022	<0.01	<0.005	<0.02	<0.034	<0.009

Remark codes used in this table:
< -- Less than
E -- Estimated value

WATER-COLUMN BACTERIA ANALYSES

Samples were collected synoptically over a 30-day period during the summer.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Enterococci, m-E MF, water, col/ 100 mL (31649)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Fecal coliform, ECbroth water, MPN/ 100 mL (31615)
AUG				
06...	1040	590	100	500
19...	1150	210	100	300
20...	1015	240	<100	20
27...	1020	140	100	20
SEP				
03...	0955	410	200	1,100

Remark codes used in this table:
< -- Less than

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LOW-FLOW CHARACTERISTICS AND FLOW DURATION OF NEW JERSEY STREAMS

By Brian D. Gillespie and Robert D. Schopp

Open-File Report 81-1110

Prepared in cooperation with the
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION,
DIVISION OF WATER RESOURCES

Trenton, New Jersey
January 1982

UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information, write to:

U.S. Geological Survey
Room 430, Federal Building
402 East State Street
Trenton, New Jersey 08608

DELAWARE BAY BASINS

MAP NO.	STATION NUMBER	STATION NAME	QUADRANGLE MAP 7.5 MINUTE SERIES	PAGE
		DELAWARE BAY BASINS		
		FISHING CREEK BASIN		
1	01411400	FISHING CREEK AT RIO GRANDE	RIO GRANDE	116
		GREEN CREEK BASIN		
2	01411404	GREEN CREEK AT GREEN CREEK	RIO GRANDE	116
		DIAS CREEK BASIN		
3	01411408	DIAS CREEK NEAR CAPE MAY COURT HOUSE	STONE HARBOR	116
		BIDWELL DITCH BASIN		
		BIDWELL DITCH:		
4	01411410	BIDWELL DITCH TRIBUTARY NEAR CAPE MAY COURT HOUSE	STONE HARBOR	116
5	01411412	BIDWELL DITCH TRIBUTARY NO. 2 NEAR CAPE MAY COURT HOUSE	STONE HARBOR	117
		GOSHEN CREEK BASIN		
6	01411418	GOSHEN CREEK AT GOSHEN	WOODBINE	117
		DENNIS CREEK BASIN		
		DENNIS CREEK:		
7	01411430	SLUICE CREEK AT CLERMONT	WOODBINE	117
		MAURICE RIVER BASIN		
8	01411500	MAURICE RIVER AT NORMA	MILLVILLE	117
9	01411800	MAURICE RIVER NEAR MILLVILLE	MILLVILLE	118
10	01411850	MILL CREEK NEAR MILLVILLE	MILLVILLE	118
11	01412000	MENANTICO CREEK NEAR MILLVILLE	FIVE POINTS	118
12	01412100	MANUMUSKIN RIVER NEAR MANUMUSKIN	PORT ELIZABETH	118
13	01412500	WEST BRANCH COHANSEY RIVER AT SEELEY	SHILOH	119
		STOW CREEK BASIN		
14	01413050	STOW CREEK AT JERICHO	SHILOH	119
15	01413060	CANTON DRAIN NEAR CANTON	SALEM	119

01411412 BIDWELL DITCH TRIBUTARY NO. 2 NEAR CAPE MAY COURT HOUSE, NJ

LOCATION -- LAT 39 06 25, LONG 074 50 12, CAPE MAY COUNTY, AT CULVERT PIPE ON GOSHEN ROAD, 1.8 MI (2.9 KM) NORTHWEST OF CAPE MAY COURT HOUSE, 2.3 MI (3.7 KM) SOUTHEAST OF GOSHEN, AND 3.6 MI (5.8 KM) UPSTREAM FROM MOUTH.
DRAINAGE AREA -- 0.19 SQ-MI (0.49 SQ-KM)
TRIBUTARY TO -- BIDWELL DITCH
STATION TYPE -- LOW-FLOW PARTIAL-RECORD STATION
REMARKS -- LOW-FLOW FREQUENCY ESTIMATES BASED ON CORRELATIONS WITH GAGING STATIONS 01409500, 01410000, 01411000 AND 01411500. CORRELATIONS RATED GOOD.

LOW-FLOW FREQUENCY -- PERIOD 1967-72

PERIOD OF CONSECUTIVE DAYS	AVERAGE ANNUAL MINIMUM DISCHARGE IN CU FT/S (CU M/S) FOR INDICATED RECURRENCE INTERVALS	
	2 YEARS	10 YEARS
7	0.0 (0.00)	0.0 (0.00)

01411418 GOSHEN CREEK AT GOSHEN, NJ

LOCATION -- LAT 39 07 39, LONG 074 50 45, CAPE MAY COUNTY, AT CULVERT PIPE ON GOSHEN ROAD, 1.0 MI (1.6 KM) SOUTHEAST OF GOSHEN, 3.3 MI (5.3 KM) NORTHWEST OF CAPE MAY COURT HOUSE, AND 3.3 MI (5.3 KM) UPSTREAM FROM MOUTH.
DRAINAGE AREA -- 0.33 SQ-MI (0.85 SQ-KM)
TRIBUTARY TO -- DELAWARE BAY
STATION TYPE -- LOW-FLOW PARTIAL-RECORD STATION
REMARKS -- LOW-FLOW FREQUENCY ESTIMATES BASED ON CORRELATIONS WITH GAGING STATIONS 01409500, 01411000 AND 01411500. CORRELATIONS RATED GOOD.

LOW-FLOW FREQUENCY -- PERIOD 1967-72

PERIOD OF CONSECUTIVE DAYS	AVERAGE ANNUAL MINIMUM DISCHARGE IN CU FT/S (CU M/S) FOR INDICATED RECURRENCE INTERVALS	
	2 YEARS	10 YEARS
7	0.0 (0.00)	0.0 (0.00)

01411430 SLUICE CREEK AT CLERMONT, NJ

LOCATION -- LAT 39 09 26, LONG 074 46 18, CAPE MAY COUNTY, AT CULVERT PIPE ON STATE ROUTE 83, 0.6 MI (1.0 KM) NORTHWEST OF CLERMONT, 3.7 MI (6.0 KM) SOUTHEAST OF DENNISVILLE, AND 5.6 MI (9.0 KM) UPSTREAM FROM MOUTH.
DRAINAGE AREA -- 0.67 SQ-MI (1.74 SQ-KM)
TRIBUTARY TO -- DENNIS CREEK
STATION TYPE -- LOW-FLOW PARTIAL-RECORD STATION
REMARKS -- LOW-FLOW FREQUENCY ESTIMATES BASED ON CORRELATIONS WITH GAGING STATIONS 01409500, 01411000 AND 01411500. CORRELATIONS RATED GOOD.

LOW-FLOW FREQUENCY -- PERIOD 1967-72

PERIOD OF CONSECUTIVE DAYS	AVERAGE ANNUAL MINIMUM DISCHARGE IN CU FT/S (CU M/S) FOR INDICATED RECURRENCE INTERVALS	
	2 YEARS	10 YEARS
7	0.0 (0.00)	0.0 (0.00)

01411500 MAURICE RIVER AT NORMA, NJ

LOCATION -- LAT 39 29 42, LONG 075 04 38, SALEM COUNTY, ON RIGHT BANK JUST UPSTREAM FROM ALMOND ROAD BRIDGE IN NORMA, AND 0.8 MI (1.3 KM) DOWNSTREAM FROM BLACKWATER BRANCH.
DRAINAGE AREA -- 113 SQ-MI (293 SQ-KM)
TRIBUTARY TO -- DELAWARE BAY
STATION TYPE -- CONTINUOUS RECORD GAGING STATION
AVERAGE DISCHARGE -- 168 CU FT/S (4.76 CU M/S)
DAILY DISCHARGE EXTREMES -- MAXIMUM 5260 CU FT/S (149 CU M/S)
MINIMUM 23 CU FT/S (0.65 CU M/S)
REMARKS -- OCCASIONAL REGULATION; PROBABLY NOT SIGNIFICANT.

DURATION TABLE OF DAILY FLOW -- PERIOD 1933-75
DISCHARGE WHICH WAS EXCEEDED FOR INDICATED PERCENT OF TIME

	2.0%	5.0%	10.0%	20.0%	30.0%	40.0%	50.0%	60.0%	70.0%	80.0%	90.0%	95.0%	98.0%	99.0%	99.5%
CU FT/S	430	345	287	233	198	173	150	129	108	90.0	68.8	55.3	44.1	37.7	33.5
CU M/S	12.2	9.77	8.13	6.60	5.61	4.90	4.25	3.65	3.06	2.55	1.95	1.57	1.25	1.07	0.949

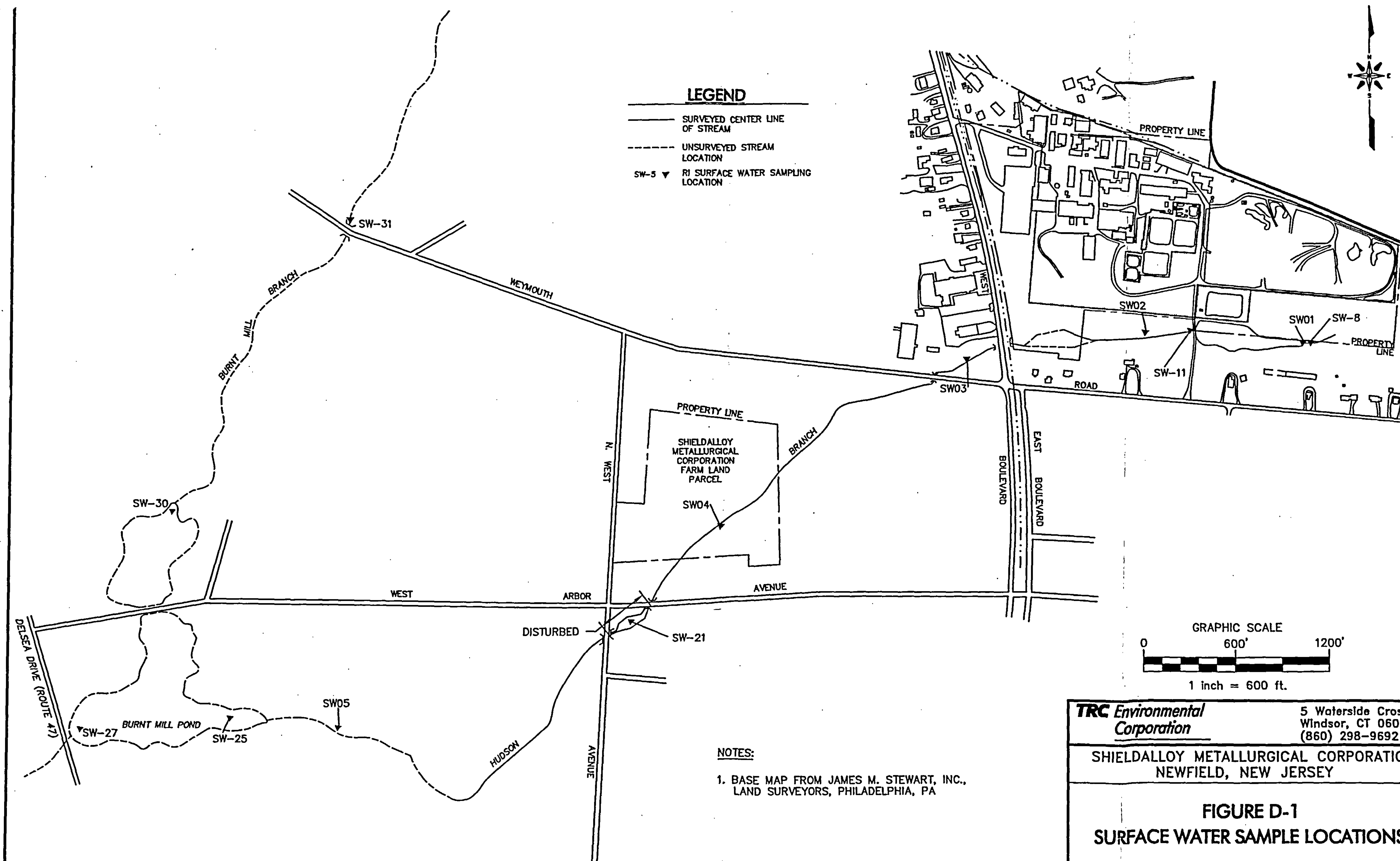
LOW-FLOW FREQUENCY -- PERIOD 1934-75

PERIOD OF CONSECUTIVE DAYS	AVERAGE ANNUAL MINIMUM DISCHARGE IN CU FT/S (CU M/S) FOR INDICATED RECURRENCE INTERVALS			
	2 YEARS	5 YEARS	10 YEARS	20 YEARS
3	53 (1.5)	39 (1.1)	33 (0.93)	28 (0.79)
7	59 (1.7)	44 (1.2)	37 (1.0)	32 (0.91)
30	70 (2.0)	51 (1.4)	43 (1.2)	38 (1.1)
90	90 (2.5)	66 (1.9)	55 (1.6)	47 (1.3)

APPENDIX D - SURFACE WATER SAMPLING RESULTS

APPENDIX D - SURFACE WATER SAMPLING RESULTS

Figure D-1 - Surface Water Sample Locations
Summary of Field Measurements - 1990 RI
Chemical Analysis Results - 1990 RI (Table 31a-31d)
Chemical Analysis Results - 1995 Supplemental Sampling (Table 1-9)



NOTES:

1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA

TRC Environmental Corporation

5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE D-1
SURFACE WATER SAMPLE LOCATIONS

04/05 | PROJECT No. 26770-0100-00000

\26770\0100\Figure D-1

TABLE 7

SHIELDALLOY METALLURGY CORPORATION
SURFACE WATER
FIELD MEASUREMENTS

SAMPLE ID NUMBER	TEMPERATURE (degree C)	pH	SPECIFIC CONDUCTIVITY (micromhos)
SMC-SW01-01	3.8	6.98	273
SMC-SW02-01	5.4	6.99	275
SMC-SW03-01	4.3	7.76	270
SMC-SW04-01	4.9	7.28	265
SMC-SW05-01	5.8	7.60	250

TABLE 31a
SHIELDALLOY METALLURGICAL CORPORATION
SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED IN SURFACE WATER SAMPLES

SAMPLE IDENTIFICATION:	SW1-01	SW2-01	SW3-01	SW10-01	SW4-01	SW5-01	SW6-01	SW7-01	SW8-01	SW9-01
VOLATILE ORGANICS (ppb)										
CHLOROMETHANE	–	–	–	–	9 J	–	–	–	–	–
BROMOMETHANE	–	–	–	–	–	–	–	–	–	–
VINLY CHLORIDE	–	–	–	–	–	–	–	–	–	–
CHLOROETHANE	–	–	–	–	–	–	–	–	–	–
METHYLENE CHLORIDE	19 R*	17 R*	18 R*	18 R*	10 BJ*	10 BJ*	41 R*	36 R*	35 R*	19 R*
ACETONE	12 BJ*	6 JB	6 JB	5 JB	7 JB	7 JB	6 N*	10 N*	9 N*	4 N*
CARBON DISULFIDE	–	–	–	–	–	–	2 N*	2 N*	2 N*	2 N*
1,1-DICHLORETHENE	–	–	–	–	–	–	–	–	–	–
1,1-DICHLORETHANE	–	–	–	–	–	–	–	–	–	–
1,2-DICHLORETHENE (total)	–	–	–	–	2 J	–	–	–	–	–
CHLOROFORM	–	–	–	–	–	–	–	–	–	–
1,2-DICHLORETHANE	–	–	–	–	–	–	–	–	–	–
2-BUTANONE	–	–	–	–	–	–	–	–	–	–
1,1,1-TRICHLOROETHANE	–	–	–	–	–	–	–	–	–	–
CARBON TETRACHLORIDE	–	–	–	–	–	–	–	–	–	–
VINYL ACETATE	–	–	–	–	–	–	–	–	–	–
BROMODICHLOROMETHANE	–	–	–	–	–	–	–	–	–	–
1,2-DICHLOROPROPANE	–	–	–	–	–	–	–	–	–	–
cis-1,3-DICHLOROPROPENE	–	–	–	–	–	–	–	–	–	–
TRICHLOROETHENE	–	–	–	–	3 J	–	–	–	–	–
DIBROMOCHLOROMETHANE	–	–	–	–	–	–	–	–	–	–
1,1,2-TRICHLOROETHANE	–	–	–	–	–	–	–	–	–	–
BENZENE	–	–	–	–	–	–	–	–	–	–
trans-1,3-DICHLOROPROPENE	–	–	–	–	–	–	–	–	–	–
BROMOFORM	–	–	–	–	–	–	–	–	–	–
4-METHYL1-2-PENTANONE	–	–	–	–	–	–	–	–	–	–
2-HEXANONE	–	–	–	–	–	–	–	–	–	–
TETRACHLOROETHENE	–	–	–	–	–	–	–	–	–	–
1,1,2,2-TETRACHLOROETHANE	–	–	–	–	–	–	–	–	–	–
TOLUENE	–	–	–	–	–	–	–	–	–	–
CHLOROBENZENE	–	–	–	–	–	–	–	–	–	–
ETHYLBENZENE	–	–	–	–	–	–	–	–	–	–
STYRENE	–	–	–	–	–	–	–	–	–	–
XYLENE (total)	–	–	–	–	–	–	–	–	–	–
TOTAL VOCs	12	6	6	5	31	17	8	0	0	0

B – QUALIFIER USED WHEN THE ANALYTE IS FOUND IN THE ASSOCIATED METHOD BLANK AS WELL AS IN THE SAMPLE. IT INDICATES POSSIBLE / PROBABLE CONTAMINATION.
J – QUALIFIER USED TO INDICATE AN ESTIMATED VALUE. THE CONCENTRATION IS QUANTITATIVELY QUALIFIED AND THE FINAL RESULT REPORTED IS ESTIMATED.
N – QUALIFIER INDICATES THE CONCENTRATION FOUND IN THE SAMPLE IS LESS THAN THREE TIMES THE CONCENTRATION FOUND IN THE ASSOCIATED BLANKS. THE PRESENCE OF THE ANALYTE IS NEGATED DUE TO LABORATORY CONTAMINATION.
R – DATA IS REJECTED DUE TO HOLDING TIME EXCEEDED, BLANK CONTAMINATION, INSTRUMENT CALIBRATION ERROR, OR OTHER MAJOR CONTROLLING LIMITS ARE EXCEEDED.
* – INDICATES QUALIFIER PLACED BY TRC-ECI.
N/A – NOT ANALYZED FOR THIS COMPOUND
'–' – NOT DETECTED TO THE REPORTED DETECTION LIMIT

TABLE 31b
SHIELDALLOY METALLURGICAL CORPORATION
SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED IN SURFACE WATER SAMPLES

SAMPLE IDENTIFICATION:	SW1-01	SW2-01	SW3-01	SW10-01	SW4-01	SW5-01	SW6-01	SW7-01	SW8-01	SW9-01
BASE NEUTRAL / ACIDS (ppb)										
PHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
bis(2-CHLOROETHYL)ETHER	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2-CHLOROPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
1,3-DICHLOROBENZENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
1,4-DICHLORBENZENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BENZYL ALCOHOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
1,2-DICHLOROBENZENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2-METHYLPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
bis(2-CHLOROISOPROPYL)ETHI	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4-METHYLPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
N-NITROSO-DI-N-PROPYLAN	–	N/A	N/A	N/A	–	N/A	–	–	–	–
HEXACHLOROETHANE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
NITROBENZENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ISOPHORONE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2-NITROPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2,4-DIMETHYLPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BENZOIC ACID	–	N/A	N/A	N/A	–	N/A	–	–	–	–
bis(2-CHLOROETHOXY)METHAN	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2,4-DICHLOROPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
1,2,4-TRICHLOROBENZENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
NAPHTHALENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4-CHLOROANILINE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
HEXACHLOROBUTADIENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4-CHLORO-3-METHYLPHENOI	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2-METHYLNAPHTHALENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
HEXACHLOROCYCLOPENTADIEI	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2,4,6-TRICHLOROPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2,4,5-TRICHLOROPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2-CHLORONAPHTHALENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2-NITROANILINE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
DIMETHYLPHTHALATE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ACENAPHTHYLENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2,6-DINITROTOLUENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–

B – QUALIFIER USED WHEN THE ANALYTE IS FOUND IN THE ASSOCIATED METHOD BLANK AS WELL AS IN THE SAMPLE. IT INDICATES POSSIBLE / PROBABLE CONTAMINATION.
J – QUALIFIER USED TO INDICATE AN ESTIMATED VALUE. THE CONCENTRATION IS QUANTITATIVELY QUALIFIED AND THE FINAL RESULT REPORTED IS ESTIMATED.
N – QUALIFIER INDICATES THE CONCENTRATION FOUND IN THE SAMPLE IS LESS THAN THREE TIMES THE CONCENTRATION FOUND IN THE ASSOCIATED BLANKS. THE PRESENCE OF THE ANALYTE IS NEGATED DUE TO LABORATORY CONTAMINATION.
R – DATA IS REJECTED DUE TO HOLDING TIME EXCEEDED, BLANK CONTAMINATION, INSTRUMENT CALIBRATION ERROR, OR OTHER MAJOR CONTROLLING LIMITS ARE EXCEEDED.
* – INDICATES QUALIFIER PLACED BY TRC-ECI.
N/A – NOT ANALYZED FOR THIS COMPOUND
'–' – NOT DETECTED TO THE REPORTED DETECTION LIMIT

TABLE 31b
SHIELDALLOY METALLURGICAL CORPORATION
SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED
IN SURFACE WATER SAMPLES
PAGE 2 OF 2

SAMPLE IDENTIFICATION:	SW1-01	SW2-01	SW3-01	SW10-01	SW4-01	SW5-01	SW6-01	SW7-01	SW8-01	SW9-01
BASE NEUTRAL / ACIDS (ppb) (continued)										
3-NITROANILINE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ACENAPHTHENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
1,4-DINITROPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4-NITROPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
DIBENZOFURAN	–	N/A	N/A	N/A	–	N/A	–	–	–	–
2,4-DINITROTOLUENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
DIETHYLPHTHALATE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4-CHLOROPHENYL-PHENYLET	–	N/A	N/A	N/A	–	N/A	–	–	–	–
FLUORENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4-NITROANILINE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4,6-DINITRO-2-METHYLPHEN(	–	N/A	N/A	N/A	–	N/A	–	–	–	–
N-NITROSODIPHENYLAMINE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4-BROMOPHENYL-PHENYLETH	–	N/A	N/A	N/A	–	N/A	–	–	–	–
HEXACHLOROBENZENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
PENTACHLOROPHENOL	–	N/A	N/A	N/A	–	N/A	–	–	–	–
PHENANTHRENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ANTHRACENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
DI-n-BUTYLPHALATE	1 J	N/A	N/A	N/A	1 J	N/A	–	2 J	2 J	1 J
FLUORANTHENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
PYRENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BUTYLBENZYLPHTHALATE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
3,3'-DICHLOROBENZIDINE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BENZO(a)ANTHRACENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
CHRYSENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
bis(2-ETHYLHEXYL)PHTHALATE	–	N/A	N/A	N/A	2 J	N/A	–	–	–	–
DI-n-OCTYL PHTHALATE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BENZO(b)FLUORANTHENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BENZO(k)FLUORANTHENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BENZO(a)PYRENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
INDENO(1,2,3-cd)PYRENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
DIBENZO(A,H)ANTHRACENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BENZO(g,h,i)PERYLENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
TOTAL caPAH	0	N/A	N/A	N/A	0	N/A	0	0	0	0

B – QUALIFIER USED WHEN THE ANALYTE IS FOUND IN THE ASSOCIATED METHOD BLANK AS WELL AS IN THE SAMPLE. IT INDICATES POSSIBLE / PROBABLE CONTAMINATION.
J – QUALIFIER USED TO INDICATE AN ESTIMATED VALUE. THE CONCENTRATION IS QUANTITATIVELY QUALIFIED AND THE FINAL RESULT REPORTED IS ESTIMATED.
N – QUALIFIER INDICATES THE CONCENTRATION FOUND IN THE SAMPLE IS LESS THAN THREE TIMES THE CONCENTRATION FOUND IN THE ASSOCIATED BLANKS. THE PRESENCE OF THE ANALYTE IS NEGATED DUE TO LABORATORY CONTAMINATION.
R – DATA IS REJECTED DUE TO HOLDING TIME EXCEEDED, BLANK CONTAMINATION, INSTRUMENT CALIBRATION ERROR, OR OTHER MAJOR CONTROLLING LIMITS ARE EXCEEDED.
* – INDICATES QUALIFIER PLACED BY TRC-ECI.
N/A – NOT ANALYZED FOR THIS COMPOUND
'–' – NOT DETECTED TO THE REPORTED DETECTION LIMIT

TABLE 31c
SHIELDALLOY METALLURGICAL CORPORATION
SUMMARY OF PESTICIDES/PCB COMPOUNDS DETECTED
IN SURFACE WATER SAMPLES

SAMPLE IDENTIFICATION:	SW1-01	SW2-01	SW3-01	SW10-01	SW4-01	SW5-01	SW6-01	SW7-01	SW8-01	SW9-01
PESTICIDES/PCB'S (ppb)										
ALPHA-BHC	–	N/A	N/A	N/A	–	N/A	–	–	–	–
BETA-BHC	–	N/A	N/A	N/A	–	N/A	–	–	–	–
DELTA-BHC	–	N/A	N/A	N/A	–	N/A	–	–	–	–
GAMMA-BHC(LINDANE)	–	N/A	N/A	N/A	–	N/A	–	–	–	–
HEPTACHLOR	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ALDRIN	–	N/A	N/A	N/A	–	N/A	–	–	–	–
HEPTACHLOR EPOXIDE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ENDOSULFAN I	–	N/A	N/A	N/A	–	N/A	–	–	–	–
DIELDRIN	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4,4-DDE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ENDRIN	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ENDOSULFAN II	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4,4-DDD	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ENDOSULFAN SULFATE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
4,4-DDT	–	N/A	N/A	N/A	–	N/A	–	–	–	–
METHOXYCHLOR	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ENDRIN KETONE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
ALPHA-CHLORDANE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
GAMMA-CHLORDANE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
TOXAPHENE	–	N/A	N/A	N/A	–	N/A	–	–	–	–
AROCLOR-1016	–	N/A	N/A	N/A	–	N/A	–	–	–	–
AROCLOR-1221	–	N/A	N/A	N/A	–	N/A	–	–	–	–
AROCLOR-1232	–	N/A	N/A	N/A	–	N/A	–	–	–	–
AROCLOR-1242	–	N/A	N/A	N/A	–	N/A	–	–	–	–
AROCLOR-1248	–	N/A	N/A	N/A	–	N/A	–	–	–	–
AROCLOR-1254	–	N/A	N/A	N/A	–	N/A	–	–	–	–
AROCLOR-1260	–	N/A	N/A	N/A	–	N/A	–	–	–	–

B – QUALIFIER USED WHEN THE ANALYTE IS FOUND IN THE ASSOCIATED METHOD BLANK AS WELL AS IN THE SAMPLE. IT INDICATES POSSIBLE / PROBABLE CONTAMINATION.
J – QUALIFIER USED TO INDICATE AN ESTIMATED VALUE. THE CONCENTRATION IS QUANTITATIVELY QUALIFIED AND THE FINAL RESULT REPORTED IS ESTIMATED.
N – QUALIFIER INDICATES THE CONCENTRATION FOUND IN THE SAMPLE IS LESS THAN THREE TIMES THE CONCENTRATION FOUND IN THE ASSOCIATED BLANKS. THE PRESENCE OF THE ANALYTE IS NEGATED DUE TO LABORATORY CONTAMINATION.
R – DATA IS REJECTED DUE TO HOLDING TIME EXCEEDED, BLANK CONTAMINATION, INSTRUMENT CALIBRATION ERROR, OR OTHER MAJOR CONTROLLING LIMITS ARE EXCEEDED.
* – INDICATES QUALIFIER PLACED BY TRC-ECI.
N/A – NOT ANALYZED FOR THIS COMPOUND
'–' – NOT DETECTED TO THE REPORTED DETECTION LIMIT

TABLE 31d
SHIELDALLOY METALLURGICAL CORPORATION
SUMMARY OF INORGANIC COMPOUNDS DETECTED IN SURFACE WATER SAMPLES

SAMPLE IDENTIFICATION:	SW1-01	SW2-01	SW3-01	SW10-01	SW4-01	SW5-01	SW6-01	SW7-01	SW8-01	SW9-01
INORGANICS (ppb)										
ALUMINUM	4610	44800	544	442	319	224	3450	48100	12800	9300
ANTIMONY	44.2 B	151	–	–	–	–	–	–	–	–
ARSENIC	2.0 B	34.6	–	–	2.4 B	–	–	116	2.4 B	2.2 B
BARIUM	78.2 B	962	44.4 B	43.6 B	40.8 B	24.5 B	205	400	65.1 B	160 B
BERYLLIUM	1.3 B	25.1	1.0 B	1.0 B	1.0 B	–	–	468	15.4	37.2
CADMIUM	–	9.0	–	–	–	–	–	5.2	–	–
CALCIUM	5480	18100	4040 B	3960 B	4600 B	4940 B	9200	30300	13300	11000
CHROMIUM	43.3	8520	120	106	208	99.0	29.8	313	91.4	283
CHROMIUM VI	–	–	–	–	0.054	–	0.031	0.057	0.028	0.14
COBALT	–	62.2	–	–	–	–	–	13.1 B	–	–
COPPER	8.0 B	432	13.7 B	11.8 B	7.7 B	7.3 B	6.3 B	64.2	16.3 B	23.2 B
CYANIDE, TOTAL (UG/L)	–	11.0J*	–	–	–	–	–	94.4	–	12.3
IRON	4660	71000	1210	1020	933	697	128	13900	14200	6820
LEAD	28.0	–	7.6	9.3	3.8 B	5.5 B	8	1240	1050	170
MAGNESIUM	9250	5670	1700 B	1690 B	2060 B	2400 B	16500	63200	12000	27800
MANGANESE	622	2590	220	219	342	131	10.7 B	1160	223	500
MERCURY	–	21.4	–	–	–	–	–	–	–	–
NICKEL	20.8 B	618	29.6 B	34.5 B	17.7 B	17.1 B	–	415	49.2	242
POTASSIUM	8670	4670 B	1610 B	1890 B	4310 B	4490 B	9300	171000	6890	14400
SELENIUM	–	–	–	–	–	–	–	29 B	–	2.1 B
SILVER	–	–	–	–	–	–	–	–	–	–
SODIUM	25900	20300	24400	23900	107000	65200	64900	90100	23800	80700
THALLIUM	–	–	–	–	–	–	–	–	–	–
VANADIUM	272	5700	310	307	246	286	1410	8650	3380	8350
ZINC	56.4	1070	41.8	32.4	25.4	20.8	58.6	942	108	234
BORON	828	N/A	N/A	N/A	585	N/A	14100	4960	286	320
NIOBIUM	–	N/A	N/A	N/A	–	N/A	–	527	–	–
STRONTIUM	–	N/A	N/A	N/A	–	N/A	221	–	–	–
TITANIUM	–	N/A	N/A	N/A	–	N/A	–	443	193	143
ZIRCONIUM	–	N/A	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A
FLUORIDE	0.87	0.92	1.1	1.1	0.84	0.97	N/A	N/A	N/A	N/A
SULPHATE	68.7	25.8	12.2	11.7	139	80.2	N/A	N/A	N/A	N/A

B – INDICATES THAT THE REPORTED VALUE IS LESS THAN THE CRDL BUT GREATER THAN THE IDL.
J – QUALIFIER USED TO INDICATE AN ESTIMATED VALUE. THE CONCENTRATION IS QUANTITATIVELY QUALIFIED AND THE FINAL RESULT REPORTED IS ESTIMATED.
* – INDICATES QUALIFIER PLACED BY TRC-ECI.
N/A – NOT ANALYZED FOR THIS COMPOUND
'–' – NOT DETECTED TO THE REPORTED DETECTION LIMIT
CRDL – CONTRACT REQUIRED DETECTION LIMITS.
IDL – INSTRUMENT DETECTION LIMITS.

TABLE 1-9
SURFACE WATER SUMMARY TABLE
INORGANICS
SUPPLEMENTAL SAMPLING INVESTIGATION
SHIELDALLOY METALLURGICAL CORPORATION

SAMPLE ID:	SW-8	SW-11	SW-32 Dup of SW-11	SW-21	SW-25	SW-27	SW-30	SW-31
INORGANICS (µg/L)								
Aluminum	979	1,770	227	169	2310	286	163	127
Antimony	27.2 u	27.2 u	27.2 u	27.2 u	27.2 u	27.2 u	27.2 u	27.2 u
Arsenic	3.2	1.8 u	1.8 u	1.8 u	2.8	1.8 u	1.8 u	1.8 u
Barium	34	53.3	21.1	40.4	87.1	119	174	162
Beryllium	0.7 u	0.7 u	0.7 u	1	2.6	1	0.7 u	0.7 u
Cadmium	2.9 u	2.9 u	2.9 u	2.9 u	3.1 u	3.1 u	3.1 u	3.1 u
Calcium	3,650	4,250	4,200	5,189	4660	5220	8960	8330
Chromium	101	47.6	23	19.6	46.8	38.7	2.7 u	2.7 u
Chromium VI (mg/L)	0.02 u	0.02 u	0.02 u	0.02 u	0.02 u	0.02 u	0.02 u	0.02 u
Cobalt	2.9 u	4.9	2.9 u	2.9 u	10.1	7.4	6.3	7.9
Copper	23.2	17.6	13.5	6.2	7.9	6	2.7	3.3
Iron	655	1,710	143	150	3080	374	301	259
Lead	2.9	0.7 u	0.7 u	0.7 u	2.7	3.4	0.9 u	0.9 u
Magnesium	3,210	7,770	3,620	3,860	8670	2620	4440	4160
Manganese	42.3	42.3	28.2	9.4	88	194	180	271
Mercury	0.1 u	0.1 u	0.1 u	0.1 u	0.1 u	0.1 u	0.1 u	0.1 u
Nickel	10.2	12.3	6.8 u	6.8 u	19.2	8.1	6.9 u	10.5
Potassium	18,600	21,000	22,700	15,800	8960	4890	3080	2600
Selenium	4.4	1.2 u	1.2 u	1.2 u	1.7	1.5 u	1.5 u	1.5 u
Silver	2.5 u	2.5 u	2.5 u	2.5 u	2.5 u	2.5 u	2.5 u	2.5 u
Sodium	177,000	196,000	215,000	150,000	44,600	15,000	6390	5970
Vanadium	64.3	33	33.9	257	413	144	3.5 u	3.5 u
Zinc	287	54.1	54.4	47.5	24.6	55.1	77.6	85.9
Thallium	2 u	2 u	2 u	2 u	2 u	2 u	2 u	2 u
Cyanide	5 u	5 u	5 u	5 u	5 u	5 u	5 u	5 u
Hardness (mg/L)	21.6	22.5	22.5	20.6	23.5	29.4	38.3	37.4

µg/L=micrograms per liter
mg/L=milligrams per liter
u=Analyzed, Not Detected

APPENDIX E - REGIONAL HYDROGEOLOGIC INFORMATION

APPENDIX E - REGIONAL HYDROGEOLOGIC INFORMATION

Qualitative Description of the New Jersey Coastal Plain Aquifer System
New Jersey Coastal Plain Aquifer System Sole Source Aquifer Designation
Regional Ground Water Quality: Gloucester and Cumberland Counties, New Jersey; USGS Well MW-24
Regional Ground Water Quality: Gloucester and Cumberland Counties, New Jersey; USGS Well OU02

U.S. Environmental Protection Agency

Region 2 Water

Serving New Jersey, New York, Puerto Rico, US Virgin Islands and 7 Tribal Nations

New Jersey Coastal Plain Aquifer

Support Document

Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Ocean, and Salem Counties New Jersey

May 1988

- I. Introduction
  - A. Statement of Section 1424 (e)
  - B. Receipt of Petition
  - C. Area of Consideration
  - D. Topography
- II. Hydrogeology
  - A. Geologic Framework
  - B. Geologic Setting (Major Aquifers and Confining Units)
  - C. Ground Water Hydrology
    - 1. Recharge
    - 2. Discharge
    - 3. Streamflow Source Zone
  - D. Ground Water Quality
  - E. Designated Areas
  - F. Ground Water Use
- III. Susceptibility to Contamination
- IV. Alternative Sources of Drinking Water
- V. Summary
- VI. Selected References
- VII. Tables
  - Table 1. Characteristics of the New Jersey Coastal Plain Aquifer System
  - Table 2. Total Drinking Water Pumped from the New Jersey Coastal Plain Area
  - Table 3. Major Ground Water Withdrawals from the Coastal Plain Area
  - Table 4. Population within Coastal Plain Aquifer System
- VIII. Figures
  - Figure 1. The Coastal Plain of New Jersey
  - Figure 2. Physiographic Provinces of New Jersey
  - Figure 3. Coastal Plain Aquifer System Designated Area
  - Figure 4. Aquifer Outcrop Areas of the Coastal Plain
  - Figure 5. Generalized Cross Section of the Coastal Plain Aquifers
  - Figure 6. Drainage Basins in the Coastal Plain of New Jersey
  - Figure 7. Delineation of Fall Line

I. Introduction

A. Statement of Section 1424 (e)

The Safe Drinking Water Act (SDWA), Public Law 93-523, of December 16, 1974 contains a provision in Section 1424(e), which states that:

> If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create significant hazard to public health, he shall publish notice of that determination in the Federal Register. After the publication of any such notice, no commitment for Federal financial assistance (through a grant, contract, loan guarantee, or otherwise) may be entered into for any project which the Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health; but a commitment for Federal financial assistance may, if authorized under another provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer.

This section allows for the specific designation of areas which are dependent upon ground water supplies. Following designation, the review process will ensure that federal agencies will not commit funds toward projects which may contaminate these ground water supplies.

B. Receipt of Petition

On December 4, 1978 the Environmental Defense Fund, Inc. and Sierra Club New Jersey Chapter petitioned the U.S. Environmental Protection Agency (EPA) Administrator to determine that the Counties of Monmouth, Burlington, Ocean, Camden, Gloucester, Atlantic, Salem, Cumberland, Cape May and portions of Mercer and Middlesex Counties, New Jersey, constitute an area whose aquifer system is "the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health".

C. Area of Consideration

The area of the New Jersey Coastal Plain Aquifer System includes the area for the Counties of Monmouth, Burlington, Ocean, Camden, Gloucester, Atlantic, Salem, Cumberland, Cape May and portions of Mercer and Middlesex Counties, New Jersey. Pursuant to section 1424(e), Federally assisted projects proposed for construction in the New Jersey Coastal Plain Area and the project review area within portions of its streamflow source zone will be subject to EPA review.

The streamflow source zone for the New Jersey Coastal Plain Aquifer System includes upstream portions of the Delaware River Basin in the States of Delaware (New Castle County), New Jersey (Mercer-part, Hunterdon-part, Sussex-part, and Warren Counties), New York (Delaware, Orange, Sullivan and Ulster Counties), and Pennsylvania (Berks-part, Bucks, Carbon-part, Chester-part, Delaware, Lackawanna-part, Lancaster, Lehigh, Luzerne-part, Monroe, Montgomery, Northampton, Philadelphia, Pike, Schuykill and Wayne Counties).

The project review area includes that portion of the streamflow source zone which lies within two miles of the Delaware River in the States of New Jersey (in Mercer, Hunterdon, Sussex and Warren Counties), Delaware (in New Castle County), Pennsylvania (in Delaware, Philadelphia, Bucks, Monroe, Northampton, Pike and Wayne Counties) and New York (in Delaware, Orange and Sullivan Counties).

D. Topography

The New Jersey Coastal Plain is part of the Atlantic Plain physiographic province. The Coastal Plain physiographic province lies along the Atlantic and Gulf Coasts from Long Island to Mexico and contains one of the most prolific system of aquifers in the country. The area petitioned by the Environmental Defense Fund, Inc. and the Sierra Club New Jersey Chapter is the New Jersey Coastal Plain Aquifer System, which is located between the Delaware River and Bay, the Atlantic Coast, Staten Island and a belt of more rugged, generally higher terrain called the Piedmont province. A Fall Line, extending northeast along the Delaware River and through Mercer and Middlesex counties, separates the Coastal Plain from the Appalachian Highlands. The Fall Line separates areas with major differences in topography, geology, and hydrology.

The New Jersey Coastal Plain Aquifer System, lying southeast of the Fall Line, covers about 4,200 square miles. More than half of the land area is below an altitude of fifty feet (50') above sea level (NGVD). The area is largely surrounded by salty or brackish water and is bounded by the Delaware River on the west, Delaware Bay on the south, the Atlantic Ocean on the east, and Raritan Bay on the north.

The land surface is divided into drainage basins. A drainage basin is an area that contributes runoff to a stream and its tributaries. A drainage divide marks the topographic boundary between adjacent drainage basins. A major stream divide in the Coastal Plain of New Jersey separates streams flowing to the Delaware River and the Atlantic Ocean.

II. Hydrogeology

A. Geologic Framework

The following physiographic and hydrogeologic descriptions are excerpted from the United States Geological Survey (USGS) Report on the New Jersey Coastal Plain Area (Vowinkel and Foster, 1981). The New Jersey Coastal Plain is underlain by a wedge shaped mass of unconsolidated sediments composed of clay, silt, sand and gravel. The wedge thins to a featheredge along the Fall Line and attains a thickness of over six-thousand feet (6,000') at the tip of Cape May County, New Jersey. These sediments range in age from Cretaceous to Holocene and can be classified as continental, coastal or marine deposits. The Cretaceous and Tertiary age sediments generally strike on a northeast-southwest direction and dip gently to the southeast from ten to sixty feet (10 - 60') per mile. The overlying Quaternary deposits, where present, are basically flat lying. The unconsolidated Coastal Plain deposits, are unconformably underlain by a Pre-Cretaceous basement bedrock complex, which consists primarily of Precambrian and early Paleozoic age rocks. Locally, along the Fall Line in Mercer and Middlesex Counties, Triassic age rocks underlie the unconsolidated sediments.

Potomac Raritan Magothy aquifer system is divided into two aquifers. They are the Farrington aquifer and the Old Bridge aquifer. These aquifers are both upper Cretaceous in age and would be stratigraphically equivalent to the Raritan and Magothy formations, respectively.

B. Geologic Setting (Major Aquifers and Confining Units)

The wedge of sediment comprises one interrelated aquifer system that includes several aquifers and confining units. These sediments range in age from Cretaceous to Holocene and can be classified as continental, coastal or marine deposits. In general, aquifers and confining units in the Coastal Plain Aquifer System correspond to the geologic formations presented in Table 1. However, the boundaries of the aquifers and confining beds may not be the same as the geologic formations for the following reasons: (1) the formations may change in physical character from place to place and may act as an aquifer in one area or a confining bed in another; (2) some formations are divided into several aquifers and confining beds; and (3) adjacent formations may form a single aquifer or confining bed.

There are five major aquifers in the New Jersey Coastal Plain Aquifer System. They are the Potomac-Raritan-Magothy aquifer system, Englishtown aquifer, Wenonah-Mount Laurel aquifer, lower "800 foot" sand aquifer of the Kirkwood Formation and the Kirkwood-Cohansey aquifer. The major aquifers and their respective confining units are described in ascending order from the bedrock surface.

Overlying the consolidated rocks of the bedrock is the Potomac-Raritan-Magothy aquifer system. This wedgeshaped mass of sediments of Cretaceous age is composed of alternating layers of clay, silt, sand, and gravel. These deposits range in thickness from a featheredge along the Fall Line to more than 4,100 feet beneath Cape May County. The Potomac-Raritan-Magothy aquifer system is exposed in a narrow outcrop along the Fall Line and the Delaware River. The aquifer is confined except in outcrop areas by the underlying crystalline rocks and the overlying Merchantville-Woodbury confining unit. In the northern part of the Coastal Plain, the Potomac-Raritan-Magothy aquifer system is divided into two aquifers. They are the Farrington aquifer (mainly Raritan age) and the Old Bridge aquifer (Magothy age).

The Merchantville Formation and Woodbury Clay form a major confining unit throughout most of the Coastal Plain of New Jersey. Although their permeability is very low, the Merchantville-Woodbury confining unit can transmit significant quantities of water when sizeable differences in potentiometric head exist between overlying and underlying aquifers.

The Englishtown aquifer overlies the Merchantville and Woodbury confining unit in the central and northern parts of the Coastal Plain. The aquifer is a significant source of water for Ocean and Monmouth Counties. In northern and eastern Ocean County, the Englishtown aquifer can be subdivided into two waterbearing sands. Upper and lower units of quartz sand with thin interbeds of dark sandy silt are separated by a thick sequence of sandy and clayey lignitic silt (Nichols, 1977).

The Marshalltown Formation overlies the Englishtown sand in most of the Coastal Plain but overlies the Woodbury Clay in much of Salem County. The formation has a maximum thickness of thirty feet (30'). Because the Marshalltown Formation is thin and contains some slightly to moderately permeable beds, it acts as a leaky confining bed.

Although the Wenonah Formation and Mount Laurel Sand are distinct lithologic units, they are hydraulically connected and together form the Wenonah-Mount Laurel aquifer. The Mount Laurel Sand, a coarser sandunit than the Wenonah Formation, is the major component of the aquifer. The combined thickness of the Wenonah Formation and Mount Laurel Sand in outcrop is as much as one hundred feet (100'). In the subsurface they range in thickness from forty feet (40') to slightly more than two hundred feet (200') (Nemickas, 1976). The Wenonah-Mount Laurel aquifer is an important water producing aquifer in the northern and western parts of the Coastal Plain.

Overlying the Wenonah-Mount Laurel aquifer is a confining unit that comprises several geologic units. The confining unit consists of the Navesink Formation, Red Bank Sand, Tinton Sand, Hornerstown Sand, Vincentown Formation, Manasquan Formation, Shark River Marl, Piney Point Formation and the basal clay of the

Kirkwood Formation. Some of these geologic units may act as aquifers on a local basis.

The Kirkwood Formation includes several waterbearing units. The major Kirkwood aquifer is the principal artesian aquifer within the Kirkwood Formation, also known as the Atlantic City "800 foot" sand (Barksdale and others, 1936). The Kirkwood "800 foot" sand aquifer extends along the Atlantic Coast from Cape May to Barnegat Light and some distance inland. In Cape May and Cumberland Counties, the upper artesian aquifer of the Kirkwood Formation is defined as the Rio Grande waterbearing zone (Gill, 1962). This aquifer is productive only locally in Cape May County. Along the coast north of Barnegat Light and inland from the coast in Ocean, Burlington, Atlantic, and the western part of Cumberland Counties, the sands of the upper part of the Kirkwood Formation are hydraulically connected to the overlying Cohansey Sand.

The Cohansey Sand is typically a lightcolored quartzose sand with lenses of silt and clay. The Cohansey Sand is exposed throughout most of the outer part of the Coastal Plain and attains a maximum thickness of about two hundred fifty feet (250'). Ground water in the Cohansey aquifer occurs generally under watertable conditions except Cape May County, where the aquifer is confined. Inland from the coast and in the northern part of Ocean County, the upper part of the Kirkwood Formation is in hydraulic connection with the Cohansey Sand and they act as a single aquifer.

C. Ground Water Hydrology

Man has modified the natural equilibrium of the New Jersey Coastal Plain Aquifer System by increasing the rate of outflow from the system to the ocean. One major effect of the increased outflow of water is a regional decline in ground water levels. This decline in potentiometric head (the level to which water will rise under a given pressure with respect to aknown datum) within the aquifers may change the direction of ground water flow and cause induced recharge and/or saltwater encroachment into the system. Significant regional waterlevel declines have occurred in the Potomac-Raritan-Magothy aquifer system, Englishtown aquifer, Wenonah-Mount Laurel aquifer and the "800 foot" sand aquifer of the Kirkwood Formation. Ground water withdrawals from the Potomac-Raritan-Magothy aquifer system have resulted in ground water level declines of 1.5 to 2.5 feet per year from 1966 to 1976 (Luzier, 1980). These declines in head are causing a reversal in the direction of ground water flow near pumping centers. Model studies have indicated that about forty three percent (43%) of the total inflow to the Potomac-Raritan-Magothy aquifer system in 1973 was induced recharge from the Delaware River (Luzier, 1980). Saline water in the Delaware River Estuary threatens water quality in the aquifers along Salem and Gloucester Counties. sustained increases in the rate of withdrawal from the Potomac-Raritan-Magothy and in the consumptive uses of Delaware River water portends continued and increased movement of inferior quality water into the aquifer.

The head reductions in the Potomac-Raritan-Magothy aquifer system have also increased leakage from the overlying Englishtown and Wenonah-Mount Laurel aquifers through the Merchantville Formation Woodbury Clay confining unit. In model simulation, approximately thirty percent (30%) of the recharge to the Potomac-Raritan-Magothy aquifer system in 1973 was due to leakage from overlying aquifers (Luzier, 1980).

Withdrawal of water from the Englishtown aquifer has had a marked effect on the water level in the overlying Wenonah-Mount Laurel aquifer. Decline in head in the Englishtown aquifer from 1959 to 1970 was 8 to 12 ft/yr over a large area. As a consequence of this change in head, increased quantities of water apparently leak from the Wenonah-Mount Laurel aquifer, through the confining layers, and into the

Englishtown aquifer (Nichols, 1977).

Since the recharge from precipitation and induced infiltration is insufficient to replace ground water in heavily pumped areas close to the saltwater-freshwater interface, the interface can advance toward pumping centers.

1. Recharge

The Delaware River and Estuary, Sandy Hook Bay, the Atlantic Coast and the older, harder rocks of the Piedmont province constitute the recharge boundaries of the New Jersey Coastal Plain aquifers. These hydrographicfeatures represent the interfaces across which water either moves into or out of the ground water reservoir. Natural recharge occurs primarily through direct precipitation on the outcrop area of the geologic formations. A smaller component of natural recharge to the deeper layers of the system occurs by vertical leakage from the upper layers. This accounts for a small percentage of the total amount of recharge; however, over a large area and a long period of time the amount of water transmitted can be significant.

Natural recharge to the New Jersey Coastal Plain Area occurs primarily through direct precipitation on the outcrop area of the geologic formations. Based primarily on estimates of ground water contributing to streamflow and basin runoff, several estimates of ground water recharge in the Coastal Plain have been made. In the outcrop areas of the Potomac - Raritan - Magothy aquifer system, where it is unconfined, recharge to the aquifer is about twelve (12) inches per year (in/yr). In the outcrop area of the Farrington aquifer, the recharge to ground water is twelve (12) in/yr. Recharge ranges from twelve to twenty (12 - 20) in/yr in the outcrop of the Old Bridge aquifer.

Another component of natural recharge to deep, confined aquifers is primarily by vertical leakage from the upper layers. Only a small percentage of the water within the unconfined ground water system leaks to the confined aquifers; but over a large area and a long period of time, the amount of water transmitted can be significant (Vowinkel & Foster, 1981).

2. Discharge

The New Jersey Coastal Plain Aquifer discharges to the surface through streams, springs and evapotranspiration. Many streams ultimately flow into bays or directly into the ocean. Development of the ground water reservoir as a water supply source constitutes another discharge component which today accounts for a significant portion of discharge from the overall system. In certain areas (e.g., along the Delaware River) heavy pumping has caused a reversal in the normal discharge from the aquifer (Raritan-Magothy) such that the surface stream (Delaware River) now recharges the aquifer. This phenomenon implies that, in addition to the New Jersey Coastal Plain Area, the Delaware River Basin within Delaware, New Jersey, Pennsylvania and New York must be regarded as a streamflow source zone (an upstream headwaters area which drains into a recharge zone), which flows into the Coastal Plain Area.

3. Streamflow Source Zone

The New Jersey Coastal Plain Aquifer System discharge to the surface through streams, springs and evapotranspiration. Many streams ultimately flow into bays or directly into the ocean. Development of the ground water reservoir as a water supply source constitutes another discharge component which today accounts for a significant portion of discharge from the overall system. In certain areas (e.g. along the Delaware River) heavy pumping has caused a reversal in the normal discharge from the aquifer (Raritan-Magothy) such that the surface stream (Delaware River) now recharges the aquifer. This phenomena implies that, in addition to the New Jersey Coastal Plain Area, a major portion of the Delaware River Basin must be regarded as a streamflow source zone (an upstream headwaters area which drains into a recharge zone), which flows into the designated area.

D. Ground Water Quality

Fresh, uncontaminated ground water in the New Jersey Coastal Plain is low in dissolved solids (generally less than 150 milligrams per liter (mg/l). Calcium and bicarbonate are usually dominant ions in solution with smaller amounts of sodium, potassium, magnesium sulfate and chloride. Locally, concentrations of iron and manganese present a problem near the water table because the ground water tends to have a low pH. These waters are treated to make them palatable. Historically, no significant quantities of heavy metals, pesticides, organics or coliform bacteria have been found in the artesian aquifers. Except for specific parameters (e.g. iron) and contamination incidents, water quality in the artesian ground water system meets or exceeds Federal and State drinking water standards. The quality of ground water in the outcrop area, on the other hand, is variable, being largely determined by local conditions at the land surface.

A large part of the Potomac-Raritan-Magothy aquifer system in the southern Coastal Plain of New Jersey contains salty ground water with chloride concentrations ranging from less than 250 to as high as 27,000 mg/L (Luzier, 1980). The concentrations of chloride increase with depth as well as toward the ocean.

E. Designated Areas

The proposed Sole Source Aquifer designation areas for the New Jersey Coastal Plain Aquifer System are defined within the Counties of Monmouth, Burlington, Ocean, Cumberland and Cape May, and portions of Mercer and Middlesex Counties, New Jersey, and that portion of the streamflow source zonewhich lies within two miles of the Delaware River in the States of New Jersey (in Mercer, Hunterdon, Sussex and Warren Counties), Delaware (in New Castle County), Pennsylvania (in Delaware, Philadelphia, Bucks, Monroe, Northampton, Pike and Wayne Counties) and New York (in Delaware, Orange and Sullivan Counties). Outside the New Jersey Coastal Plain Area and further than two miles from the Delaware River in the streamflow source zone, only those Federally assisted proposed projects requiring the preparation of an Environmental Impact Statement will be reviewed. The two-mile limit for the project review area along the Delaware River is based on the climate and hydrologic setting of the area.

F. Ground Water Use

Ground water use for public supply in the Coastal Plain area, was about 250 million gallons per day (MGD) in 1978. Use of surface water for public supply in this same area amounts to 79 MGD. Of the estimated 400 MGD withdrawn from the Coastal Plain aquifer system in 1978, approximately seventy-five percent (75%) was used for drinking water purposes to serve 2.3 million people.

Estimates for industrial and commercial consumption of ground water range from 75 MGD (USGS, 1978) to 97 MGD (NJ Water Supply Master Plan, WSMP, 1976). Agriculture is also a major consumer of ground water, pumping anywhere from 11 MGD (USGS, 1978) to 50 MGD (NJWSMP, 1976).

No accurate tally of domestic consumption in the Coastal Plain Area is available; however, the New Jersey Water Supply Master Plan estimates that as much as 40 MGD of ground water was pumped to private households.

The PotomacRaritanMagothy aquifer system is the most widely used aquifer in the Coastal Plain, but it is not the primary source of drinking water for every county. The Cohansey and Kirkwood aquifers are the primary sources of ground water in Atlantic, Cape May and Cumberland County. In these counties, the Potomac-Raritan-Magothy aquifer contains saltwater. The Englishtown and Wenonah-Mount Laurel aquifers are productive mainly in the northern and central counties of the Coastal Plain.

III. Susceptibility to Contamination

The New Jersey Coastal Plain Aquifer System is susceptible to contamination across several interfaces. In the outcrop areas, the water table conditions and the highly permeable nature of the soil, with its low attenuation capability, facilitate the movement of contaminants from the land surface into the system. Significant pollution sources include septic tanks, landfills, chemical spills and dumping, chemical storage leaks, industrial waste lagoons, highway deicing and agricultural chemicals. These sources have immediate local impacts as well as long term cumulative impacts as they progress through to the lower system.

EPA has identified roughly 150 hazardous waste disposal sites within the New Jersey Coastal Plain area which have the potential for contaminating the environment.

<u>Municipal Land Disposal</u>

Municipal land disposal sites frequently are discovered to contain other than municipal wastes. One example is Jackson Township, Ocean County. The Township disposal site has been found to be leaching chlorinated industrial solvents and other toxic organic chemicals into the aquifer that serves private drinking water wells of more than 100 homes in a nearby development. A second site is the Price Landfill in Pleasantville, New Jersey. The contamination emanating from this site does threaten the Atlantic City water supply.

<u>Pipelines and Storage Tanks</u>

Pipelines and tanks which carry and store petroleum products and other chemicals are subject to accidental rupture, external corrosion, and structural failure from a wide variety of causes. In the Pinelands, there are fourteen (14) storage tanks which are required to have Federal and/or State permits because of their size. Approximately 13.9 million gallons are stored in these facilities, and additional amounts are transferred through them.

<u>Industrial Waste Lagoons</u>

Industrial waste lagoons are constructed for the primary purpose of providing temporary storage of waste materials. Seven industrial lagoons have been identified in the Pinelands, and three have been linked to contaminated wells (New Jersey Pinelands Comprehensive Management Plan, 1980).

Hazardous Waste Sites

The lower Delaware along the TriCounty and Salem County area is highly industrialized, densely populated and contains a concentration of hazardous waste sites as well as an assortment of treatment, storage and disposal facilities. The potential for pointsource contamination of ground andsurface water quality is therefore greater in this area.

Fertilizer

In the Pinelands, there is increasing evidence to support an association between fertilizer use and nitrate in ground water. For example, high ground water nitrate levels possibly stemming from agricultural fertilization has been noted in Winslow Township. (New Jersey Pinelands Comprehensive Management Plan)

Hydraulic Gradient Variability Across Confining Units

Contamination across the confining units is another mechanism through which the Coastal Plain aquifer system is susceptible to contamination. Significant hydraulic gradients and variabilities in the integrity of these units has facilitated the migration of pollutants from one formation into another in South Brunswick (Geraghty and Miller, 1979)

Salt Water Encroachment

The Coastal Plain aquifers are also susceptible to contamination by saltwater encroachment. A large part of the Potomac-Raritan-Magothy aquifer system in the southern Coastal Plain of New Jersey contains saline ground water. m e concentrations of chloride increase with depth as well as distance toward the ocean. According to Luzier (1980), head reductions caused by withdrawal of ground water near the saltwater interface are more than sufficient to cause the slow migration of the saltwater toward pumping centers.

Lateral Salt Water Intrusion

Lateral saltwater intrusion is occurring in a part of the Old Bridge aquifer in the vicinity of Keyport and Union Beach Boroughs in Monmouth County, NJ. The reduction in water levels has caused a reversal in the direction of ground water flow in the Old Bridge aquifer. Prior to development, water in the aquifer flowed into Raritan Bay; however, saltwater is now flowing inland from the submerged (exposed) outcrop of the aquifer beneath Raritan Bay. As previously discussed, saltwater contamination is a threat to the Potomac-Raritan-Magothy Aquifer along the Delaware River.

In summary, problems in the New Jersey Coastal Plain Aquifer System revolve around rapid migration of contaminants as a result of the predominantly permeable hydrogeology. This poses an immediate threat to existing water supplies, as in the case of the Price Landfill, or may result in a more chronic contamination of the large interrelated aquifers.

IV. Alternative Sources of Drinking Water

The New Jersey Coastal Plain Aquifer System area is heavily dependent upon the ground water system for its drinking water supply. The many streams throughout the area might be considered alternative supplies; however, the streams are not as readily accessible to everyone as is ground water. Since the ground water has historically been the primary source of supply, considerable cost would be associated with tapping, treating and distributing this surface resource as an alternative supply. Most importantly, the close interrelationship between the ground water system and quality and baseflow of the streams precludes stream resource as a viable longterm alternative in the event of ground water contamination. The Delaware River may be considered an alternative source of supply for portions of the area; however, existing competitive uses severely limit the availability of additional water for drinking purposes.

In the event of contamination, it is possible to relocate drinking water wells to different depths and, in some portions of the Coastal Plain, to different formations. Deeper wells inevitably incur higher costs for drilling, piping and pumping. As evidenced in the discussions on ground water movement and susceptibility to contamination, the practical lifetime of this alternative can be limited and very costly.

Desalinization is also an alternative source of drinking water for the Coastal and Bay areas; however, conversion of saltwater requires considerable energy and the economic constraints make desalinization an impractical alternative.

Since the ground water resources of the New Jersey Coastal Plain Aquifer System are vast in magnitude and distribution, no alternative sources of water supply are considered viable.

V. Summary

Based upon the information presented, the New Jersey Coastal Plain Aquifer System, as defined in this document, meet the technical requirements for Sole Source Aquifer designation. More than fifty percent (50%) of the drinking water for the aquifer service areas is supplied by the aquifer system. In addition, there are no economically feasible alternative drinking water sources which could replace the aquifer systems. Therefore, it is recommended that the New Jersey Coastal Plain Aquifer System be designated a Sole Source Aquifer. This will provide an additional review of ground water protection measures, incorporating state and local measures whenever possible, for only those projects which request Federal financial assistance.

The Coastal Plain Aquifer System of New Jersey is an interrelated hydrologic system which responds to natural and manmade stresses. The wedge of unconsolidated sediments underlying the Coastal Plain Aquifer System of New Jersey is comprised of a series of hydrologic units that have varying thickness, lateral extent, and waterbearing characteristics. Some of the units act as aquifers, while others act as confining beds. Previous to development by wells, the groundwater system is in a state of dynamic equilibrium.

Withdrawal of ground water by wells is a stress superimposed on a previously balanced groundwater system. The response of an aquifer to pumping stresses may result in an increase in recharge to the aquifer, a decrease in the natural discharge, a loss of storage within the aquifer, or a combination of these effects. Also, the response of an aquifer to stress may extend beyond the limits of the aquifer being evaluated.

The following findings, which are the basis for the determination:

(1.) The New Jersey Coastal Plain Area depends upon the under-lying Coastal Plain Aquifer System for seventy-five percent (75%) or more of its drinking water to serve 3 million people.

(2.) Data show that the formations of the New Jersey Coastal Plain Area are hydrologically inter-connected such that they respond collectively as an interrelated aquifer system.

(3.) If the aquifer were to become contaminated, exposure of the persons served by the system would constitute a significant hazard to public health.

(4.) Alternative supplies capable of providing fifty (50) percent or more of the drinking water to the designated area are not available at similar economic costs.

VI. Selected References

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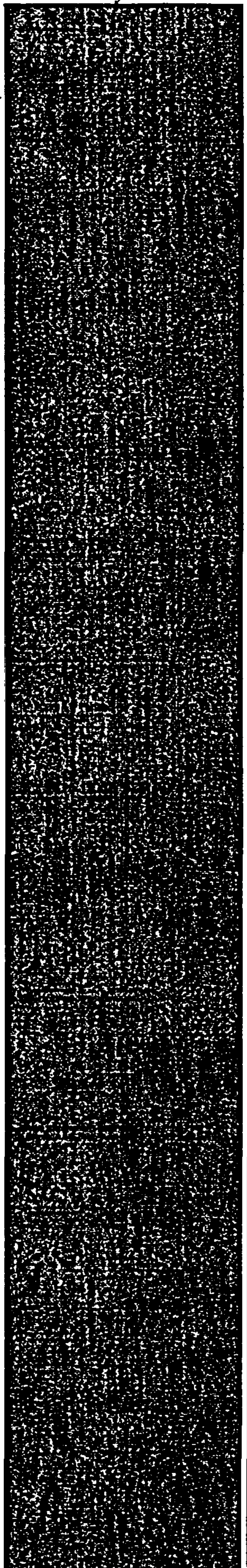
VII. Tables

Table 1. Characteristics of the New Jersey Coastal Plain Aquifer System

System	Formation	Thickness	Lithology
Quaternary	Alluvial & Cape May Formation	80'	Sand, silt, black mud
	Pennsauken &		Sand, quartz, light-colored



Tertiary	Bridgeton Formation	200'	clayey, pebbly, glauconite
	Beacon Hill Formation	40'	Gravel, quartz, light-colored sandy
	Cohansey Sand	250'	Sand, quartz, light-colored, medium to coarse-grained, pebbly; local clay beds
	Kirkwood Formation	780'	Sand, quartz, gray to tan, very fine- to medium-grained, micaceous
	Piney Point Formation	220'	Sand, quartz and glauconite, fine- to coarse-grained
	Shark River Marl	140' ?	Sand, quartz and glauconite, gray, brown, and green, fine- to coarse-grained, clayey and green silty and sandy clay
	Manasquan Formation	180'	Sand, quartz and glauconite, gray, brown, and green, fine- to coarse-grained, clayey and green silty and sandy clay
	Vincentown Formation	100'	Sand, quartz, gray and green, fine- to coarse-grained, glauconitic, and brown clayey, very fossiliferous, glauconite and quartz calcarenite
	Hornerstown Sand	35'	Sand, glauconite, green, medium- to coarse-grained, clayey
Cretaceous	Tinton Sand	25'	Sand, quartz, and glauconite, brown and gray, fine- to coarse grained, clayey, micaceous
	Red Band Sand	150'	Sand, quartz, and glauconite, brown and gray, fine- to coarse grained, clayey, micaceous
	Navesink Formation	50'	Sand, glauconite, and quartz, green, black and brown, medium- to coarse grained, clayey
	Mount Laurel Sand / Wenonah Formation	220'	Sand, quartz, brown and gray, fine- to coarse-grained, glauconitic
	Marshalltown Formation	30'	Sand, quartz, and glauconite, gray and black, very fine- to medium-grained, very clayey
	Englishtown Formation	220'	Sand, quartz, tan and gray, fine- to medium-grained; local clay beds
	Woodbury Clay / Merchantville Formation	325'	Clay, gray and black, micaceous, glauconitic, silty
	Magothy - Raritan - Potomac Formations	4100'	Sand, quartz, light-gray, fine- to coarse-grained, pebbly, arkosic, dark-gray lignitic clay/red, white and varigated clay/alternating clay, silt, sand and gravel

Pre-Cretaceous	Pre-Cretaceous Unconsolidated rocks and Wissahickon Formation	?	Precambrian and lower Paleozoic crystalline rocks, metamorphic schist and gneiss; locally Triassic basalt, sandstone, and shale

Table 2. Total Drinking Water Pumped from the New Jersey Coastal Plain Area

	(Million Gallons per day)			
County	USGS (a)	208 Plan (b)	NJWSMP ©	Est. Private Use ©
Atlantic	20.1	28.5	17.7	4.4
Burlington	30.5	25.5	32.4	4:7
Camden	67.5	66.7	70.3	2.4
Cape May	10.9	9.0	11.3	2.5
Cumberland	14.2	13.5	13.5	4.2
Gloucester	16.6	15.0	16.0	4.0
Mercer	7.2	6.5	4.5	1.5
Middlesex	24.7	25.8	24.1	1.5
Monmouth	26.0	28.6	28.6	4.2
Ocean	29.6	28.5	29.5	3.1
Salem	2.8	3.0	3.0	2.2
TOTAL	**251.0**	**251.0**	**251.0**	**39.6**

Sources of information:
(a) USGS Report on the NJ Coastal Plain Area; Database: 1978.
(b) Respective Water Quality Management Plans; database: 1970-75.
© New Jersey Water Supply Master Plan; database: 1976.

Table 3. Major Ground Water Withdrawals from the Coastal Plain Area

	(Million Gallons per day)					
County	PRM	E	W-M	K	K-C	Other
Atlantic	---	---	---	9.12	16.75	0.30
Burlington	38.96	0.49	1.14	---	0.36	---
Camden	69.57	0.76	0.88	---	0.04	0.98
Cape May	---	---	---	5.36	0.38	0.56
Cumberland	---	---	---	0.80	20.12	0.45
Gloucester	25.19	---	0.02	---	1.76	---
Mercer	8.12	---	---	---	---	---
Middlesex	49.38	---	---	---	---	---
Monmouth	21.60	6.25	1.31	---	1.14	0.31
Ocean	11.53	4.59	0.03	4.22	12.50	4.84

Salem	6.10	---	1.32	---	1.86	0.82
TOTAL	230.45	12.09	4.70	19.50	60.92	8.26

PRM = Potomac-Raritan-Magothy
W = Englishtown
WM = Wenonah-Mount Laurel
K = Kirkwood
KC = Kirkwood-Cohansey
Source: Vonwinkle and Foster, 1981.

Table 4. Population within Coastal Plain Aquifer System

County	1985	2000	Change
Atlantic	226,800	277,400	50,600
Burlington	372,900	471,900	99,000
Camden	482,600	555,900	73,300
Cape May	85,500	91,600	6,100
Cumberland	135,100	142,600	7,500
Gloucester	206,300	269,100	62,800
Mercer	100,330	111,602	11,272
Middlesex	256,440	302,840	46,400
Monmouth	515,700	588,200	72,500
Ocean	370,100	447,300	77,200
Salem	66,500	6,100	2,600
TOTAL	2,818,270	3,327,542	509,272

VIII. Figures

Coastal Plain Figures

For information on this page, contact: Rinaldo.Lawrence@epamail.epa.gov

Biosolids
Dredging
Drinking Water
Estuaries
Great Lakes
Groundwater
Infrastructure
Lakes, Rivers, Streams
Non-point Pollution
Oceans
Permits & Compliance
Stormwater
Waste Water
Water Quality
Watershed Protection
Wetlands

New Jersey Coastal Plain Aquifer

Federal Register Notice

Volume 53, No. 122, Page 23791
Friday, June 24, 1988
Sole Source Aquifer Determination for the New Jersey Coastal Plain Aquifer System

- AGENCY
- ACTION
- SUMMARY
- DATES
- SUPPLEMENTARY INFORMATION
  - I. Background
  - II. Basis for the Determination
  - III. Description of the New Jersey Coastal Plain Area Aquifer Systems, Its Recharge Zone and Its Streamflow Source Zone
  - IV. Information Utilized in Determination
  - V. Project Review
  - VI. Summary and Discussion of Public Comments

AGENCY

Environmental Protection Agency

ACTION

Notice.

SUMMARY

Notice is hereby given that, pursuant to section 1424(e) of the Safe Drinking Water Act, the Administrator of the U.S. Environmental Protection Agency (EPA) has determined that the New Jersey Coastal Plain Aquifer System, underlying the New Jersey Coastal Plain Area, is the sole or principal source of drinking water for the Counties of Monmouth, Burlington, Ocean, Camden, Gloucester, Atlantic, Salem, Cumberland, Cap May and portions of Mercer and Middlesex Counties, New Jersey, and that the aquifer, if contaminated, would create a significant hazard to public health.

As a result of this action EPA will review Federally assisted projects (projects which receive Federal financial assistance through a grant, contract, loan guarantee, or otherwise) proposed for constructed in a project review area which includes the New Jersey Coastal Plain Area and a portion of the aquifer streamflow source zone.

The streamflow source zone includes upstream portions of the Delaware River Basin in the States of Delaware, New Jersey, New York and Pennsylvania. Federally assisted projects will be reviewed to ensure that they are designed and constructed so that they do not

create a significant hazard to public health. Projects outside of the project review area but within the streamflow source zone will be reviewed if they require an Environmental Impact Statement (EIS).

DATES

This determination shall be promulgated for purposes of judicial review at 1:00 P.M., Eastern Time on July 7, 1988. This determination shall become effective on August 8, 1988.

ADDRESS: The data on which these findings are based, detailed maps of the New Jersey Coastal Plain Area and the project review area, a compilation of public comments and the Agency's response to those comments, are available to the public and may be inspected during normal business hours at the U.S. Environmental Protection Agency, Water Management Division, 26 Federal Plaza, New York, New York 10278. In addition, copies of a map showing the designated area and a responsiveness summary to public comment are available upon request.

FOR FURTHER INFORMATION CONTACT: John S. Malleck, Chief, Office of Ground Water Management, U.S. Environmental Protection Agency, 26 Federal Plaza, New York, NY 10278, (212) 264-5635.

SUPPLEMENTARY INFORMATION

Notice is hereby given that pursuant to section 1424(e) of the Safe Drinking Water Act (42 U.S.C., 300f, 300h-3(e), Pub. L. 93-523), the Administrator of the U.S. Environmental Protection Agency (EPA) has determined that the New Jersey Coastal Plain Aquifer System, underlying the New Jersey Coastal Plain Area, is the sole or principal source of drinking water for the Counties of Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Monmouth, Ocean, Salem, and portions of Mercer and Middlesex Counties, New Jersey.

Pursuant to section 1424(e), Federally assisted projects proposed for construction in the New Jersey Coastal Plain Area and the project review area within portions of its streamflow source zone will be subject to EPA review.

The streamflow source zone for the New Jersey Coastal Plain Aquifer System includes upstream portions of the Delaware River Basin in the States of Delaware (New Castle County), New Jersey (Mercer-part, Hunterdon-part, Sussex-part, and Warren Counties), New York (Delaware, Orange, Sullivan and Ulster Counties), and Pennsylvania (Berks-part, Bucks, Carbon-part, Chester-part, Delaware, Lackawanna-part, Lancaster, Lehigh, Luzerne-part, Monroe, Montgomery, Northampton, Philadelphia, Pike, Schuykill and Wayne Counties).

The project review area includes that portion of the streamflow source zone which lies within two miles of the Delaware River in the States of New Jersey (in Mercer, Hunterdon, Sussex and Warren Counties), Delaware (in New Castle County), Pennsylvania (in Delaware, Philadelphia, Bucks, Monroe, Northampton, Pike and Wayne Counties) and New York (in Delaware, Orange and Sullivan Counties).

I. Background

Section 1424(e) of the Safe Drinking Water Act states: (e) If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health, he shall publish a notice of the determination in the Federal Register. After the publication of any such notice, no commitment for Federal financial assistance (through a grant, contract, loan guarantee, or otherwise) may be entered into for any project which the Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health, but a commitment for Federal financial as-sistance may, if authorized under another provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer.

On December 4, 1978 the Environmental Defense Fund, Inc., and Sierra Club New Jersey Chapter petitioned the EPA Administrator to determine that the Counties of Monmouth, Burlington, Ocean, Camden, Gloucester, Atlantic, Salem, Cumberland, Cap May and portions of Mercer and Middlesex Counties, New Jersey, constitute an area whose aquifer system is "the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health." On March 21, 1979, EPA published the petition in the Federal Register. Public hearings on the petition request were heal May 1, 15 and 17, 1979 in Lindenwold, Trenton, Freehold and Pomona, New Jersey. A May 19, 1983 Federal Register notice announced the availability of additional technical information and the extension of public comment period to July 15, 1983.

II. Basis for the Determination

Among the factors to be considered by the Administrator in con-nection with the de-signating an area under section 1424(e) are:

(1) Whether the aquifer is the area's sole or principal source of drinking water and (2) whether contamination of the aquifer would create a significant hazard to public health.

On the basis of information available to this Agency, the Administrator has made the following findings, which are the basis for the determination noted above:

(1.) The New Jersey Coastal Plain Area depends upon the under-lying Coastal Plain Aquifer System for seventy-five (75) percent or more of its drinking water to serve 3 million people.

(2.) Data show that the formations of the New Jersey Coastal Plain Area are hydrologically inter-connected such that they respond collectively as an interrelated aquifer system.

(3.) If the aquifer were to become contaminated, exposure of the persons served by the system would constitute a significant hazard to public health.

(4.) Alternative supplies capable of providing fifty (50) percent or more of the drinking water to the designated area are not available at similar economic costs.

The New Jersey Coastal Plain Aquifer System is highly susceptible to contamination through its recharge zone from a number of sources, including but not limited to, chemical spills, leachate from landfills, stormwater runoff, highway deicing, faulty septic systems, wastewater treatment systems and waste disposal lagoons. The aquifer is also susceptible to contamination to a lesser degree fro the same sources through its streamflow source zone. Since ground water contamination can be difficult or impossible to reverse completely and since the aquifer in this area is solely or principally relied upon for drinking water purposes by the population of the New Jersey Coastal Plain Area, contamination of the aquifer could pose a significant hazard to public health.

III. Description of the New Jersey Coastal Plain Area Aquifer Systems, its Recharge Zone and its Streamflow Source Zone

The New Jersey Coastal Plain Aquifer System consists of a wedge-shaped mass of unconsolidated sediments composed of clay, silt, sand and gravel. The wedge thins to a feathered edge along the Fall Line and attains a thickness of 6,000 feet at the tip of Cape May County, New Jersey.

These sediments range in age from Cretaceous to Holocene and can be classified as continental, coastal or marine deposits. There are five major aquifers within the Coastal Plain Aquifer System. They are the Potomac-Raritan-Magothy Aquifer System, Englishtown

Aquifer, Wenonah-Mount Laurel Aquifer, Kirkwood Aquifer and the Cohansey Aquifer. Natural recharge to the New Jersey Coastal Plain Aquifer System occurs primarily through direct precipitation on the outcrop area of the geologic formations. A smaller component of natural recharge to the deeper layers of the system occurs by vertical leakage from the upper layers. This accounts for a small percentage of the total amount of recharge; however, over a large area and a long period of time the amount of water transmitted can be significant.

The New Jersey Coastal Plain Aquifer discharges to the surface through streams, springs and evapotranspiration. Many streams ultimately flow into bays or directly into the ocean. Development of the ground water reservoir as a water supply source constitutes another discharge component which today accounts for a significant portion of discharge from the overall system. In certain areas (e.g., along the Delaware River) heavy pumping has caused a reversal in the normal discharge from the aquifer (Raritan-Magothy) such that the surface stream (Delaware River) now recharges the aquifer. This phenomenon implies that, in addition to the New Jersey Coastal Plain Area, the Delaware River Basin within Delaware, New Jersey, Pennsylvania and New York must be regarded as a streamflow source zone (an upstream headwaters area which drains into a recharge zone), which flows into the Coastal Plain Area.

IV. Information Utilized in Determination

The information utilized in this determination includes the petition, written and verbal comments submitted by the public, and various technical publications. The above data are available to the public and may be inspected during normal business hours at the U.S. Environmental Protection Agency, Region II, Water Management Division, 26 Federal Plaza, New York, New York 10278.

V. Project Review

When the EPA Administrator publishes his determination for a sole or principal drinking water source, no commitment for Federal financial assistance may be committed if the Administrator finds that the Federally assisted project may contaminate the aquifer through a recharge zone so as to create a significant hazard to public health...Safe Drinking Water Act section 1424(e), 42 U.S.C. 300h-3(e). In many cases, these Federally assisted projects would also be analyzed in an "Environmental Impact Statement" (EIS) under the National Environ-mental Policy Act (NEPA), 42 U.S.C. 4332(2)(C). All EIS's, as well as any other proposed Federal actions affecting an EPA program or responsibility, are required by Federal law (under the so-called "NEPA/309" process) to be reviewed and commented upon by the EPA Administrator. Therefore, in order to streamline EPA's review of the possible environmental impacts on designated aquifers, when an action is analyzed in an EIS, the two reviews will be consolidated and both authorities cited. The EPA review (under the Safe Drinking Water Act) of Federally assisted projects potentially affecting sole or principal source aquifers, will be included in the EPA review (under the "NEPA/309" process) of any EIS accompanying the same Federally assisted project. The letter transmitting EPA's comments on the final EIS to the lead agency will be the vehicle for informing the lead agency of EPA's actions under Section 1424(e).

All Federally assisted proposed projects will be reviewed, within the New Jersey Coastal Plain Area (Counties of Monmouth, Burlington, Ocean, Cumberland and Cape May, and portions of Mercer and Middlesex Counties, New Jersey (as delineated on maps included in the petition), and that portion of the streamflow source zone which lies within two miles of the Delaware River in the States of New Jersey (in Mercer, Hunterdon, Sussex and Warren Counties), Delaware (in New Castle County), Pennsylvania (in Delaware, Philadelphia, Bucks, Monroe, Northampton, Pike and Wayne Counties) and New York (in Delaware, Orange and Sullivan Counties) (asdelineated on maps included in the public record).

Outside the New Jersey Coastal Plain Area and further than two miles from the Delaware River in the streamflow source zone, only those Federally assisted proposed projects requiring the preparation of an EIS will be reviewed. The Agency has chosen a two-mile limit for the project review area along the Delaware River based on the climate and hydrologic setting of the area. The two-mile distance is consistent with the two-mile review radius included in the EPA guidelines for Ground Water Classification and is protective of human health.

VI. Summary and Discussion of Public Comments

There has been much controversy over the possible designation of this aquifer system. The majority of the public comments from the original 1979 public hearings were in direct opposition to such a designation. More than half of all responses received were against designation. Several commenters felt constrained by the original comment period and thereby requested an extension. EPA complied with this request on two occasions, once by announcing at the four public hearings it held throughout the area under consideration that the agency had extended the formal comment period from May 14, 1979, to December 31, 1979, and again in a May 19, 1983 Federal Register Notice that announced the availability of additional information and extension of the public comment period to July 15, 1983. Although a number of ground water protection measures are available at the Federal, State and local level, none of these, either individually or collectively, permit EPA to act as directly as would a sole source aquifer designation in the review and approval of Federally assisted projects. In addition, EPA feels that the sole source project review process will foster integration rather than duplication of environmental review efforts. Memoranda of Understanding have been negotiated with various Federal agencies with the purpose of streamlining the review process and minimizing project delays. Most of the commenters expressed concern that a designation would be a duplication of efforts already existing on the state and local levels. Some commenters felt that a sole source aquifer designation would give EPA the power to reject any applications for Federally funded projects indiscriminately and to delay any project underway. Another main concern of many commenters was that a designation would cause a strong negative impact on the area in question and curtail needed development, thus eliminating jobs. EPA is sympathetic to the concerns of the commenters; however, the Agency feels that a sole source aquifer designation would not interfere with economic development. Federal financial assistance will be withheld only in those instances where it is determined that a proposed project may contaminate the aquifer so as to create a significant hazard to public health and no acceptable remedial measures are available to prevent the potential hazard.

Dated: June 16, 1988.
Lee M. Thomas, Administrator

[FR Doc. 8814293 Filed 6/23/88; 8:45 am]
BILLING CODE 656050M

For information on this page, contact: Rinaldo.Lawrence@epamail.epa.gov

Regional Ground Water Quality: Gloucester and Cumberland Counties, New Jersey
(Source: USGS Water Quality Database)

USGS Well MW-24 Station Number 394014075060011 Camden NJ Gloucester County		
Parameter	Units	Concentration
		8/22/2000
Temperature	deg C	16
Barometric pressure	mm Hg	765
Specific conductance	ms/cm	245
Dissolved oxygen mg/L	mg/L	10.5
pH		4.5
Ammonia (filtered)	mg/L	0.02
Nitrite (filtered)	mg/L	0.01
Ammonia	mg/L	0.09
Nitrite	mg/L	10.9
Orthophosphate	mg/L	0.01
Organic carbon	mg/L	3.2
Calcium	mg/L	20.1
Magnesium	mg/L	6.56
Sodium	mg/L	1.85
Potassium	mg/L	3.01
Chloride	mg/L	16.2
Sulfate	mg/L	29.1
Fluoride	mg/L	0.1
Silica	mg/L	8.2
Arsenic	mg/L	0.9
Barium	mg/L	331
Boron	mg/L	12
Cadmium	mg/L	1
Chromium	mg/L	0.8
Copper	mg/L	1.2
Iron	mg/L	7
Lead	mg/L	1.73
Manganese	mg/L	93.5
Silver	mg/L	1
Zinc	mg/L	1
Aluminum	mg/L	383
Selenium	mg/L	2.5
Gross beta radioactivity	pci/L	4
Propachlor	ug/L	0.007
Butylate	ug/L	0.002
Simazine	ug/L	0.005
Prometon	ug/L	0.02
2-Chloro-4-isopropylamino-6-amino-s-triazine	ug/L	0.093
Cyanazine	ug/L	0.004
Fonofos	ug/L	0.003
Alpha radioactivity	ug/L	6.2
Bromodichloromethane	ug/L	0.1
Tetrachloromethane	ug/L	0.2
1,2-Dichloroethane	ug/L	0.2

Regional Ground Water Quality: Gloucester and Cumberland Counties, New Jersey
(Source: USGS Water Quality Database)

USGS Well MW-24 Station Number 394014075060001 Camden NJ Gloucester County		
Parameter	Units	Concentration 8/22/2000
Tribromomethane	ug/L	0.2
Dibromochloromethane	ug/L	0.2
Trichloromethane	ug/L	0.1
Toluene	ug/L	0.1
Benzene	ug/L	0.1
alpha-HCH	ug/L	0.002
Chlorobenzene	ug/L	0.1
Ethylbenzene	ug/L	0.1
Dichloromethane	ug/L	0.2
Tetrachloroethene	ug/L	0.1
Trichlorofluoromethane	ug/L	0.2
1,1-Dichloroethane	ug/L	0.1
1,1-Dichloroethene	ug/L	0.1
1,1,1-Trichloroethane	ug/L	0.1
1,2-Dichlorobenzene	ug/L	0.1
1,2-Dichloropropane	ug/L	0.1
trans-1,2-Dichloroethene	ug/L	0.1
1,3-Dichlorobenzene	ug/L	0.1
1,4-Dichlorobenzene	ug/L	0.1
p,p'-DDE	ug/L	0.006
Dichlorodifluoromethane	ug/L	0.2
Chlorpyrifos	ug/L	0.004
Vinyl chloride	ug/L	0.2
Trichloroethene	ug/L	0.1
Lindane	ug/L	0.004
Dieldrin	ug/L	0.013
Metolachlor	ug/L	0.002
Malathion	ug/L	0.005
Parathion	ug/L	0.004
Diazinon	ug/L	0.002
Atrazine	ug/L	0.177
Alachlor	ug/L	0.013
Acetochlor	ug/L	0.002
tert-Butyl ethyl ether	ug/L	0.1
Methyl tert-pentyl ether	ug/L	0.2
Turbidity	ug/L	4.2
Mercury	ug/L	0.2
Alpha radioactivity 2-sigma	ug/L	3.2
Beta radioactivity 2-sigma	ug/L	4.1
cis-1,2-Dichloroethene	ug/L	0.1
Styrene	ug/L	0.1
o-Xylene	ug/L	0.1
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	0.1
Methyl tert-butyl ether	ug/L	0.2

Regional Ground Water Quality: Gloucester and Cumberland Counties, New Jersey
(Source: USGS Water Quality Database)

USGS Well MW-24 Station Number 394014075060001 Camden NJ Gloucester County		
Parameter	Units	Concentration 8/22/2000
Diethyl ether	ug/L	0.2
Diisopropyl ether	ug/L	0.2
Sampling method	ug/L	4040
Metribuzin	ug/L	0.004
2,6-Diethylaniline	ug/L	0.003
Trifluralin	ug/L	0.002
Ethalfluralin	ug/L	0.004
Phorate	ug/L	0.002
Terbacil	ug/L	0.007
Linuron	ug/L	0.002
Methyl parathion	ug/L	0.006
EPTC	ug/L	0.002
Pebulate	ug/L	0.004
Tebuthiuron	ug/L	0.01
Molinate	ug/L	0.004
Ethoprop	ug/L	0.003
Benfluralin	ug/L	0.002
Carbofuran	ug/L	0.003
Terbufos	ug/L	0.01
Propyzamide	ug/L	0.003
Disulfoton	ug/L	0.02
Triallate	ug/L	0.001
Propanil	ug/L	0.004
Carbaryl	ug/L	0.003
Thiobencarb	ug/L	0.002
DCPA	ug/L	0.002
Pendimethalin	ug/L	0.004
Napropamide	ug/L	0.003
Propargite	ug/L	0.01
Azinphos-methyl	ug/L	0.001
cis-Permethrin	ug/L	0.005
m-Xylene plus p-xylene	ug/L	0.2
Specific conductance	ug/L	227
Acid neutralizing capacity	ug/L	1
Diazinon-d10	ug/L	104
alpha-HCH-d6	ug/L	85.5
1,2-Dichloroethane-d4, surrogate	ug/L	106
Toluene-d8, surrogate	ug/L	103
1-Bromo-4-fluorobenzene	ug/L	87.8

Regional Ground Water Quality: Gloucester and Cumberland Counties, New Jersey
(Source: USGS Water Quality Database)

USGS Well OU02 Station Number 392920075011901 Vineland, NJ Cumberland County									
Parameter	Units	Concentration							
		9/24/1996	9/24/1996	9/24/1996	9/24/1996	12/18/1996	12/18/1996	12/18/1996	9/13/1999
Temperature	dec C						15.8	15.9	20
Barometric Pressure	mm Hg						756		763
Specific conductance	ms/cm						232	236	250
Dissolved Oxygen	mg/L						6.3	5.7	6
pH							4.4	4.5	4.4
Bicarbonate	mg/L						0		
Ammonia	mg/L						≤.01	≤.01	≤.02
Nitrite	mg/L						≤.010	0.01	≤.010
Ammonia	mg/L						0.04	≤.20	0.1
Nitrite	mg/L						4.3	4.3	2.77
Phosphorus	mg/L						≤.01		
Orthophosphorus	mg/L						≤.01	≤.01	≤.01
Organic Carbon	mg/L						0.9	0.9	0.9
Calcium	mg/L						8.5	8.6	10.1
Magnesium	mg/L						3.4	3.6	4.21
Sodium	mg/L						25	23	23.5
Potassium	mg/L						3	2.9	3.89
Chloride	mg/L						26		43.2
Sulfate	mg/L						38		27
Fluoride	mg/L						≤.1		≤.1
Silica	mg/L						4.9	5	6
Arsenic	ug/L							≤1	≤1
Barium,	ug/L							82	116
Beryllium	ug/L							≤1.00	
Boron	ug/L							44	
Cadmium	ug/L							≤1.00	≤1.0
Chromium	ug/L							2	≤1.0
Cobalt	ug/L							4	
Copper	ug/L							≤1.0	1.5
Iron	ug/L						23	4	≤10
Lead	ug/L							≤1.00	≤1
Manganese	ug/L						30	30	36.8
Molybdenum	ug/L							≤1.0	
Nickel	ug/L							3	
Silver	ug/L							≤1.0	≤1.0
Strontium	ug/L							23	
Zinc	ug/L							6	23
Antimony	ug/L							≤1.00	
Aluminum	ug/L							315	470
Selenium	ug/L								1
Gross beta	pCi/L								25.6
Propachlor	ug/L						≤.007		≤.007
Butylate	ug/L						≤.002		≤.002
Bromacil	ug/L						≤.04		
Simazine	ug/L						Est.≤.004		≤.005
Prometon	ug/L						≤.02		≤.02
CIAT	ug/L						≤.002		≤.002
Cyanazine	ug/L						≤.004		≤.004
Fonofos	ug/L						≤.003		≤.003
Gross Alpha	pCi/L								35.4
Ra-226,	pCi/L							0.42	
Uranium	ug/L							≤1.00	
Dibromomethane	ug/L					≤.10			
Bromodichloromethane	ug/L					≤.10			≤.1
Tetrachloromethane	ug/L					≤.05			≤.2
1,2-Dichloroethane	ug/L					≤.1			≤.2
Tribromomethane	ug/L					≤.20			≤.2

Regional Ground Water Quality: Gloucester and Cumberland Counties, New Jersey
(Source: USGS Water Quality Database)

USGS Well OU02 Station Number 392920075011901 Vineland NJ Cumberland County									
Parameter	Units	Concentration							
		9/24/1996	9/24/1996	9/24/1996	9/24/1996	12/18/1996	12/18/1996	12/18/1996	9/13/1999
Debromochlormethane	ug/L					≤.1			≤.2
Trechloromethane	ug/L					Est.≤.04			≤.1
Toluene	ug/L					≤.05			≤.1
Benzene	ug/L					≤.05			≤.1
Acrolien	ug/L					≤2			
Acrylonitrile	ug/L					≤2			
Alpha-HCH	ug/L						≤.002		≤.002
Chlorobenzene	ug/L					≤.05			≤.1
Chloroethane	ug/L					≤.1			
Ethylbenzene	ug/L					≤.05			≤.1
Hexachloroethane	ug/L					≤.1			
Bromomethane	ug/L					≤.1			
Chloromethane	ug/L					≤.2			
Dichloromethane	ug/L					≤.1			≤.2
Tetrachloroethene	ug/L					≤.1			≤.1
Trichlorofluoromethane	ug/L					≤.10			≤.2
1,1-Dichloroethane	ug/L					≤.05			≤.1
1,1-Dichloroethene	ug/L					≤.10			≤.1
1,1,1-Trichloroethane	ug/L					≤.05			≤.1
1,1,2-Tetrachloroethane	ug/L					≤.10			
1,1,2,2-Tetrachloroethane	ug/L					≤.10			
1,2-Dichlorobenzene	ug/L					≤.05			≤.1
1,2-Dichloropropane	ug/L					≤.05			≤.1
1,2-Dichloroethene	ug/L					≤.05			≤.1
1,2,4-Trichlorobenzene	ug/L					≤.2			
1,3-Dichlorobenzene	ug/L					≤.05			≤.1
1,4-Dichlorobenzene	ug/L					≤.05			≤.1
p,p'-DDE,	ug/L						≤.006		≤.006
Dichlorodofluoromethane	ug/L					≤.2			≤.2
Naphthalene,	ug/L					≤.2			
trans-1,3-Dichloropropene	ug/L					≤.10			
cis-1,3-Dichloropropene	ug/L					≤.10			
Dicamba	ug/L						≤.04		
Linuron	ug/L						≤.02		
MCPA	ug/L						≤.05		
MCPB	ug/L						≤.04		
Methiocarb	ug/L						≤.03		
Propoxur	ug/L						≤.04		
Bentazon	ug/L						≤.01		
2,4-DB	ug/L						≤.04		
Fluometuron	ug/L						≤.04		
Oxamyl	ug/L						≤.02		
Chlorpyrifos	ug/L						≤.004		≤.004
Vinyl Chloride	ug/L					≤.1			≤.2
Trichloroethene	ug/L					≤.05			≤.1
Aldrin	ug/L						≤.01		
Lindane	ug/L						≤.004		≤.004
Chlordane	ug/L						≤.1		
p,p'-DDD	ug/L						≤.01		
p,p'-DDE	ug/L						≤.01		
p,p'-DDT	ug/L						≤.01		
Dieldrin	ug/L						0.06		0.108
Endrin	ug/L						≤.01		
Toxaphene	ug/L						≤1		
Heptachlor	ug/L						≤.01		
Metolachlor	ug/L						≤.002		≤.002
Heptachlorepoxide	ug/L						≤.01		

Regional Ground Water Quality: Gloucester and Cumberland Counties, New Jersey
(Source: USGS Water Quality Database)

USGS Well OU02 Station Number 392920075011901 Vineland NJ Cumberland County									
Parameter	Units	Concentration							
		9/24/1996	9/24/1996	9/24/1996	9/24/1996	12/18/1996	12/18/1996	12/18/1996	9/13/1999
PCBs	ug/L						≤.1		
Malathion	ug/L						≤.005		≤.005
Parathion	ug/L						≤.004		≤.004
Diazinon	ug/L						≤.002		≤.002
Atrazine	ug/L						≤.001		≤.004
Hexachlorobutadiene	ug/L					≤.2			
Picloram	ug/L						≤.01		
2,4-D	ug/L						≤.01		
2,4-D	ug/L						≤.04		
2,4,5-T	ug/L						≤.01		
2,4,5-T	ug/L						≤.04		
Mirex	ug/L						≤.01		
Silvex	ug/L						≤.01		
Silvex	ug/L						≤.02		
Alachlor	ug/L						≤.002		≤.002
Triclopyr	ug/L						≤.05		
Propham	ug/L						≤.04		
Acetochlor	ug/L						≤.002		≤.002
Picloram	ug/L						≤.05		
Oryzalin	ug/L						≤.02		
Norflurazon	ug/L						≤.02		
Neburon	ug/L						≤.01		
1-Naphthol	ug/L						≤.01		
Methomyl	ug/L						≤.02		
Fenuron	ug/L						≤.01		
Esfenvalerate	ug/L						≤.02		
2Methyl4,6dinitrophenol	ug/L						≤.04		
Diuron	ug/L						≤.02		
Dinoseb	ug/L						≤.04		
Dichlorprop	ug/L						≤.03		
Dichlobenil	ug/L						≤.02		
Dacthalmonoacid	ug/L						≤.02		
Clopyralid	ug/L						≤.05		
Chlorothalonil	ug/L						≤.04		
Hydroxycarbofuran	ug/L						≤.01		
Carbofuron	ug/L						≤.03		
Carbaryl	ug/L						≤.008		
Bromoxynil	ug/L						≤.04		
Aldicarb	ug/L						≤.02		
Aldicarb sulfone	ug/L						≤.02		
Aldicarbsulfoxide	ug/L						≤.02		
Acifluorfen	ug/L						≤.04		
Methylacrylate	ug/L					≤2			
Tetramethylbenzene	ug/L					≤.1			
1,2,3,5-Tetramethylbenzene	ug/L					≤.1			
Bromoethene	ug/L					≤.1			
t-Butylethylether	ug/L					≤.10			≤.1
Methyltertpentylether	ug/L					≤.1			≤.2
Turbidity	NTU							0.2	4.1
Chlorambenmethylester	ug/L						≤.01		
Solids	mm	0.6	0.5	0.4	0.4				
Solids	mm	1.4	1.5	1.1	0.9				
Solids,	mm	2.4	3.1	2	1.4				
Bromide	mg/L						0.08		
Mercury	ug/L							0.2	≤.1
trans-1,4-Dichlorobutene	ug/L					≤5.0			
Ethylmethacrylate	ug/L					≤1.0			

USGS Well QU02 Station Number 392920075011901 Vineland, NJ Cumberland County

Parameter	Units	Concentration							
		9/24/1996	9/24/1996	9/24/1996	9/24/1996	12/18/1996	12/18/1996	12/18/1996	9/13/1999
Alpha radioactivity	pCi/L								6.8
Beta radioactivity	pCi/L								5.3
Ra-228	pCi/L							1.4	
Ra-226	pCi/L							0.07	
Rn-222	pCi/L							36	
Carbon disulfide	ug/L					≤.05			
Vinyl acetate	ug/L					≤5			
cis-1,2-Dichloroethene	ug/L					≤.05			≤.1
Methyl n-butylketone	ug/L					≤5.0			
Styrene	ug/L					≤.05			≤.1
Xylene	ug/L					≤.05			≤.1
1,1-Dichloropropene	ug/L					≤.05			
2,2-Dichloropropane	ug/L					≤.05			
1,3-Dichloropropane	ug/L					≤.1			
Ethyltoluene	ug/L					≤.05			
1,2,3-Trimethylbenzene	ug/L					≤.1			
1,2,4-Trimethylbenzene	ug/L					≤.05			
Isopropylbenzene	ug/L					≤.05			
n-propylbenzene	ug/L					≤.05			
1,3,5-Trimethylbenzene	ug/L					≤.05			
2-Clorotoluene	ug/L					≤.05			
4-Chlorotoluene	ug/L					≤.05			
Bromochloromethane	ug/L					≤.10			
n-Butylbenzene	ug/L					≤.1			
sec-Butylbenzene	ug/L					≤.05			
tert-Butylbenzene	ug/L					≤.05			
4-Isopropyltoluene	ug/L					≤.05			
Iodomethane	ug/L					Má			
1,2,3-Trichloropropane	ug/L					≤.2			
1,1,1,2-Tetrachloroethane	ug/L					≤.05			
1m2m3-Trechlorobenzene	ug/L					≤.2			
1,2-Dibromoethane	ug/L					≤.10			
CFC-113	ug/L					≤.05			≤.1
Methyl-t-butylether	ug/L					0.3			0.4
Chloropropene	ug/L					≤.1			
Isobutylmethylketone	ug/L					≤5.0			
Ra-228	pCi/L							6	
Acetone	ug/L					≤5			
Bromobenzene	ug/L					≤.05			
Di-ethylether	ug/L					≤.1			≤.2
Diisopropylether	ug/L								≤.2
Methylacrylonitrile	ug/L					≤2.0			
Ethylmethylketone	ug/L					≤5			
Methylmethacrylate	ug/L					≤1.0			
Tetrahydrofuran	ug/L					≤5			
Dicamba	ug/L						≤.01		
Dichlorprop	ug/L						≤.01		
Rn-222	pCi/L							300	
p,p'-Ethyl-DDD	ug/L						≤.1		
p,p'-Methoxychlor	ug/L						≤.01		
alpha-Endosulfan	ug/L						≤.01		
PCNs	ug/L						≤.1		
Dibromochloropropane	ug/L					≤.5			
Metribuzin	ug/L						≤.004		≤.004
2,6-Di-ethylaniline	ug/L						≤.003		≤.003
Trifluralin	ug/L						≤.002		≤.002

APPENDIX F - LOCAL HYDROGEOLOGIC DATA

APPENDIX F - LOCAL HYDROGEOLOGIC DATA

Table F-1A Summary of Large Capacity Well Search Results
Table F-1B Summary of Well Search Results – Lower Capacity Wells
Figure F-1 - Locations of Large Capacity Water Supply Wells
Figure F-2 - Well Restriction Area
City of Vineland Well Restriction Area
Figure F-3 - Ground Water Contours - Shallow Wells, July 2005
Figure F-4 - Ground Water Contours - Deep Wells, July 2005
Table F-2 July 2005 Quarterly Ground Water Sampling Results - On-site Wells
Table F-3 July 2005 Quarterly Ground Water Sampling Results - Off-site Wells
Ground Water Contaminant Isopleth Maps

Figure F-5	TCE Concentration (ppb); Shallow Wells, April 2005
Figure F-6	TCE Concentration (ppb); Deep Wells, April 2005
Figure F-7	Total Chromium Concentration (ppb); Shallow Wells, April 2005
Figure F-8	Total Chromium Concentration (ppb); Deep Wells, April 2005
Figure F-9	Hexavalent Chromium Concentration (ppb); Shallow Wells, April 2005
Figure F-10	Hexavalent Chromium Concentration (ppb); Deep Wells, April 2005

Table F-4 Ground Water/Suspended Solids Radiological Results - April 2004
June 9, 2005 Letter Report - Results of Ground Water Sampling (April 13, 2005)

Table F-1A
Summary of Large Capacity Well Search Results
Shieldalloy Metallurgical Corporation

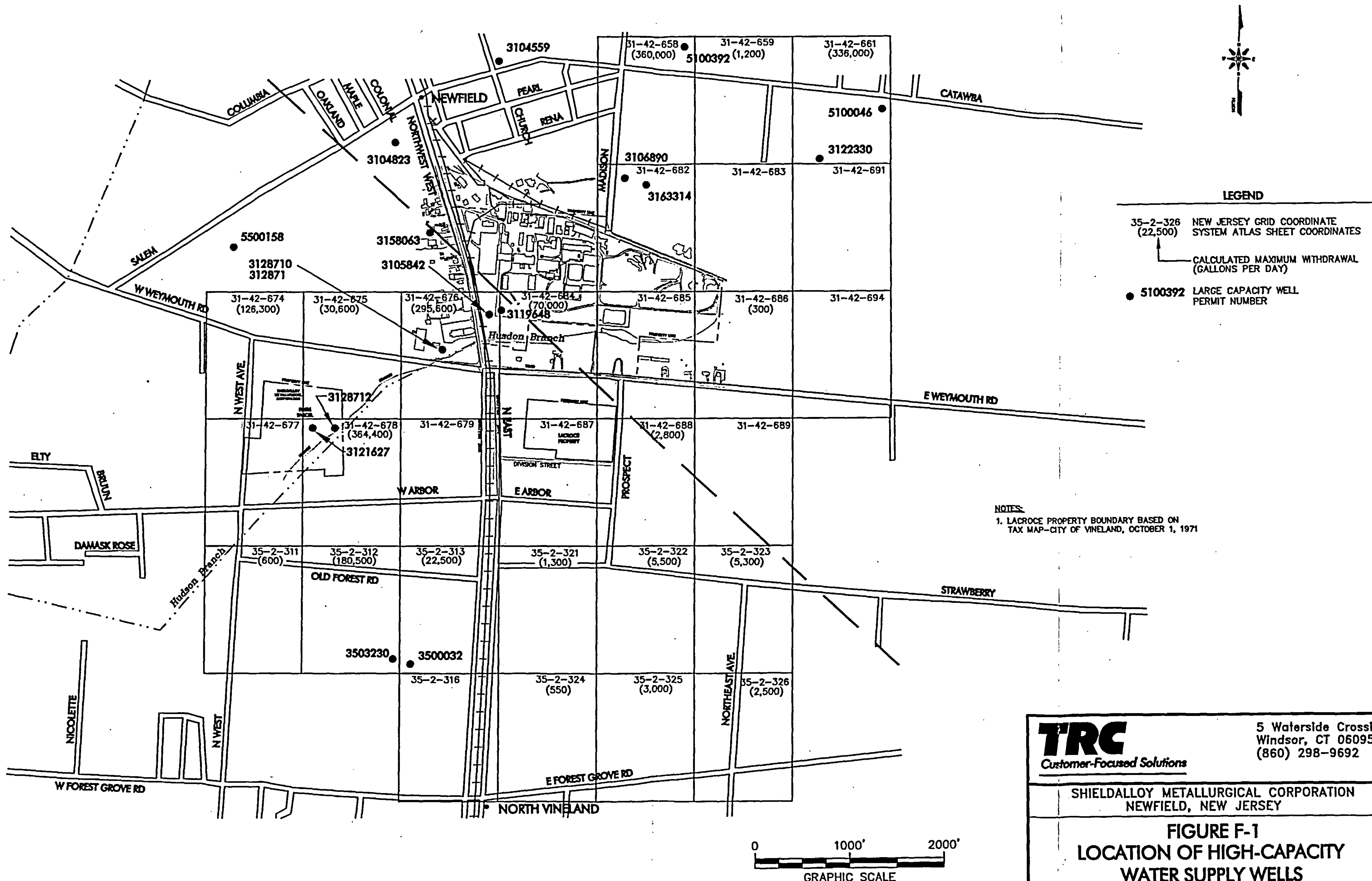
Number	Owner's Name	Permit Number	Local Identification	Latitude	Longitude	Distance / Direction (miles) / (Compass)	Well Depth (feet)	Pump Capacity (gpm)	Withdrawal Rate (gpd)
2237P	Shieldalloy Metalurgical Corp.	3119648	W9	393224	750120	0.30/SW	130	100	70000
2237P	Shieldalloy Metalurgical Corp.	3105842	Layne	393224	750123	0.33/SW	47	100	30000
2237P	Shieldalloy Metalurgical Corp.	3128710	RW6S	393220	750128	0.43/SW	75	100	135000
2237P	Shieldalloy Metalurgical Corp.	3128711	RW6D	393220	750128	0.43/SW	125	100	130000
2237P	Shieldalloy Metalurgical Corp.	3128712	RIW2	393213	750143	0.69/SW	75	200	220000
5147	Newfield Borough Water Dept	3104559	3	393254	750121	0.54/NW	162	400	265000
5147	Newfield Borough Water Dept	5100046	5	393246	750031	0.59/NE	140	500	335000
CU0029	Sepers Nursery	5500158	Well 5	393232	750157	0.84/W	85	300	108000
CU0129	Petronglo Farms, Inc.	3121627	Well 6	393213	750146	0.73/SW	100	350	126000
CU105R	Lopergolo, Mike	3500032	Well 1	393147	750143	0.89/SW	129	90	21,600*
GL0048	Pine Grove Camp, Inc.	3503230	Well 1	393148	750145	0.91/SW	100	500	180000
GL0182	Leshay Farms, Samuel	3104823	Well 2	393243	750132	0.59/NW	130	1000	360000
GL0182	Leshay Farms, Samuel	5100392	Well 1	393253	750045	0.49/N	104	1000	360000
	Leshay Farms, Samuel**	3122330	Well 3	393241	750035	0.43/NE	130		
	Leshay Farms, Samuel**	3158063	Well 4	393233	750128	0.45/NW	100		
	Leshay Farms, Samuel**	3163314	Well 5	393238	750059	0.20/N	109		
	Leshay Farms, Samuel**	3106890	Well 6	393239	750102	0.22/NW	100		

Notes:
Source: NJDEP - Water Supply Element, Bureau of Water Allocation; Large Capacity (100,000 GPD) Well Search Within 5 Miles of Site Focus; Performed on 3/17/00
Number field indicates either a Water Allocation Permit, Agricultural Certification, or Registration Number
Distance field indicates the distance in miles between the well current slag pile.
Direction field indicates compass direction from the search focus.
Withdrawal rate for Shieldallow Metalurgical Corp. wells based on ground water remediation system operation records
Withdrawal rates for Newfield Borough Water Dept wells based on reports by Mr. Jack Harris, Water Department Superintendant, Borough of Newfield
* Maximum pumping rate from well permit
** Information provided to TRC by NJDEP July 26, 2004

Table F-1B
Summary of Well Search Results - Lower Capacity Wells[1]
Shieldalloy Metallurgical Corporation

Permit Number	Install Date	Well Owner	Owner's Address	Well Location Address	Atlas Sheet Coordinates	Well Location Lot/Block	Screen Diameter	Screened Interval (FBG)	Average Withdrawal (GPD)	Maximum Pumping Rate (GPD)	Specific Capacity (GPM/FT)	Pump Capacity (GPM)	Well Usage
Sheet 31													
31-6890	4/18/1973	Leshay Bros.	Newfield	Catawba Ave	31 42 658		6	70-100			50		Irrigation
31-31860	8/29/1989	Sam Le Shay	Catawba Ave., Newfield	Same	31 42 659	17/24	4	75-85			1.58		Domestic
31-31859	8/29/1989	Sam Le Shay	Catawba Ave., Newfield	Same	31 42 659	18a/24	4	80-90			1.58		Domestic
31-20606	3/20/1984	D&M Builders	596 Clayton Rd., Franklin Twp.		31 42 661	3c/519	2	55-59	500	500		9	Domestic
31-20755	7/20/1984	D&M Builders	596 Clayton Rd., Franklin Twp.		31 42 661	3d/519	2	54-58	500	500		9	Domestic
31-21627	6/12/1984	Carman Petronglo	5014 N. Delsea Drive, Vineland		31 42 674	13/83	5	40-60				350*	Irrigation
31-28468	5/20/1989	Sol Finkelstein	882 S. Spring Rd, Vineland		31 42 674	1.05/43	2	145-150	150	300		10	Domestic
31-19465	9/18/1982	James Bringer	555 E. Elm Rd., Vineland		31 42 675	3/968	4	75-85				15	Domestic
31-143	5/15/1950	Gus Hauser	Weymouth Rd., Newfield		31 42 675		4	140-150		30,000	2.5	NI	Irrigation
31-49153	4/27/1996	Eugene Magliocco	756 Strawberry Ave., Vineland	Same	31 42 676	4/6901	4	90-100				12	Domestic
31-19723	4/5/1983	Petronglo Farms	5014 N. Delsea Drive, Newfield		31 42 678	10/83	6	42-62					Irrigation
31-9125	8/14/1975	J. Ruberto	605 W. Arbor Ave., Vineland	Arbor Ave/West Ave	31 42 678		2	51-61	300	400		50	Domestic
31-23513	9/12/1985	Bruce Wean	R.D. 1 Box 511 W. Garden Rd.	Pottsgrove Twp.	31 42 678	46/67	3	62-72				50	Irrigation
31-6092	11/3/1969	Borough of Newfield	Borough Hall, Newfield	Main St., Newfield	31 42 685		10	129-149			21.91	500	Public Supply
31-13812	6/13/1978	Krykory Torgover	Weymouth Rd., Vineland	Same	31 42 686	6b/581	2	53-58	200	300			Domestic
31-21871	9/1/1984	Newlin Caudill	Aura Willow Grove Rd.	Weymouth Rd.	31 42 688		4	90-100	500	600		12	Domestic
31-21871	9/25/1984	Newlin Caudill	Aura Willow Grove Rd.	Weymouth Rd.	31 42 688	6c/581	4	80-90	500	600		16	Domestic
31-19468	9/27/1982	Richard Krason	3151 North East Ave., Vineland	East Avenue	31 42 688		3	70-80				15	Domestic
31-1066	7/10/53	Louis Pelts	Prospect Ave., Vineland	Same	31 42 688		4	45-51.	500	600		10	Domestic and Poultry
31-1133	9/12/1953	Alfred Osterman	Arbor Ave , Vineland	Same	31 42 688		4	65-71	300	400	5.5	10	Domestic
Sheet 35													
35-12130	7/15/1991	Frank Marchisella	3183 N. East Blvd, Vineland	Same	35 02 311	12/114	4	90-100				11	Domestic
35-2734	1/1982	Gene Brenner	Arbor Ave, Vineland	Same	35 02 312		2	65-70	200	500		12	Domestic
35-3230	4/12/1982	Joseph Petronglo Jr.	4724 N. Delsea Dr.	West Ave	35 02 312		3	34-64				500*	Irrigation
35-32	7/12/1950	Frank Russo	West Blvd, N. Vineland	Same	35 02 313		4	99-129		21600	8.25	90	Irrigation
35-4248	7/1/1984	Bob Carpenter	168 Arbor Ave:, Vineland	Same	35 02 313	8/83	2	90-95				10	Domestic
35-75	3/5/1952	Joseph Girardi	E. Blvd & Strawberry Ave., Vineland	Same	35 02 313		4	25.5-31.5	300	300		8	Domestic
35-14281	8/16/1993	John Ruggiano	311 Baylor Ave., Vineland	Strawberry Ave.	35 02 321	24.03/114	4	80-90					Return
35-1653	5/10/1978	Ronald Jacobson	181 Strawberry Ave		35 02 321		3	84-94	200	400			Domestic
35-18262	12/14/1997	W. Sarad	745 Strawberry Ave.	Same	35 02 321	67/7004	4	90-100				12	Domestic
35-5352	2/24/1986	Leo Palmonal	3127 N.E. Blvd		35 02 321	10/114	4	80-90	150	300			Domestic
35-11946	5/16/1991	Richard Bruno	3120 N. East Ave., Vineland	Same	35 02 322	28/114	4	95-105	400	600		25	Domestic
35-12625	1/7/1992	Richard Lorenzini	3181 N. East Ave., Vineland	Same	35 02 322	20/121	4	90-100	400	600		10	Domestic
35-13775	8/16/1993	John & Margaret Ruggiano	311 Baylor Ave., Vineland	Strawberry Ave.	35 02 322	24.03/114	4	85-95				25	Domestic
35-14414	9/27/94	Richard Linn	1069 Linda Lane, Vineland	Strawberry Ave.	35 02 322	24.02/114	4	108-118	500	750		20	Domestic
35-14783	4/11/1995	Wells Cornell	1022 Holmes Ave, Vineland	Strawberry Ave.	35 02 322	24.03/114	4	73-83	500	1800	2.08		Domestic
35-15257	9/27/1994	Richard Linn	1019 Linda Lane, Vineland	Strawberry Ave.	35 02 322	24.02/114	4	100-110					Heat Pump Discharge
35-3132	2/2/1982	Daniel S. Falasca	Box 127 Morris Ave.	Strawberry Ave.	35 02 322		3	69-79				15	Domestic
35-3133	2/2/1982	Daniel S. Falasca	Box 127 Morris Ave.	Strawberry Ave.	35 02 322		3	69-79				15	Domestic
35-06267	5/15/1987	KDR Contractors	PO Box 2370, Vineland		35 02 323	32.01/114	2	84-90	500	600		10	Domestic
35-10153	1/24/1990	James Schrier	560 E. Forest Grove Rd.	Same	35 02 323	11/121	4	115-130				15	Domestic
35-12597	11/13/1992	Phil Schreiber	935 Magnolia Rd	N. E. Ave	35 02 323	32/114	4	80-90				25	Domestic
35-12842	3/21/1992	Louis Dalesandro	3005 N. East Ave., Vineland	Same	35 02 323	15/121	4	58-68	500	1800		12	Domestic
35-13276	8/28/1992	Charles Schaser	3176 N. East Ave., Vineland	Same	35 02 323		4	110-120	400	600		20	Domestic
35-3611	3/17/1983	Charles R. Johnson	741 Strawberry Ave.		35 02 323	1B/583	2	120-127					Domestic
35-4916	9/14/1985	Robert Petronglo	2060 Weymouth Rd.		35 02 323	1/46	4	125-135	200	500		25	Domestic
35-08272	2/16/1989	Garden Homes	N. Delsea Dr. / Garden Rd.	Forest Grove Rd.	35 02 324	32.02/114	4	73-83	150	150	1.1	11	Domestic
35-13626	12/23/1992	Mary H. Gamba	3095 North East Blvd. Vineland	Same	35 02 324	9/114	2	88-98	300	400	7.8	10	Domestic
35-05892	5/20/1987	Daniel McDermott	2668 Division St, Vineland	Same	35 02 325	34/114	2	78-85					Domestic
35-14509	12/17/1993	Philo & Maxine Chapman	2388 N. East Ave	Same	35 02 325	5/127	4	80-90	400	600		15	Domestic
35-15381	10/31/1994	Mary C. Meyer-Bowen	855 E. Forest Grove Rd., Vineland	Same	35 02 325	4/128	4	86-96	400	600		10	Domestic
35-17000	6/21/1996	Audrey McDermott	330 Grove Road, Vineland	Same	35 02 325	35/114	4	73-83				20	Domestic
35-17367	1/20/1997	Edward & Bridget Conrow	311 Central Ave, Vineland	Forest Grove Rd.	35 02 325	1/124	4	90-100				25	Domestic
35-15575	1/20/1995	Steven Gatier	267 E. Forest Grove Rd.	Same	35 02 326	6/123	4	75-85	300	400		8	Domestic
35-02260	4/1/1981	Richard McDermott	Division Street		35 02 326		2	71-76	200	500		18	Domestic
35-3929	11/15/1984	William Sirawatka			35 02 326	9.10/121	2	72-79				NI	Domestic
35-07901	7/2/1988	Lottie Reed Jones	304 E. Forest Grove Rd.	Same	35 02 326	36/114	4	90-100	500	750		11	Domestic

[1] Source: NJDEP - Water Supply Element, Bureau of Water Allocation; Well Permit Search Within 1 Mile of Site Focus; Performed March 2000
NI - Pump not installed
* - Pump capacity reported in Large Capacity Well Search



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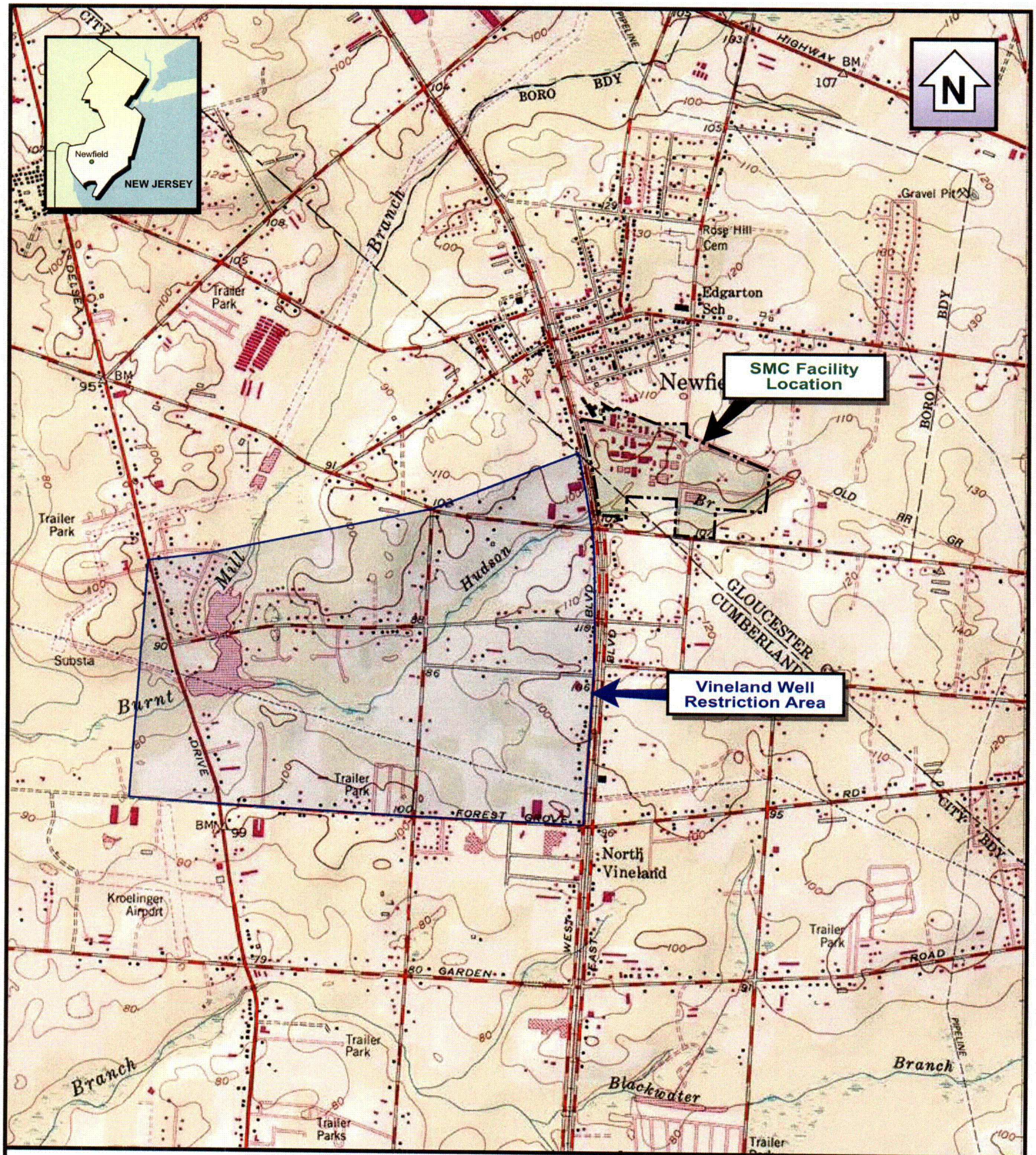
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE F-1
LOCATION OF HIGH-CAPACITY WATER SUPPLY WELLS

Date: 04/05 | Project No. 26770-0100-00000

\26770\0100\Figure F-1



0 2000
SCALE FEET

0 1
SCALE 1:24000 MILE

BASE CREATED WITH TOPO™ © 1996 WILDFLOWERS PRODUCTIONS, www.topo.com
7.5' USGS TOPOGRAPHIC MAP

PERS/JW/HAZ/SMC/WELL RESTRICTION.fh10

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SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE F-2
LOCATION OF VINELAND WELL RESTRICTION AREA

Date: 04/05 | **Project No.** 26770-0100-00000

C35

CITY OF VINELAND
WATER-SEWER UTILITY

FACSIMILE COVER SHEET

DATE: 6-3-91 FAX NO: 697-9025

TO: Shield Alloy

ATTENTION: Mr. Jim Valente

FROM: Paul Horner

TOTAL NUMBER OF SHEETS INCLUDING COVER SHEET: Ø2

COMMENTS: Description of Well Restriction Area in North Vineland

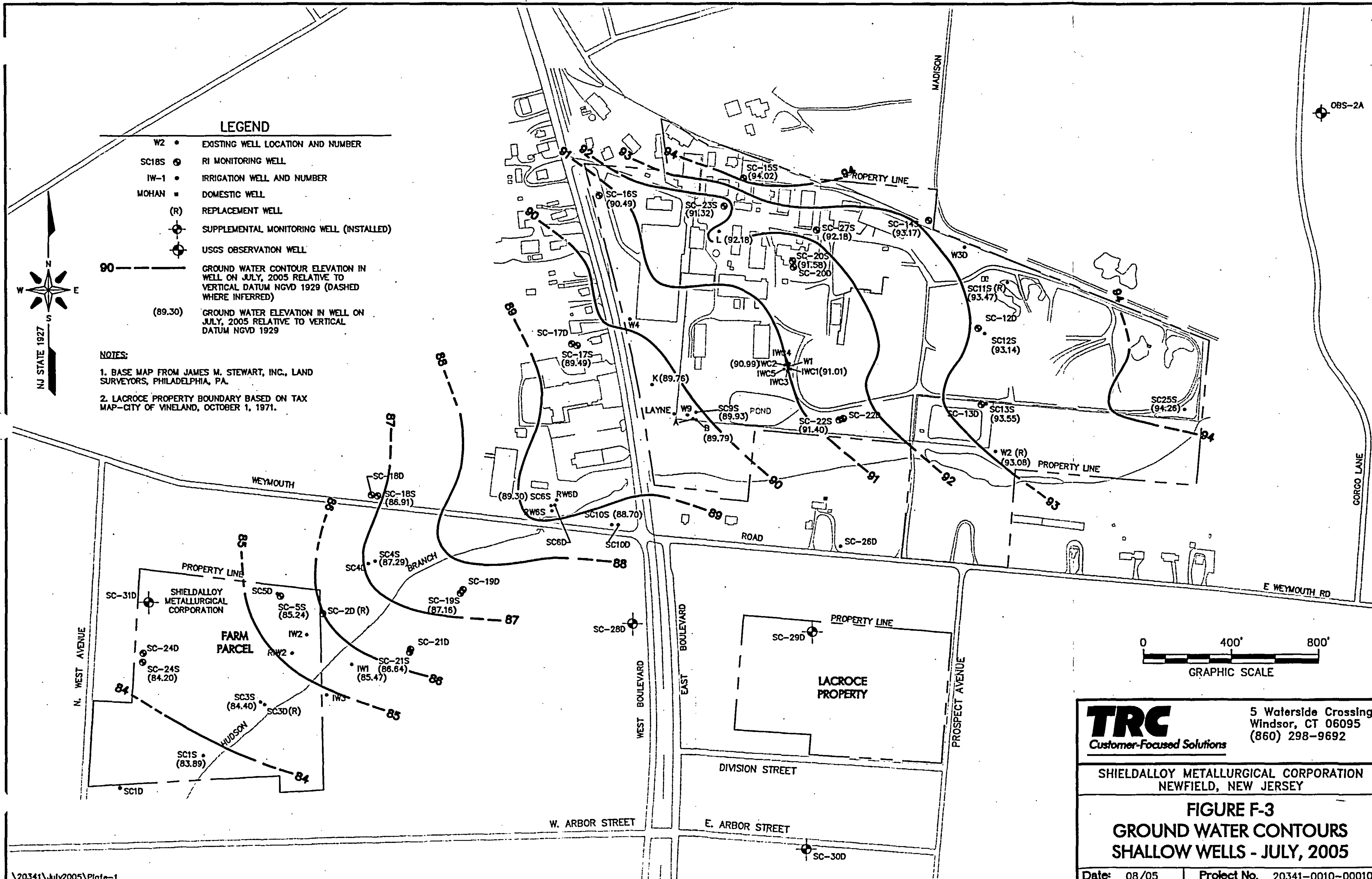
FAX # 609-794-6181
TEL # 609-794-4056

WHEREAS, the State legislature has provided, in N.J.S. 40:63-52, et seq., for local ordinances requiring mandatory connection with water systems, and the State of New Jersey, Department of Environmental Protection, has ordered mandatory sealing of wells in accordance with N.J.S.A. 58:4A-4.1 et seq., and N.J.S.A. 58:12A-1 et seq.;

NOW, THEREFORE, BE IT ORDAINED by the City Council of the City of Vineland, County of Cumberland, and State of New Jersey, as follows:

1. All buildings located upon a street in which the public water supply main is constructed in the area designated by the State of New Jersey, Department of Environmental Protection, identified in Section 2 of this Ordinance, shall be connected with the public water supply main, and the private water supply well shall be permanently sealed.

2. All private water supply wells in the following area shall be sealed pursuant to mandatory order issued by the State Department of Environmental Protection, and the City of Vineland shall contract therefor upon connection of all properties to the Municipal Water Utility's distribution mains in said area: N. West Avenue, from Weymouth Road to Forest Grove Road; W. Arbor Avenue, from N.J. Route No. 47 (Delsea Drive) to N. West Boulevard; Old Forest Road, from N. West Avenue to N. West Boulevard; W. Forest Grove Road, from 1,225 feet west of N.J. Route No. 47 (Delsea Drive) to N. West Boulevard; N.J. Route No. 47, from W. Forest Grove Road to 1,200 feet north of W. Arbor Avenue; N. West Boulevard, from W. Forest Grove Road to City Limit; W. Weymouth Road, from 210 feet west of N. West Avenue to N. West Boulevard; Gerow Avenue, from W. Arbor Avenue to Elty Avenue; Elty Avenue, from Gerow Avenue to Braun Avenue; Braun Avenue, from Elty Avenue to W. Arbor Avenue; Burnt Mill Road, from W. Arbor Avenue to Regina Elena Avenue; Temm Court, from Burnt Mill Drive to cul-de-sac; Regina Elena Avenue, from Burnt Mill Drive to easterly terminus.



LEGEND
W2 • EXISTING WELL LOCATION AND NUMBER
SC18S RI MONITORING WELL
IW-1 • IRRIGATION WELL AND NUMBER
MOHAN ▪ DOMESTIC WELL
(R) REPLACEMENT WELL
SUPPLEMENTAL MONITORING WELL (INSTALLED)
USGS OBSERVATION WELL
90 GROUND WATER CONTOUR ELEVATION IN WELL ON JULY, 2005 RELATIVE TO VERTICAL DATUM NGVD 1929 (DASHED WHERE INFERRED)
(89.30) GROUND WATER ELEVATION IN WELL ON JULY, 2005 RELATIVE TO VERTICAL DATUM NGVD 1929
NOTES:
1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
NJ STATE 1927
N
S
E
W
MADISON
OBS-2A
PROPERTY LINE
SC-15S (94.02)
SC-16S (90.49)
SC-23S (91.32)
SC-27S (92.18)
L (92.18)
SC-14S (93.17)
W3D
SC-20S (91.58)
SC-20D
SC11S (R) (93.47)
SC-12D
SC12S (93.14)
W4
SC-17D
SC-17S (89.49)
IW04
W1
(90.99) IWC2
IWC5
IWC3
IWC1 (91.01)
K (89.76)
LAYNE
W9
SC9S (89.93)
POND
A
B (89.79)
SC-22S (91.40)
SC-22D
SC-13D
SC13S (93.55)
SC25S (94.26)
W2 (R) (93.08)
PROPERTY LINE
WEYMOUTH
ROAD
SC-18D
SC-18S (86.91)
(89.30) SC6S
RW6D
RW6S
SC10S (88.70)
SC6D
SC10D
SC-26D
GORGO LANE
E WEYMOUTH RD
SC4S (87.29)
SC4D
BRANCH
SC-19D
SC-19S (87.16)
PROPERTY LINE
SC-31D
SHIELDALLOY METALLURGICAL CORPORATION
SC5D
SC-5S (85.24)
SC-2D (R)
FARM PARCEL
IW2
RW2
SC-24D
SC-24S (84.20)
SC-21D
SC-21S (86.64)
IW1 (85.47)
IW3
SC3S (84.40)
SC3D(R)
HUDSON
SC1S (83.89)
SC1D
N. WEST AVENUE
SC-28D
WEST BOULEVARD
EAST BOULEVARD
SC-29D
PROPERTY LINE
LACROCE PROPERTY
PROSPECT AVENUE
DIVISION STREET
W. ARBOR STREET
E. ARBOR STREET
SC-30D
0 400' 800'
GRAPHIC SCALE
84 85 86 87 88 89 90 91 92 93 94
TRC
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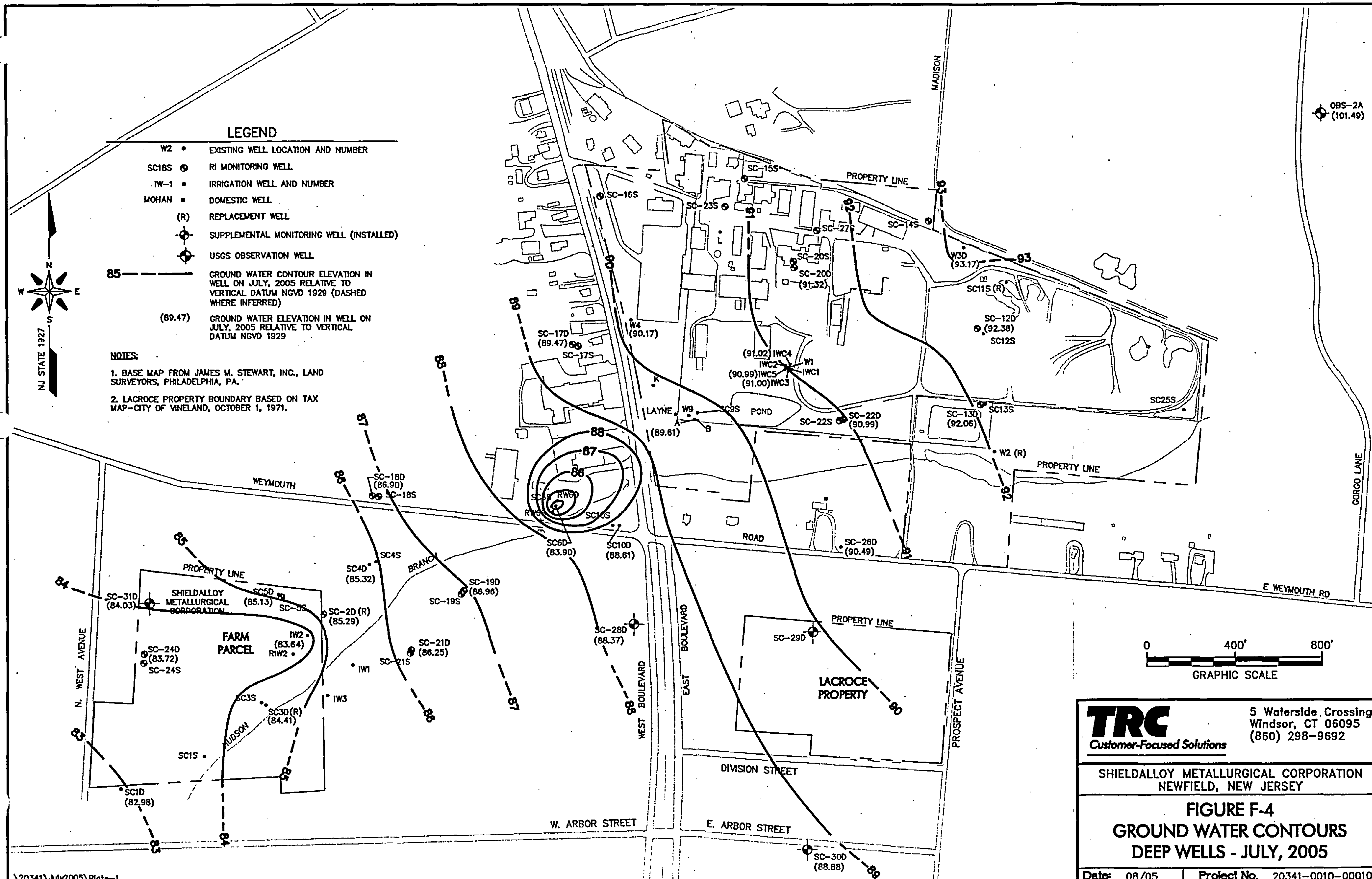
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
FIGURE F-3
GROUND WATER CONTOURS
SHALLOW WELLS - JULY, 2005
Date: 08/05
Project No. 20341-0010-00010
\20341\July2005\Plate-1



LEGEND
W2 EXISTING WELL LOCATION AND NUMBER
SC18S RI MONITORING WELL
IW-1 IRRIGATION WELL AND NUMBER
MOHAN DOMESTIC WELL
(R) REPLACEMENT WELL
SUPPLEMENTAL MONITORING WELL (INSTALLED)
USGS OBSERVATION WELL
85 GROUND WATER CONTOUR ELEVATION IN WELL ON JULY, 2005 RELATIVE TO VERTICAL DATUM NGVD 1929 (DASHED WHERE INFERRED)
(89.47) GROUND WATER ELEVATION IN WELL ON JULY, 2005 RELATIVE TO VERTICAL DATUM NGVD 1929
NOTES:
1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
NJ STATE 1927
N S E W
SHIELDALLOY METALLURGICAL CORPORATION
FARM PARCEL
LACROCE PROPERTY
PROPERTY LINE
POND
WEYMOUTH ROAD
E WEYMOUTH RD
N. WEST AVENUE
WEST BOULEVARD
EAST BOULEVARD
PROSPECT AVENUE
GORGO LANE
MADISON
DIVISION STREET
W. ARBOR STREET
E. ARBOR STREET
HUDSON
BRANCH
OBS-2A (101.49)
SC-31D (84.03)
SC1D (82.98)
SC-24D (83.72)
SC-24S
SC3S
SC3D(R) (84.41)
SC1S
IW2 (83.64)
RIW2
IW1
IW3
SC5D (85.13)
SC-5S
SC-2D (R) (85.29)
SC4D (85.32)
SC4S
SC-21S
SC-21D (86.25)
SC-18D (86.90)
SC-18S
SC-19D (86.96)
SC-19S
SC6D (83.90)
SC10D (88.61)
SC10S
RW6D
RW6S
SC-28D (88.37)
SC-29D
SC-30D (88.88)
SC-26D (90.49)
SC-17D (89.47)
SC-17S
SC-16S
W4 (90.17)
LAYNE (89.61)
W9
SC9S
SC-22S
SC-22D (90.99)
(91.02) IWC4
IWC2
W1
IWC1
(90.99) IWC5
(91.00) IWC3
SC-15S
SC-23S
SC-27S
SC-20S
SC-20D (91.32)
SC-14S
W3D (93.17)
SC11S (R)
SC-12D (92.38)
SC12S
SC-13D (92.06)
SC13S
SC25S
W2 (R)
GRAPHIC SCALE 0 400' 800'
TRC Customer-Focused Solutions
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SHIELDALLOY METALLURGICAL CORPORATION NEWFIELD, NEW JERSEY
FIGURE F-4
GROUND WATER CONTOURS
DEEP WELLS - JULY, 2005
Date: 08/05
Project No. 20341-0010-00010
\20341\July2005\Plate-1

TABLE F-2
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NJ
GROUND WATER ANALYTICAL RESULTS
ONSITE WELLS
JULY 2005

WELL NUMBER	A	B	K	SC34S (2)	L	IWC1	IWC2	IWC3	IWC4	IWC5	W2 (R)	W4	SC9S	SC11S (R)	SC12S	SC32S (1)	SC12D	SC13S	SC13D	SC14S	SC15S	SC16S	SC20S	SC20D	SC22S	SC22D	SC23S	SC25S	SC27S	W9	LAYNE	PLANT INFLUENT	PLANT EFFLUENT	TB071905	TB071905A	TB072005
SCREENED INTERVAL (FT)	114-124	36-46	36-46	36-46	42-52	15-20	35-40	55-60	75-80	95-100	2-17	55-75	15-30	9-24	15-25	15-25	126-136	14.7-24.7	127-137	12-27	12.5-27.5	12-27	7-22	129-139	3-18	111-121	9-24	7-22	7-22	110-130	42-47					
PARAMETER																																				
VOCs (ug/L)																																				
Chloromethane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Bromomethane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Chloroethane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
1,2-Dichloroethene (total)	U	U	0.28J	0.32J	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	0.55J	U	NA	NA	NA	NA	1.7	U	U	U	U
Acetone	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Carbon Disulfide	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Methylene Chloride	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
2-Butanone	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Chloroform	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Benzene	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	0.5J	U	U	U	U
1,4-Dichlorobenzene	U	U	2.1	2.1	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Trichloroethene	8.6	0.89J	3.8	3.8	NA	NA	0.74J	NA	NA	0.43J	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	29	U	NA	NA	NA	NA	8.8	U	U	U	U
1,2-Dichloropropane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Bromodichloromethane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Toluene	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	34.1	NA	NA	NA	NA	U	U	U	U	U
1,1,2,2-Trichloroethane	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Chlorobenzene	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Tetrachloroethene	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	2	U	U	U	U
Ethylbenzene	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	607	NA	NA	NA	NA	U	U	U	U	U
Total Xylenes	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	0.92J	2830	NA	NA	NA	NA	U	U	U	U	U
Vinyl Chloride	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	NA	NA	NA	NA	U	U	U	U	U
Volatile TICs	U	U	U	U	NA	NA	U	NA	NA	U	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	9.56JN	6111.6JN	NA	NA	NA	NA	U	U	U	U	U
INORGANICS (ug/L)																																				
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	603	NA	NA	243	383	370	259	823	398	U	NA	NA	NA	NA	NA	NA	NA	429	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	125	NA	NA	474	6200	5800	U	2620	U	1180	NA	NA	NA	NA	NA	NA	NA	6960	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (Total)	9210	336	785	749	98.6	NA	1140	NA	NA	338	15.3	NA	11.1	10.3	400	357	U	U	U	108	NA	NA	NA	NA	U	34600	415	U	NA	5150	1150	NA	NA	NA	NA	NA
Hexavalent Chromium	U	U	730	720	U	NA	980	NA	NA	33	14	NA	U	U	97	120	U	U	U	73	NA	NA	NA	NA	U	U	200	U	NA	5700	1200	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	NA	U	U	U	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	19800	182000	56500	55300	13500	NA	147000	NA	NA	86800	2800	NA	85500	15600	170000	160000	2630	213000	3510	18500	NA	NA	NA	NA	42100	648000	35100	67000	NA	74300	126000	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	892	NA	NA	U	2160	2400	U	27100	U	U	NA	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA
OTHER PARAMETERS (mg/L)																																				
pH	7.20	7.00	6.79	6.79	6.70	NA	7.70	NA	NA	11.00	7.32	NA	7.22	8.86	7.30	7.30	7.44	10.06	7.75	6.01	NA	NA	NA	NA	7.11	12.07	6.53	8.25	NA	7.62	7.09	6.85	7.68	NA	NA	NA
Sulfate	46.8	207	11.1	10.5	5.0	NA	85.6	NA	NA	4.8	6.7	NA	64.6	16.4	81.4	79.5	7.8	154	6.6	17	NA	NA	NA	NA	30	60.4	71.6	7.1	NA	70.9	114	NA	NA	NA	NA	NA

VOC Analysis performed via Method 624
Total metals performed via Method 6010B; Hexavalent Chromium via Method 7196A; and Sulfate via Method 300.0.
FT - Feet below ground surface.
U - Indicates compound analyzed for but not detected (organics and inorganics).
J - Indicates an estimated value (organics).
B - The analyte is found in the associated blank as well as in the sample (organics) or the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but not greater than or equal to the Instrument Detection Limit (IDL) (inorganics).
NA - Not analyzed
(1) - Duplicate sample of well SC12S
(2) - Duplicate sample of well K

TABLE F-3
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NJ
GROUND WATER ANALYTICAL RESULTS
OFF-SITE WELLS
JULY 2005

WELL NUMBER	SC1S	SC1D	SC2D (R)	SC3S	SC3D (R)	SC32D(R) (1)	SC4S	SC4D	SC5S	SC5D	SC6S	SC6D	SC10S	SC10D	SC17S	SC17D	SC18S	SC18D	SC19S	SC19D	SC21S	SC21D	SC24S	SC24D	SC26D	SC28D	SC-30D	SC-31D	IW1	IW2	RW6S	RW6D	RIW2	OBS-2A	TB071905	TB071905A	TB072005
SCREENED INTERVAL (FT)	35-55	85-95/ 100-115	106-116	35-55	102-112	102-112	35-45	110-120	5-20	90-120	45-75	110-120	35-55	105-125	13-28	143-153	4-19	119-129	2-17	120-130	3-18	125-135	5-20	105-115	127-137	133-153	147-157	120-130	32-62	40-70	55-75	90-125	30-55	129-149			
PARAMETER																																					
VOCs (ug/L)																																					
Chloromethane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Bromomethane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Chloroethane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	2.1	NA	NA	NA	NA	U	U	U
1,2-Dichloroethene (total)	U	U	0.34J	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	1.6	NA	NA	NA	NA	U	U	U
Acetone	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Carbon Disulfide	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Methylene Chloride	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	3.5	U	U	NA	U	NA	NA	NA	NA	U	U	U
p-Dichlorobenzene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
trans-Dichloroethylene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
trans-1,2-Dichloroethylene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	0.26J	U	U	NA	U	NA	NA	NA	NA	U	U	U
2-Butanone	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Chloroform	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	1.5	NA	NA	NA	NA	U	U	U
Benzene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Trichloroethene	2.1	11.1	4.4	1.8	8.6	9	NA	NA	U	8.8	0.79J	3.9	NA	NA	NA	NA	NA	NA	U	1.1	U	1.6	U	9.5	1.6	11.6	U	19.4	NA	16.1	NA	NA	NA	NA	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Bromodichloromethane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Toluene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
1,1,2,2-Trichloroethane	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Chlorobenzene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Tetrachloroethene	U	U	0.56J	U	U	U	NA	NA	U	0.57J	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	0.47J	U	U	1.3	2.6	NA	2.1	NA	NA	NA	NA	U	U	U
Ethylbenzene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Total Xylenes	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Vinyl Chloride	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Naphthalene	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	NA	U	NA	NA	NA	NA	U	U	U
Volatile TICs	U	U	U	U	U	U	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	8.6JN	U	0.49J	U	U	U	U	0.21J	U	4.17J	NA	0.52JN	NA	NA	NA	NA	U	U	U
INORGANICS (ug/L)																																					
Chromium (Total)	U	U	7020	U	U	U	NA	NA	U	320	15.8	1840	U	1070	NA	NA	NA	NA	U	U	U	U	U	U	U	96.1	U	U	U	2880	505	3640	1480	NA	NA	NA	NA
Hexavalent Chromium	U	U	5400	U	U	U	NA	NA	U	300	U	1500	U	1100	NA	NA	NA	NA	U	U	U	U	U	U	U	94	U	U	U	2500	430	2600	1400	NA	NA	NA	NA
Sodium	66000	48200	60500	87200	31000	31300	NA	NA	4840	41400	97200	108000	108000	225000	NA	NA	NA	NA	4250	24500	7440	17200	8890	33000	3340	169000	4500	38900	62900	72000	134000	111000	74200	NA	NA	NA	NA
OTHER PARAMETERS (mg/L)																																					
pH	6.42	6.73	6.38	5.54	6.04	6.04	NA	NA	5.11	5.56	6.58	6.65	6.65	6.22	NA	NA	NA	NA	5.56	4.76	6.70	5.06	4.49	5.33	5.67	6.56	5.05	5.14	6.20	6.19	6.48	6.80	5.82	NA	NA	NA	NA
Sulfate	80.1	28.6	49.6	123	22.1	22.9	NA	NA	9.2	49.9	128	178	105	136	NA	NA	NA	NA	28.5	17.9	25.4	7.5	75.9	48	U	160	U	34	71.4	51.8	106	118	114	NA	NA	NA	NA

FT - Feet below ground surface.
VOC Analysis performed via Method 524.2 (well SC28D), all other sample results via Method 624.
Total metals performed via Method 6010B; Hexavalent Chromium via Method 7196A; and Sulfate via Method 300.0.
U - Indicates compound analyzed for but not detected (organics and inorganics).
J - Indicates an estimated value (organics).
B - The analyte is found in the associated blank as well as in the sample (organics) or the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but not greater than or equal to the Instrument Detection Limit (IDL) (inorganics).
NA - Not analyzed.
(1) - Duplicate sample of well SC3D (R).

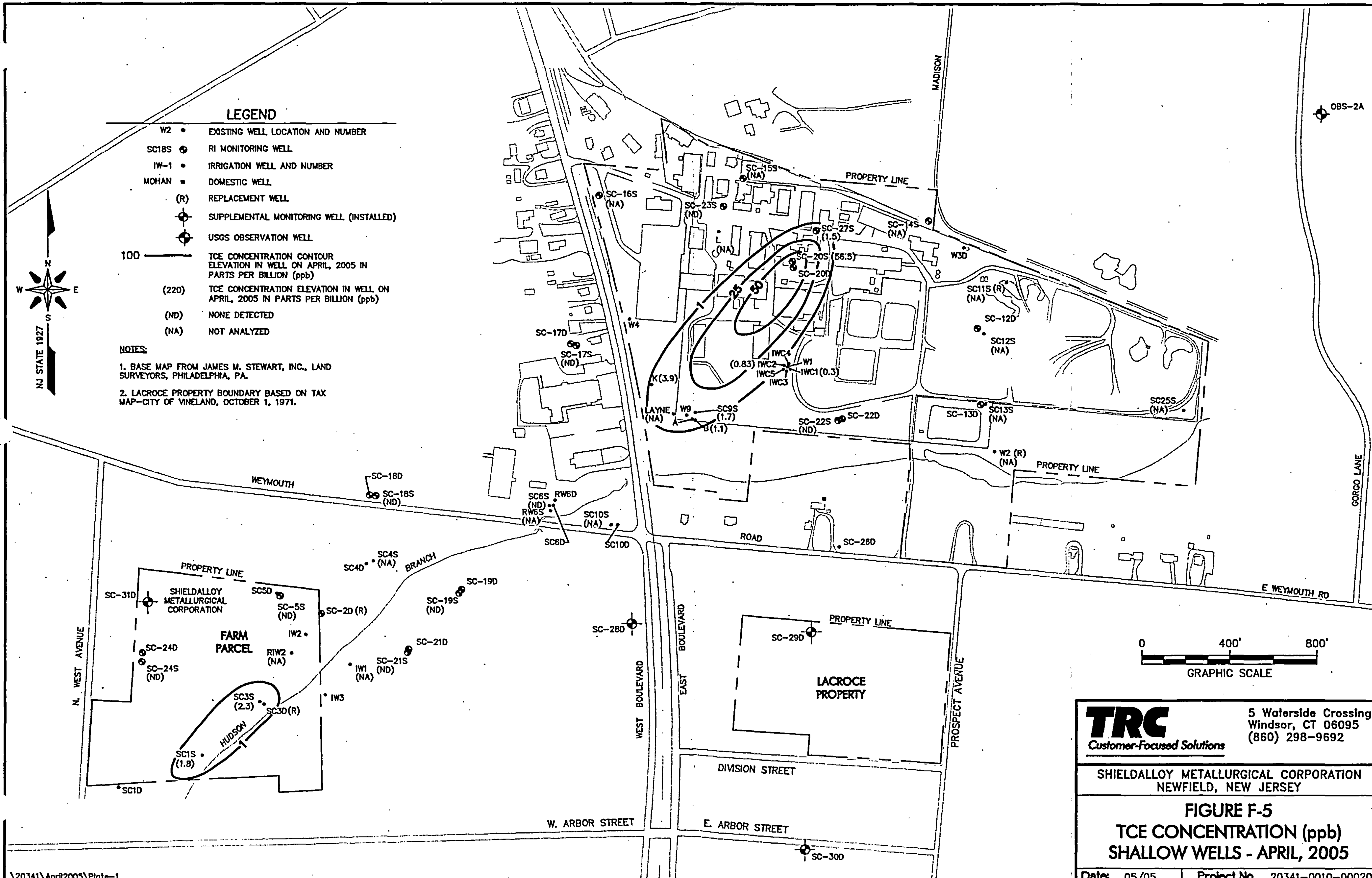
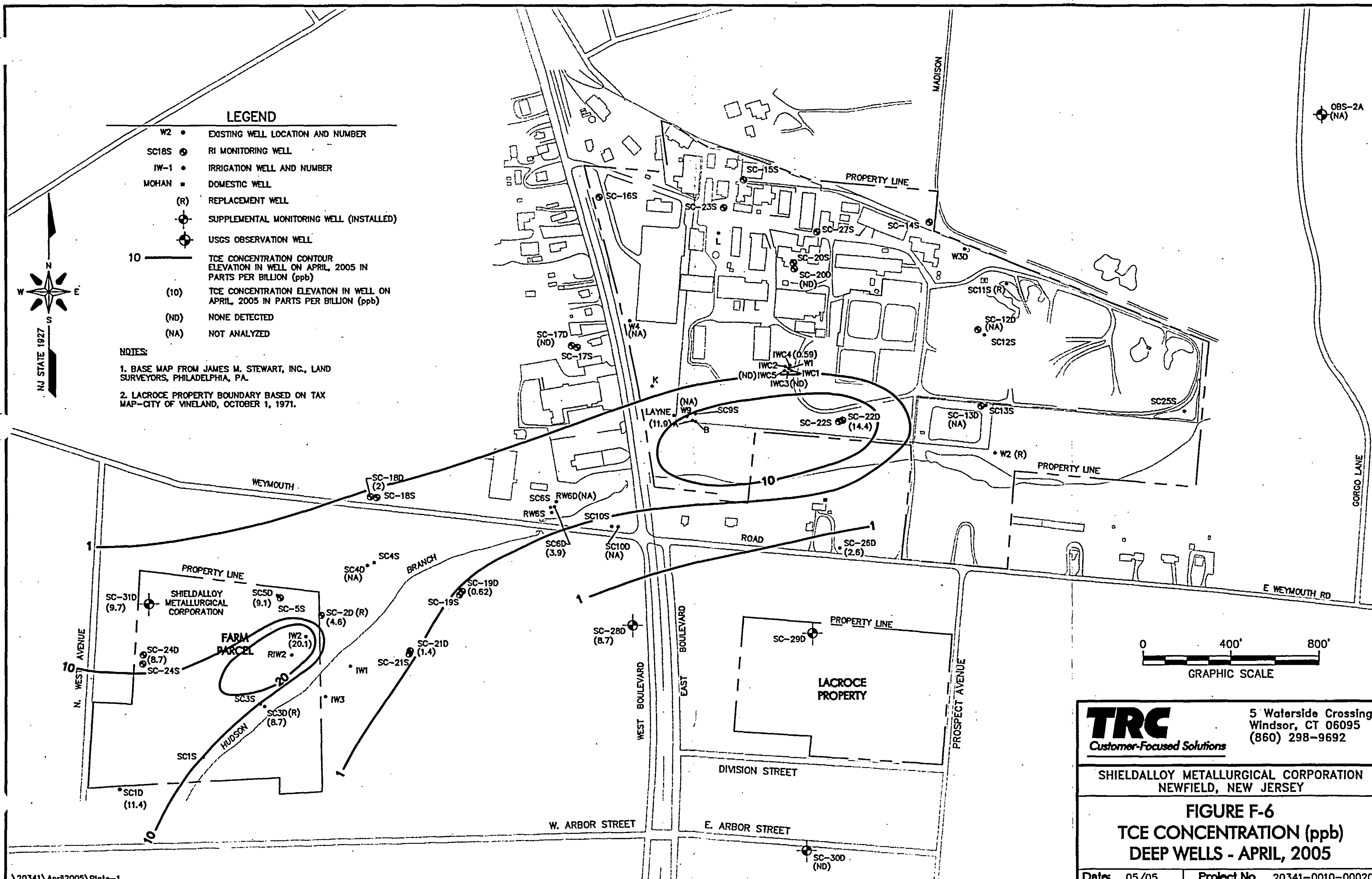
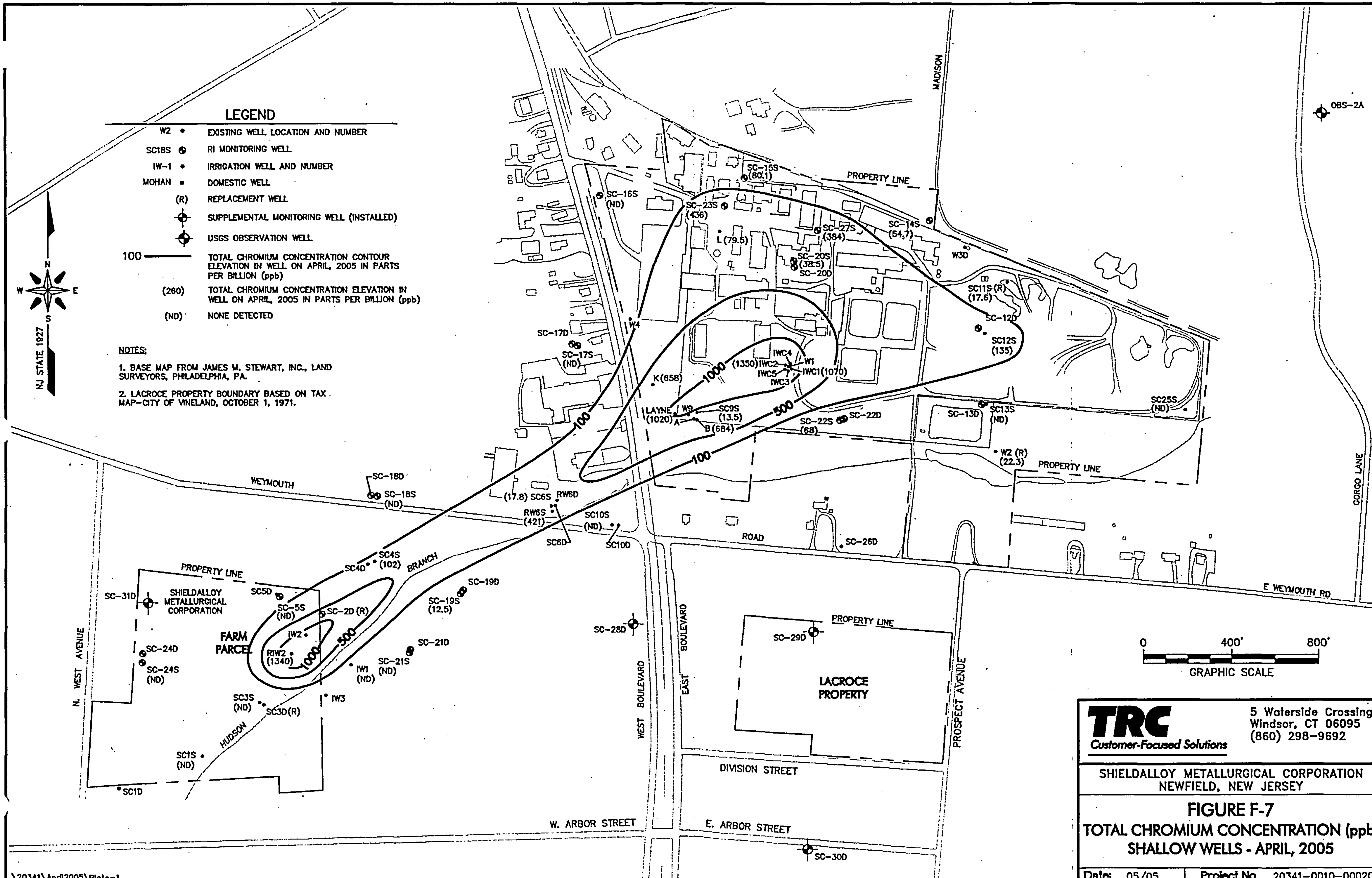
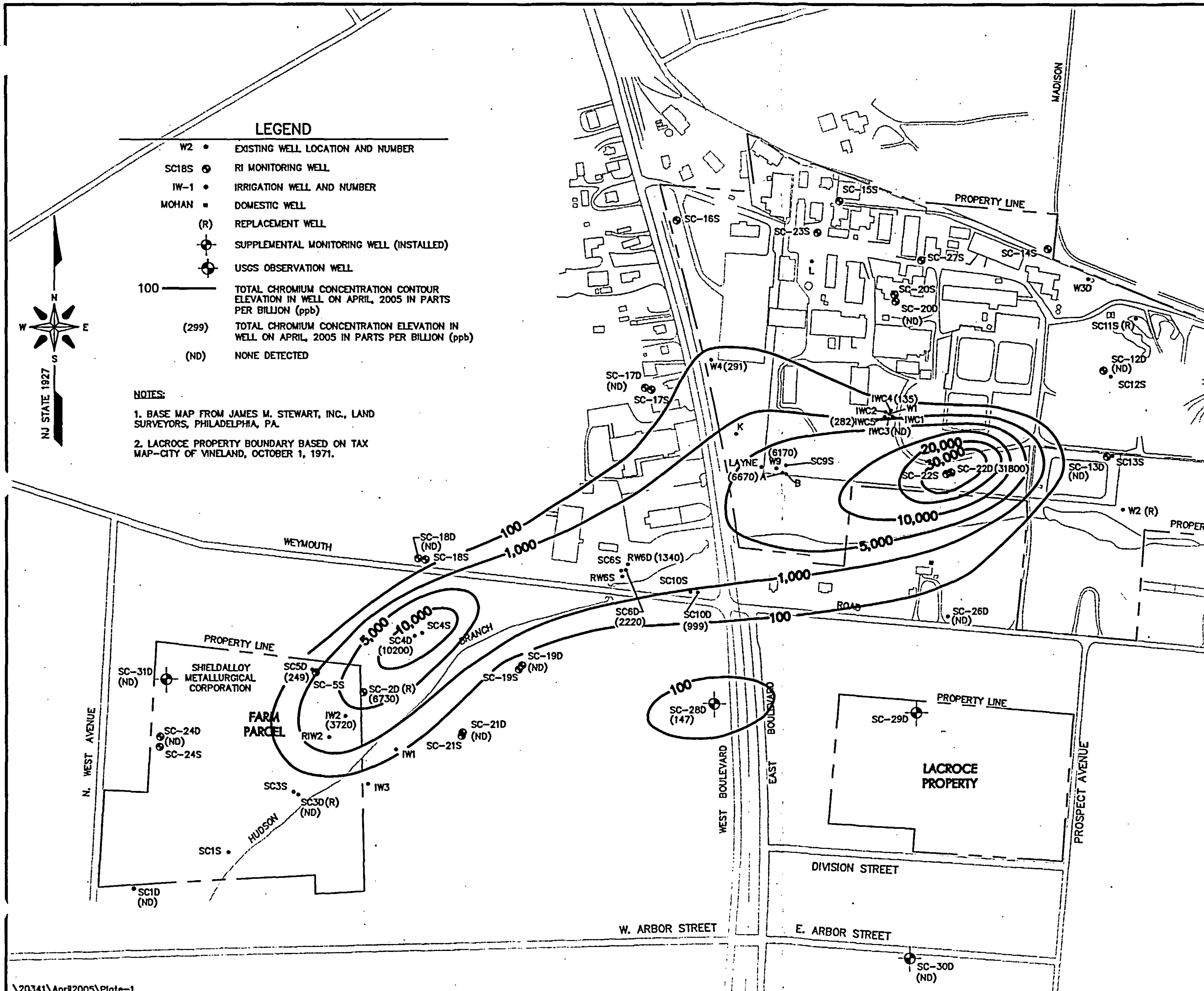


FIGURE F-5
TCE CONCENTRATION (ppb)
SHALLOW WELLS - APRIL, 2005


LEGEND
W2 • EXISTING WELL LOCATION AND NUMBER
SC18S RI MONITORING WELL
IW-1 • IRRIGATION WELL AND NUMBER
MOHAN ▪ DOMESTIC WELL
(R) REPLACEMENT WELL
SUPPLEMENTAL MONITORING WELL (INSTALLED)
USGS OBSERVATION WELL
10 TCE CONCENTRATION CONTOUR ELEVATION IN WELL ON APRIL, 2005 IN PARTS PER BILLION (ppb)
(10) TCE CONCENTRATION ELEVATION IN WELL ON APRIL, 2005 IN PARTS PER BILLION (ppb)
(ND) NONE DETECTED
(NA) NOT ANALYZED
NOTES:
1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
NJ STATE 1927
N S E W
MADISON
OBS-2A (NA)
SC-15S
PROPERTY LINE
SC-16S
SC-23S
SC-27S
SC-14S
W3D
SC-20S
SC-20D (ND)
SC11S (R)
SC-12D (NA)
SC12S
W4 (NA)
SC-17D (ND)
SC-17S
IWC4 (0.59)
W1
IWC2
(ND) IWC5
IWC1
IWC3 (ND)
K
LAYNE (11.9)
(NA) W9
SC9S
A
B
SC-22S
SC-22D (14.4)
SC-13D (NA)
SC13S
SC25S
W2 (R)
PROPERTY LINE
GORGO LANE
10
SC-18D (2)
SC-18S
WEYMOUTH
SC6S
RW6D(NA)
RW6S
SC10S
SC6D (3.9)
SC10D (NA)
ROAD
1
SC-26D (2.6)
E WEYMOUTH RD
1
SC4D (NA)
SC4S
BRANCH
PROPERTY LINE
SC-31D (9.7)
SHIELDALLOY METALLURGICAL CORPORATION
SC5D (9.1)
SC-5S
SC-2D (R) (4.6)
SC-19D (0.62)
SC-19S
1
SC-28D (8.7)
PROPERTY LINE
SC-29D
0 400' 800'
GRAPHIC SCALE
FARM PARCEL
IW2 (20.1)
RIW2
SC-24D (8.7)
SC-24S
10
N. WEST AVENUE
20
IW1
SC-21D (1.4)
SC-21S
IW3
SC3S
SC3D(R) (8.7)
HUDSON
SC1S
SC1D (11.4)
1
10
WEST BOULEVARD
EAST BOULEVARD
LACROCE PROPERTY
PROSPECT AVENUE
DIVISION STREET
W. ARBOR STREET
E. ARBOR STREET
SC-30D (ND)
\20341\April2005\Plate-1
TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
FIGURE F-6
TCE CONCENTRATION (ppb)
DEEP WELLS - APRIL, 2005
Date: 05/05
Project No. 20341-0010-00020


LEGEND
W2 • EXISTING WELL LOCATION AND NUMBER
SC18S RI MONITORING WELL
IW-1 • IRRIGATION WELL AND NUMBER
MOHAN ▪ DOMESTIC WELL
(R) REPLACEMENT WELL
SUPPLEMENTAL MONITORING WELL (INSTALLED)
USGS OBSERVATION WELL
100 TOTAL CHROMIUM CONCENTRATION CONTOUR ELEVATION IN WELL ON APRIL, 2005 IN PARTS PER BILLION (ppb)
(260) TOTAL CHROMIUM CONCENTRATION ELEVATION IN WELL ON APRIL, 2005 IN PARTS PER BILLION (ppb)
(ND) NONE DETECTED
NOTES:
1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
NJ STATE 1927
N S E W
MADISON
PROPERTY LINE
SC-15S (80.1)
SC-16S (ND)
SC-23S (436)
L (79.5)
SC-27S (384)
SC-14S (54.7)
SC-20S (38.5)
SC-20D
W3D
SC11S (R) (17.6)
SC-12D
SC12S (135)
OBS-2A
SC-17D
SC-17S (ND)
W4
K (658)
IWC4
W1
(1350) IWC2
IWC1 (1070)
IWC5
IWC3
1000
500
100
LAYNE (1020)
W3
SC9S (13.5)
A
B (684)
SC-22S (68)
SC-22D
SC-13D
SC13S (ND)
SC25S (ND)
W2 (R) (22.3)
PROPERTY LINE
CORGO LANE
WEYMOUTH
ROAD
SC-18D
SC-18S (ND)
(17.8) SC6S
RW6D
RW6S (421)
SC6D
SC10S (ND)
SC10D
SC-26D
E WEYMOUTH RD
SC4S (102)
SC4D
BRANCH
PROPERTY LINE
SC-31D
SHIELDALLOY METALLURGICAL CORPORATION
SC5D
SC-5S (ND)
SC-2D (R)
SC-19D
SC-19S (12.5)
FARM PARCEL
IW2
RIW2 (1340)
SC-21D
SC-21S (ND)
IW1 (ND)
SC-24D
SC-24S (ND)
SC3S (ND)
SC3D (R)
IW3
HUDSON
SC1S (ND)
SC1D
N. WEST AVENUE
SC-28D
WEST BOULEVARD
EAST BOULEVARD
PROPERTY LINE
SC-29D
LACROCE PROPERTY
PROSPECT AVENUE
DIVISION STREET
W. ARBOR STREET
E. ARBOR STREET
SC-30D
0 400' 800'
GRAPHIC SCALE
TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
FIGURE F-7
TOTAL CHROMIUM CONCENTRATION (ppb)
SHALLOW WELLS - APRIL, 2005
Date: 05/05
Project No. 20341-0010-00020
\20341\April2005\Plate-1



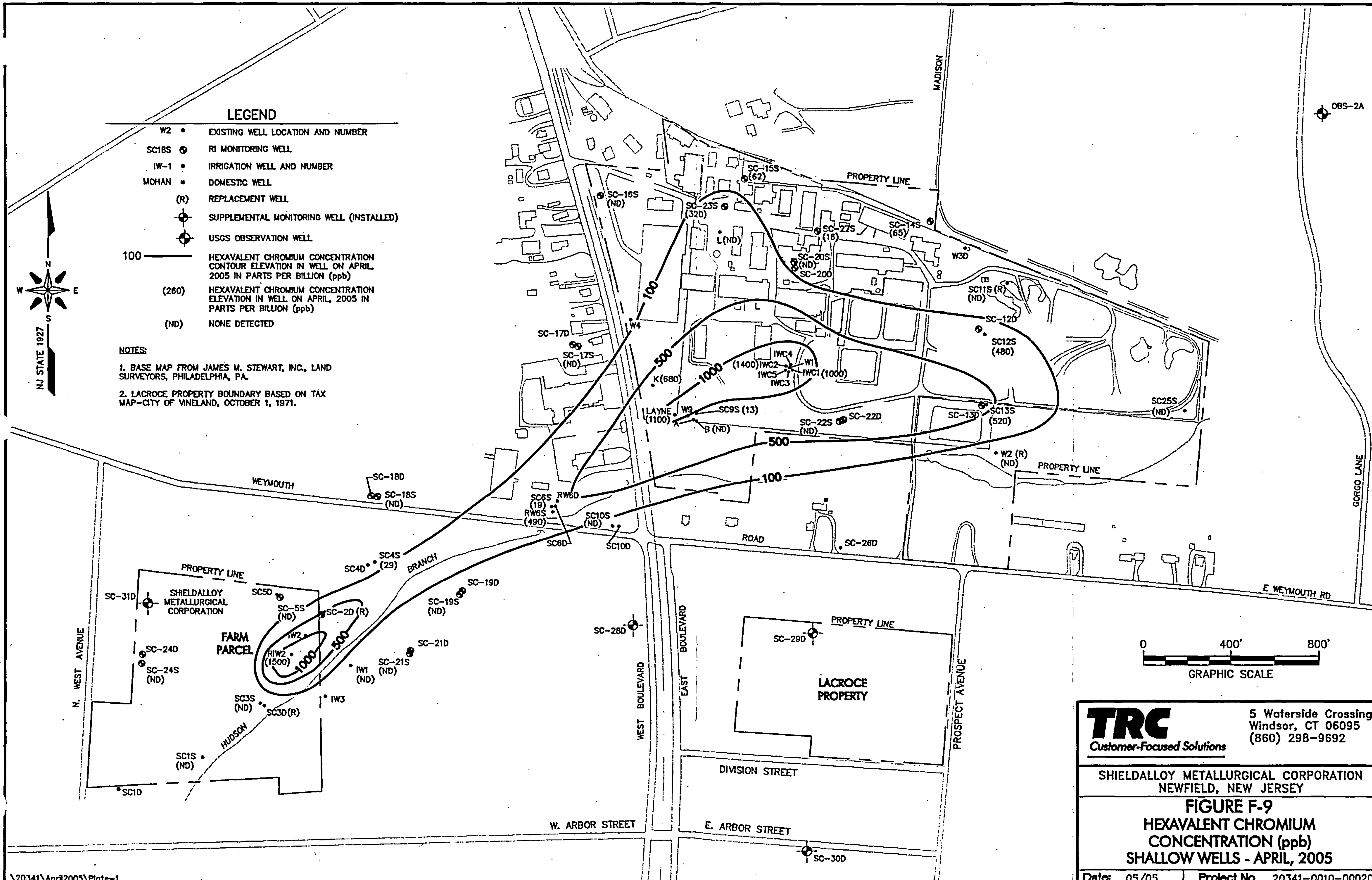
TRC Customer-Focused Solutions

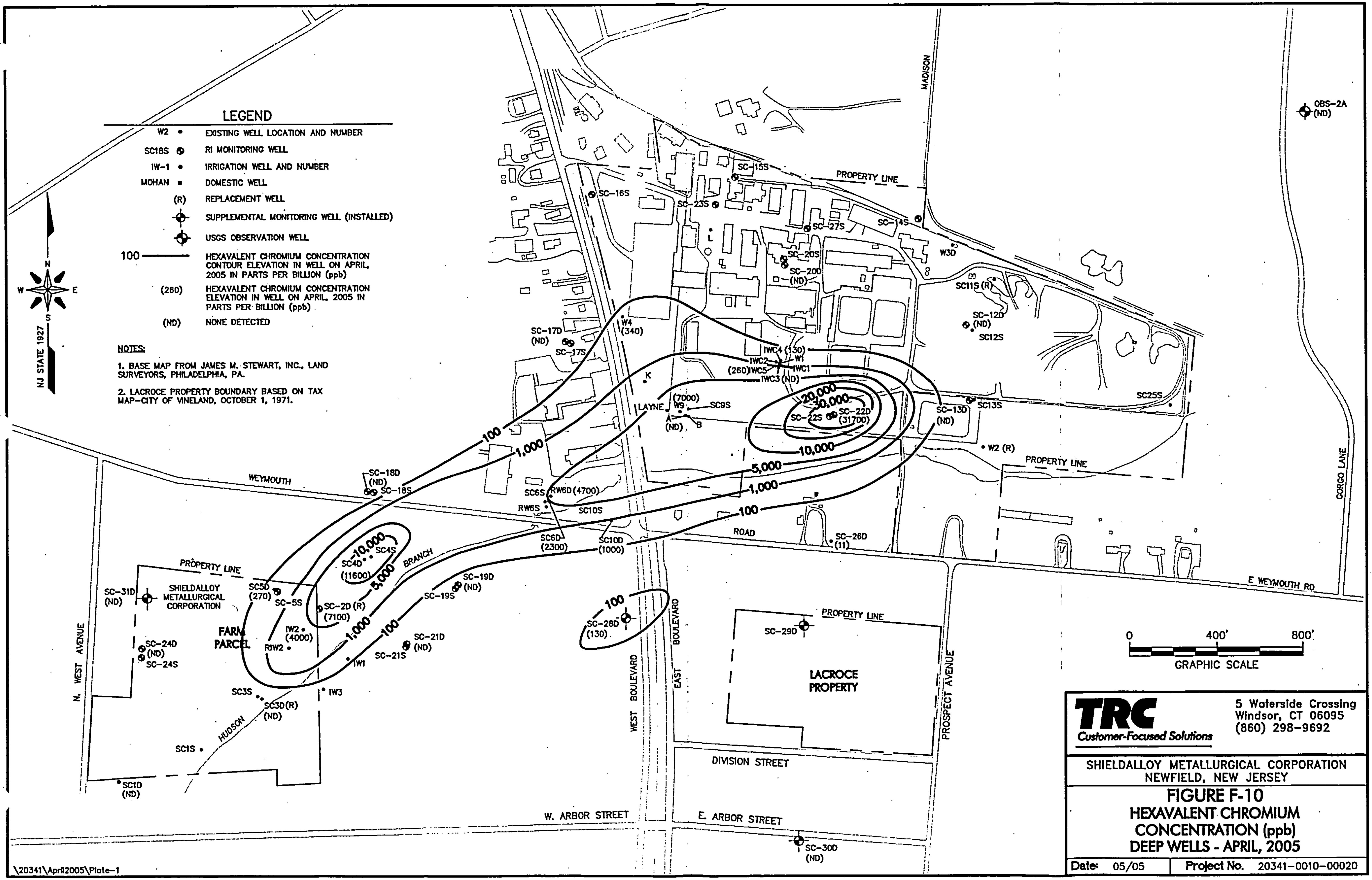
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE F-8
TOTAL CHROMIUM CONCENTRATION (ppb)
DEEP WELLS - APRIL, 2005

Date: 05/05	Project No. 20341-0010-00020


LEGEND
W2 • EXISTING WELL LOCATION AND NUMBER
SC18S RI MONITORING WELL
IW-1 • IRRIGATION WELL AND NUMBER
MOHAN ▪ DOMESTIC WELL
(R) REPLACEMENT WELL
SUPPLEMENTAL MONITORING WELL (INSTALLED)
USGS OBSERVATION WELL
100 HEXAVALENT CHROMIUM CONCENTRATION CONTOUR ELEVATION IN WELL ON APRIL, 2005 IN PARTS PER BILLION (ppb)
(260) HEXAVALENT CHROMIUM CONCENTRATION ELEVATION IN WELL ON APRIL, 2005 IN PARTS PER BILLION (ppb)
(ND) NONE DETECTED
NOTES:
1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
NJ STATE 1927
N
S
E
W
SC-15S (62)
SC-16S (ND)
SC-23S (320)
L(ND)
SC-27S (16)
SC-14S (65)
W3D
SC-20S (ND)
SC-20D
SC11S (R) (ND)
SC-12D
SC12S (480)
SC-17D
SC-17S (ND)
W4
K(680)
IWC4
(1400) IWC2
IWC5
IWC3
W1
IWC1 (1000)
LAYNE (1100)
W9
SC9S (13)
B (ND)
SC-22S (ND)
SC-22D
SC-13D
SC13S (520)
SC25S (ND)
W2 (R) (ND)
OBS-2A
MADISON
PROPERTY LINE
GORGO LANE
WEYMOUTH
ROAD
E WEYMOUTH RD
SC-18D
SC-18S (ND)
SC6S (19)
RW6D
RW6S (490)
SC6D
SC10S (ND)
SC10D
SC-26D
SC4S (29)
SC4D
BRANCH
HUDSON
SC-31D
SHIELDALLOY METALLURGICAL CORPORATION
FARM PARCEL
SC5D
SC-5S (ND)
SC-2D (R)
IW2
RIW2 (1500)
SC-19D
SC-19S (ND)
SC-21D
SC-21S (ND)
IW1 (ND)
IW3
SC-24D
SC-24S (ND)
SC3S (ND)
SC3D (R)
SC1S (ND)
SC1D
N. WEST AVENUE
SC-28D
WEST BOULEVARD
EAST BOULEVARD
SC-29D
LACROCE PROPERTY
PROSPECT AVENUE
DIVISION STREET
W. ARBOR STREET
E. ARBOR STREET
SC-30D
100
500
1000
0 400' 800'
GRAPHIC SCALE
TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
FIGURE F-9
HEXAVALENT CHROMIUM CONCENTRATION (ppb)
SHALLOW WELLS - APRIL, 2005
Date: 05/05
Project No. 20341-0010-00020
\20341\April2005\Plate-1


LEGEND
W2 • EXISTING WELL LOCATION AND NUMBER
SC18S RI MONITORING WELL
IW-1 • IRRIGATION WELL AND NUMBER
MOHAN ▪ DOMESTIC WELL
(R) REPLACEMENT WELL
SUPPLEMENTAL MONITORING WELL (INSTALLED)
USGS OBSERVATION WELL
100 HEXAVALENT CHROMIUM CONCENTRATION CONTOUR ELEVATION IN WELL ON APRIL, 2005 IN PARTS PER BILLION (ppb)
(260) HEXAVALENT CHROMIUM CONCENTRATION ELEVATION IN WELL ON APRIL, 2005 IN PARTS PER BILLION (ppb)
(ND) NONE DETECTED
NOTES:
1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
NJ STATE 1927
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S
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WEYMOUTH
ROAD
E WEYMOUTH RD
BRANCH
HUDSON
MADISON
GORGO LANE
N. WEST AVENUE
WEST BOULEVARD
EAST BOULEVARD
PROSPECT AVENUE
DIVISION STREET
W. ARBOR STREET
E. ARBOR STREET
PROPERTY LINE
SHIELDALLOY METALLURGICAL CORPORATION
FARM PARCEL
LACROCE PROPERTY
OBS-2A (ND)
SC-15S
SC-16S
SC-23S
SC-27S
SC-14S
SC-20S
SC-20D (ND)
W3D
SC11S (R)
SC-12D (ND)
SC12S
SC-17D (ND)
SC-17S
W4 (340)
IWC4 (130)
IWC2
W1
(260) IWC5
IWC1
IWC3 (ND)
K
LAYNE
(7000) W9
SC9S
A (ND)
B
20,000
30,000
SC-22S
SC-22D (31700)
10,000
5,000
1,000
100
SC-13D (ND)
SC13S
SC25S
W2 (R)
SC-18D (ND)
SC-18S
SC6S
RW6D (4700)
RW6S
SC10S
SC6D (2300)
SC10D (1000)
SC-26D (11)
SC4D (11600)
SC4S
SC-19D (ND)
SC-19S
SC-31D (ND)
SC5D (270)
SC-5S
SC-2D (R) (7100)
IW2 (4000)
RIW2
SC-24D (ND)
SC-24S
SC-21D (ND)
SC-21S
IW1
SC-28D (130)
SC-29D
SC3S
IW3
SC3D (R) (ND)
SC1S
SC1D (ND)
SC-30D (ND)
0 400' 800'
GRAPHIC SCALE
TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
FIGURE F-10
HEXAVALENT CHROMIUM CONCENTRATION (ppb)
DEEP WELLS - APRIL, 2005
Date: 05/05
Project No. 20341-0010-00020
\20341\April2005\Plate-1

TABLE F-4

GROUND WATER / SUSPENDED SOLIDS RADIOLOGICAL RESULTS
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NJ
APRIL 2004

WELL NUMBER	A			W2(R)			OBS-2A (1)			SC11S(R)		
SCREENED INTERVAL (FT)	114-124			2-17			129-149			9-24		
LABORATORY ID NUMBER	F4D100111-006	F4D100111-014	F4D100111-022	F4D100111-005	F4D100111-013	F4D100111-021	F4D100111-008	F4D100111-016	F4D100111-024	F4D100111-002	F4D100111-010	F4D100111-018
UNFILTERED/FILTERED/FILTER PAPER	Unfiltered	Filtered	Filter Paper	Unfiltered	Filtered	Filter Paper	Unfiltered	Filtered	Filter Paper	Unfiltered	Filtered	Filter Paper
PARAMETERS												
Radiochemical Parameter (pCi/L)												
Gross Alpha	0.7U +/- 1.1	0.55U +/- 0.9	NA	1.75J +/- 0.98	0.32U +/- 0.57	NA	4.0 +/- 1.2	2.08J +/- 0.83	NA	0.59U +/- 0.87	0.52U +/- 0.56	NA
Gross Beta	1.9J +/- 1.2	13.0 +/- 2.0	NA	3.4J +/- 1.2	1.6U +/- 1.1	NA	3.4J +/- 1.2	3.0J +/- 1.2	NA	2.7J +/- 1.2	2.5J +/- 0.94	NA
Radium 226	0.1U +/- 0.1	0.11U +/- 0.12	NA	0.05U +/- 0.13	0.13U +/- 0.11	NA	0.95J +/- 0.26	1.23 +/- 0.28	NA	0.14U +/- 0.13	0.17U +/- 0.13	NA
Radium 228	-0.11U +/- 0.3	0.38U +/- 0.38	NA	0.16U +/- 0.34	0.22U +/- 0.34	NA	0.58J +/- 0.33	0.68J +/- 0.39	NA	-0.14U +/- 0.27	0.24U +/- 0.36	NA
Uranium 238 (pCi/sample) (4)	NA	NA	0.31J +/- 0.12	NA	NA	0.38J +/- 0.13	NA	NA	0.32J +/- 0.13	NA	NA	0.29J +/- 0.12

WELL NUMBER	SC12S			SC32S (2)			SC13S			SC14S		
SCREENED INTERVAL (FT)	15-25			15-25			14.7-24.7			12-27		
LABORATORY ID NUMBER	F4D100111-003	F4D100111-011	F4D100111-019	F4D100111-004	F4D100111-012	F4D100111-020	F4D100111-007	F4D100111-015	F4D100111-023	F4D100111-001	F4D100111-009	F4D100111-017
UNFILTERED/FILTERED/FILTER PAPER	Unfiltered (3)	Filtered	Filter Paper	Unfiltered (3)	Filtered	Filter Paper	Unfiltered	Filtered	Filter Paper	Unfiltered	Filtered	Filter Paper
PARAMETERS												
Radiochemical Parameter (pCi/L)												
Gross Alpha	8.8U +/- 9.8	0.91U +/- 0.97	NA	14.0U +/- 10.0	0.29U +/- 0.85	NA	2.6U +/- 2.4	-0.3U +/- 1.5	NA	1.1U +/- 1.0	0.41U +/- 0.84	NA
Gross Beta	128 +/- 16.0	14.0 +/- 2.1	NA	115 +/- 15.0	15.3 +/- 2.3	NA	17.6 +/- 2.5	2.3J +/- 1.2	NA	5.3 +/- 1.5	7.3 +/- 1.4	NA
Radium 226	0.52J +/- 0.18	0.82J +/- 0.24	NA	0.98J +/- 0.24	1.09 +/- 0.26	NA	0.3J +/- 0.17	0.41J +/- 0.17	NA	0.11U +/- 0.1	0.33J +/- 0.15	NA
Radium 228	0.42U +/- 0.31	0.58U +/- 0.41	NA	0.61J +/- 0.37	1.24 +/- 0.43	NA	0.39U +/- 0.27	0.1U +/- 0.36	NA	0.91J +/- 0.36	0.89J +/- 0.32	NA
Uranium 238 (pCi/sample) (4)	NA	NA	0.43J +/- 0.14	NA	NA	0.48J +/- 0.15	NA	NA	0.24J +/- 0.11	NA	NA	0.31J +/- 0.12

Notes:

FT - Feet below ground surface.
pCi/L - Picocuries per liter
NA - Not analyzed
J - Result is greater than sample detection limit but less than stated reporting limit
U - Result is less than the sample detection limit.
(1) - USGS observation well (NJ-WRD Well Number 15-0372) located northeast of the SMC site.
(2) - Duplicate sample of well SC12S.
(3) - The standard reporting limit was exceeded due to a reduction of sample size attributed to the sample's high residual mass. The analytical results are reported with the MDA achieved.
(4) - *Isotopic uranium (U-238) analysis was conducted on the sediment retained on the filter.*

Sample Analyses:

Gross Alpha/Beta by GFPC (EPA 900.0 MOD).
Radium-226 by EPA 903.0 MOD.
Radium-228 by GFPC (EPA 904 MOD).
Isotopic Uranium by Alpha Spectroscopy (DOE A-01-R MOD).

June 9, 2005

Mr. David R. Smith
Shieldalloy Metallurgical Corporation
12 West Boulevard, PO Box 768
Newfield, NJ 08344

Re: Results of Ground Water Sampling (April 13, 2005)

Dear Mr. Smith:

Integrated Environmental Management, Inc. (IEM) is pleased to provide you with the Certificates of Analysis from a groundwater sampling round that took place on April 13, 2005. The samples were collected from four (4) on-site wells and from a well that belongs to the Borough of Newfield.[1]

The samples were collected by a representative of TRC, Inc., and forwarded, without preservative, to Outreach Laboratory in Broken Arrow, OK.[2] Attachment 1 contains the specifications for analysis of the samples. Attachment 2 contains the Certificates of Analysis. Table 1, below, is a summary of findings for an "unfiltered" aliquot:[3,4]

Table 1

Well ID	Radionuclide Concentration (picocuries per liter)*							
	Ra-226	Ra-228	Th-232	Th-230	Th-228	U-238	U-235	U-234
SC25S	< 0.454	16.9	<0.335	<0.751	<0.455	0.725	0.628	3.65
SC11S	<0.293	1.79	<0.336	<0.636	<0.366	3.03	<1.29	2.89
SC12S	<0.325	4.47	<0.246	<0.674	<0.227	<0.272	<0.154	0.427
SC13S	<0.418	7.64	<0.219	<0.606	<0.267	1.86	<0.498	2.57
*BN4-05***	*<1.00*	*5.54*	*0.144*	*<0.653*	*<0.405*	*<0.271*	*0.532*	*0.645*

* Statistically-significant results are shaded.
** Background (up-gradient and off of the Shieldalloy property) well

[1] The Newfield well is up-gradient of the Shieldalloy Metallurgical Corporation (Shieldalloy) plant, and is thus representative of "background" groundwater.

[2] Outreach Laboratory is a NELAC-Certified laboratory for radioanalytical services.

[3] The gross alpha and gross beta results, which would typically be useful as screening values, are not reported in the tables in this letter since isotopic analyses were performed on all samples. They are, however, contained in the Certificates of Analysis.

[4] If an analytical result did not have statistical confidence (i.e., the result is lower than the minimum detectable concentration calculated for each analysis), a "<MDC" value is recorded in the tables instead.

Table 2 is a summary of findings for a "filtered" aliquot, the result of which can be compared to applicable drinking water standards:

Table 2

Well ID	Radionuclide Concentration (picocuries per liter)*							
	Ra-226	Ra-228	Th-232	Th-230	Th-228	U-238	U-235	U-234
SC25S	<0.352	1.18	<0.301	<0.811	<0.455	0.725	0.628	3.65
SC11S	<0.431	5.50	<0.256	<0.696	0.373	<1.77	<0.942	<1.91
SC12S	0.598	2.28	0.312	<0.648	<0.222	<0.483	<0.281	0.666
SC13S	<0.715	<0.532	<0.207	<0.587	<0.232	1.25	<0.220	1.14
*BN4-05***	*<0.459*	*6.39*	*0.310*	*<0.616*	*0.177*	*0.527*	*0.331*	*1.23*

* Statistically-significant results are shaded.
** Background (up-gradient and off of the Shieldalloy property) well

To interpret the Table 2 data, a comparison to the maximum contaminant levels (MCLs) for radionuclides promulgated by the U. S. Environmental Protection Agency in 40 CFR §141.66 may be helpful.[5] A specific MCL is given for Ra-226 and Ra-228, combined, in 40 CFR §141.66(b). For the remaining radionuclides shown in Table 2, 40 CFR §141.66(d)(2) limits the concentration to that which would deliver a radiation dose of four (4) millirem per year if ingested at the rate of two liters of water per day for 365 days as follows:

$$\frac{picocurie}{\ell} \times \frac{2\ \ell}{day} \times \frac{365\ day}{year} \times DCF\ (\frac{millirem}{picocurie}) < \frac{4\ millirem}{year}$$

where picocurie/l = the concentration of the radionuclide in question, and DCF = a dose conversion factor that translates ingestion intake into radiation dose. Using the ingestion dose conversion factors listed in the USEPA's Federal Guidance Report No. 11 for the calculations, the following table of MCLs results:[6]

Table 3

Maximum Contaminant Levels in Drinking Water (picocuries per liter)						
Ra-226 + Ra-228	Th-232	Th-230	Th-228	U-238	U-235	U-234
5	2	10	14	231	205	210

While MCL for the radium isotopes stands alone, the radiation dose limit of four (4) millirem per year is for all other radionuclides combined. Therefore, in order to determine compliance with the MCLs for the non-radium isotopes, the "unity rule", where the sum of the ratio of isotopes to its MCL must be less than one (1). In other words:

$$\frac{[Th\text{-}232]}{MCL_{Th\text{-}232}} + \frac{[Th\text{-}230]}{MCL_{Th\text{-}230}} + \frac{[Th\text{-}228]}{MCL_{Th\text{-}228}} + \frac{[U\text{-}238]}{MCL_{U\text{-}238}} + \frac{[U\text{-}235]}{MCL_{U\text{-}235}} + \frac{[U\text{-}234]}{MCL_{U\text{-}234}} < 1$$

[5] Title 40, Code of Federal Regulations, Part 141, "National Primary Drinking Water Regulations".

[6] U. S. Environmental Protection Agency, EPA-520/1-88-020, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion: Federal Guidance Report No. 11", September, 1988.

Using the Table 2 results for the sample collected from the Borough of Newfield's well as an example:[7]

$$\frac{0.310}{2} + \frac{0.616}{10} + \frac{0.117}{14} + \frac{0.527}{231} + \frac{0.331}{205} + \frac{1.23}{210} = 0.23$$

Because the result is less than unity, the non-radium isotopes in that sample meet the USEPA's drinking water standard for those radionuclides. On the other hand, because the combined Ra-226 and Ra-228 result is slightly greater than five (5) picocuries per liter, the standard for radium cannot be met. However, it is important to note that demonstration of compliance with the drinking water standards for public water supplies is based upon an annual average radionuclide concentration (i.e., multiple analyses per year or one analysis of a composite sample collected over a period of one year), not on one sample collected at a single point in time.[8]

An important finding from this sampling campaign is that the radionuclide content of the groundwater under the Shieldalloy site cannot be distinguished from background. It is thus reasonable to conclude that the presence of licensed radioactive materials at the plant over all of these years is having no impact on the radiological quality of the groundwater.

Thank you for the opportunity of assisting you in completing this interesting assessment. If I can answer any questions or provide you with additional information on this or any other radiation-related matter, please don't hesitate to call me at (240) 631-8990. I look forward to speaking with you again soon.

Sincerely,

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

Carol D. Berger, CHP

Fil 94005.01

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[7] To ensure a level of conservatism in this evaluation, the minimum detectable concentrations shown in Table 2 are taken to be actual concentrations.

[8] See 40 CFR §141.26, "Monitoring Frequency and Compliance Requirements for Radionuclides in Community Water Systems".

APPENDIX G - ECOLOGICAL DATA

APPENDIX G - ECOLOGICAL DATA

Table G-1 - Partial List of Plant Species within Forested Uplands
Table G-2 - Wildlife Species that May Potentially Inhabit the Upland Grasslands, Forested Wetlands/Uplands, and the Hudson Branch
Table G-3 - Results of Qualitative Macroinvertebrate Collection from Selected Sampling Locations
New Jersey Natural Heritage Program Correspondence
U.S. Fish and Wildlife Program Correspondence
Endangered and Threatened Plant Species Survey Report (Amy S. Greene, Inc., 1994)

TABLE G-1
PLANT RECEPTOR SPECIES

Common Name	Scientific Name
Herbs	
Cattail	*Typha latifolia*
Giant Reed	*Phragmites australis*
Sensitive Fern	*Onoclea sensibilis*
Cinnamon Fern	*Osmunda cinnamomea*
Soft Rush	*Juncus effusus*
Japanese Knotweed	*Polygonum cuspidatum*
Sphagnum Moss	*Sphagnum spp.*
Poison Ivy	*Rhus radicans*
Jewel Weed	*Impatiens capensis*
Common Elder	*Sambucus canadensis*
Duckweed	*Lemna spp.*
Marsh Marigold	*Caltha palustris*
Goldenrod	*Salidago spp.*
Bracken Fern	*Pteridium aquilinum*
Crows Foot Club Moss	*Lycopodium*
Shrubs	
Swamp Magnolia	*Magnolia virginiana*
Sweet Pepperbush	*Clethra alnifolia*
Blueberry	*Vaccinium spp.*
Mountain Laurel	*Kalmia latifolia*
Greenbrier	*Smilax spp.*
Multiflora Rose	*Rosa multiflora*
Honeysuckle	*Lonicera spp.*
Bear Oak	*Quercus ilicifolia*
Holly	*Ilex opaca*
Staghorn Sumac	*Rhus typhina*
Trees	
Black Tupelo	*Nyssa sylvatica*
Red Maple	*Acer rubrum*
Atlantic Eastern Red Cedar	*Juniperus virginiana*
Atlantic White Cedar	*Chamaecyparis thyoides*
Willow	*Salix spp.*
White Oak	*Quercus alba*
Northern Red Oak	*Quercus rubra*
Pitch Pine	*Pinus rigida*

TABLE G-1

PLANT RECEPTOR SPECIES

Common Name	Scientific Name
Herbs	
Box Elder	*Acer negundo*
Black Cherry	*Prunus serotina*
Bigtooth Aspen	*Populus grandidentata*
Sassafras	*Sassafras albidum*
Flowering Dogwood	*Cornus florida*
Norway Maple	*Acer platanoides*
Black Locust	*Robinia pseudoacacia*

TABLE G-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
Amphibians								
Bufonidae	Fowler's Toad	*Bufo woodhousei fowleri*	I	Ground Ambusher	Water	X	X	X
Hylidae	Gray Treefrog	*Hyla versicolor*	I	Bark Ambusher	Water	X		X
	Northern Cricket Frog	*Acris crepitans*	I	Riparian Ambusher	Water	X		
	Northern Spring Peeper	*Pseudacris c. crucifer*	I	Riparian Ambusher	Water	X		X
Pelobatidae	Eastern Spadefoot	*Scaphiopus holbrookii*	I	Ground Ambusher	Water			X
Plethodontidae	Mud Salamander	*Pseudotriton montanus*	I	Water Gleaner	Water	X		
	Redback Salamander	*Plethodon c. cinereus*	I	Ground Gleaner	Terrestrial Subsurface			X
Ranidae	Bullfrog	*Rana catesbeiana*	C	Water Ambusher	Water	X		
	Green Frog	*Rana clamitans melanota*	I	Riparian Ambusher	Water	X		X
	Southern Leopard Frog	*Rana utricularia*	I	Riparian Ambusher	Water	X		
	Wood Frog	*Rana sylvatica*	I	Ground Ambusher	Water	X		X
Salamandridae	Red-spotted Newt	*Notophthalmus viridescens*	I	Water Gleaner	Water	X		X
Birds								
Accipitridae	Broad-winged Hawk	*Buteo platypterus*	C	Ground Pouncer	Tree-Branch		X	X
	Red-tailed Hawk	*Buteo jamaicensis*	C	Ground Pouncer	Tree-Branch		X	
Alcedinidae	Belted Kingfisher	*Ceryle alcyon*	P	Water Plunger	Riparian Subsurface	X		
Anatidae	Canada Goose	*Branta canadensis*	H	Ground Grazer	Riparian Ground	X	X	
	Mallard	*Anas platyrhynchos*	G	Water Forager	Riparian Ground	X		
	Wood Duck	*Aix sponsa*	G	Water Forager	Riparian Tree Cavity	X		
Apodidae	Chimney Swift	*Chaetura pelagica*	I	Air Screener	Buildings		X	
Ardeidae	Great Blue Heron	*Ardea herodias*	C	Water Ambusher	Riparian Twig-Branch	X		
	Green-backed Heron	*Butorides striatus*	C	Water Ambusher	Riparian Shrub	X		
Bombycillidae	Cedar Waxwing	*Bombycilla cedrorum*	F	Upper Canopy Gleaner	Tree-Twig		X	
Caprimulgidae	Common Nighthawk	*Chordeiles minor*	I	Air Screener	Buildings		X	
Charadriidae	Killdeer	*Charadrius vociferus*	I	Ground Gleaner	Ground-Herb		X	
Columbidae	Mourning Dove	*Zenaida macroura*	G	Ground Gleaner	Tree-Branch		X	X
	Rock Dove	*Columba livia*	O	Ground Gleaner	Buildings		X	
Corvidae	American Crow	*Corvus brachyrhynchos*	O	Ground Gleaner	Tree-Branch		X	

TABLE G-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
	Blue Jay	*Cyanocitta cristata*	O	Ground Gleaner	Tree-Branch			X
Cuculidae	Black-billed Cuckoo	*Coccyzus erythropthalmus*	I	Lower Canopy Gleaner	Tree-Branch			X
	Yellow-billed Cuckoo	*Coccyzus americanus*	I	Lower Canopy Gleaner	Tree-Branch			X
Falconidae	American Kestrel	*Falco sparverius*	C	Ground Pouncer	Tree Cavity-Crevice		X	
Fringillidae	American Goldfinch	*Carduelis tristis*	O	Ground Gleaner	Shrub		X	
	Blue Grosbeak	*Guiraca caerulea*	O	Ground Gleaner	Shrub	X		X
	Chipping Sparrow	*Spizella passerina*	O	Ground Gleaner	Shrub		X	X
	Field Sparrow	*Spizella pusilla*	O	Ground Gleaner	Ground-Herb		X	
	Indigo Bunting	*Passerina cyanea*	I	Lower Canopy Gleaner	Ground-Herb		X	X
	Northern Cardinal	*Cardinalis cardinalis*	O	Ground Gleaner	Shrub			X
	Song Sparrow	*Melospiza melodia*	O	Ground Gleaner	Ground-Herb	X	X	
	Swamp Sparrow	*Melospiza georgiana*	I	Ground Gleaner	Riparian Ground	X		
Hirundinidae	Barn Swallow	*Hirundo rustica*	I	Air Screener	Buildings		X	
	Tree Swallow	*Tachycineata bicolor*	I	Air Screener	Tree Cavity-Crevice	X	X	
Icteridae	Baltimore Oriole	*Icterus galbula*	O	Upper Canopy Gleaner	Tree-Twig			X
	Brown-headed Cowbird	*Molothrus ater*	O	Ground Gleaner	Nest Parasite	X	X	X
	Common Grackle	*Quiscalus quiscula*	O	Ground Gleaner	Tree-Branch	X	X	X
	Red-winged Blackbird	*Agelaius phoeniceus*	O	Ground Gleaner	Shrub	X	X	
Laridae	Herring Gull	*Larus argentatus*	C	Coastal Scavenger	Beach-Rock-Dune		X	
Mimidae	Brown Thrasher	*Toxostoma rufum*	O	Ground Gleaner	Shrub		X	
	Gray Catbird	*Dumetella carolinensis*	O	Ground Gleaner	Shrub	X	X	X
	Northern Mockingbird	*Mimus polyglottos*	O	Ground Gleaner	Shrub		X	
Paridae	Carolina Chickadee	*Parus carolinensis*	I	Lower Canopy Gleaner	Tree Cavity-Crevice			X
	Tufted Titmouse	*Parus bicolor*	I	Lower Canopy Gleaner	Tree Cavity-Crevice			X
Parulidae	American Redstart	*Setophaga ruticilla*	I	Lower Canopy Gleaner	Tree-Twig			X
	Black-and-White Warbler	*Mniotilta varia*	I	Bark Gleaner	Ground-Herb			X
	Common Yellowthroat	*Geothlypis trichas*	I	Lower Canopy Gleaner	Ground-Herb	X		X
	Prothonotary Warbler	*Protonotaria citrea*	I	Ground Gleaner	Tree Cavity-Crevice	X		X
	Yellow Warbler	*Dendroica petechia*	I	Lower Canopy Gleaner	Shrub	X		
Phasianidae	Northern Bobwhite	*Colinus virginianus*	O	Ground Gleaner	Ground-Herb		X	
Picidae	Downy Woodpecker	*Picoides pubescens*	I	Bark Gleaner	Tree Cavity-Crevice			X

TABLE G-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used Pond/Stream	Grass	Forest
	Northern Flicker	*Colaptes auratus*	I	Ground Gleaner	Tree Cavity-Crevice		X	X
Ploceidae	House Sparrow	*Passer domesticus*	G	Ground Gleaner	Buildings		X	
Scolopacidae	American Woodcock	*Scolopax minor*	I	Ground Prober	Ground-Herb		X	X
	Spotted Sandpiper	*Actitis macularia*	O	Riparian Gleaner	Ground-Herb	X		
Sittidae	White-breasted Nuthatch	*Sitta carolinensis*	I	Bark Gleaner	Tree Cavity-Crevice			X
Strigidae	Eastern Screech-Owl	*Otus asio*	C	Ground Pouncer	Tree Cavity-Crevice		X	
	Great Horned Owl	*Bubo virginianus*	C	Ground Pouncer	Tree-Branch		X	X
Sturnidae	European Starling	*Sturnus vulgaris*	O	Ground Gleaner	Buildings	X	X	
Sylviidae	Blue-gray Gnatcatcher	*Polioptila caerulea*	I	Upper Canopy Gleaner	Tree-Branch			X
Thraupidae	Scarlet Tanager	*Piranga olivacea*	I	Upper Canopy Gleaner	Tree-Twig			X
Trochilidae	Ruby-throated Hummingbird	*Archilochus colubris*	O	Floral Hover-Gleaner	Tree-Branch			X
Troglodytidae	Carolina Wren	*Thryothorus ludovicianus*	I	Lower Canopy Gleaner	Tree Cavity-Crevice			X
	House Wren	*Troglodytes aedon*	I	Lower Canopy Gleaner	Tree Cavity-Crevice			X
Turdidae	American Robin	*Turdus migratorius*	O	Ground Gleaner	Tree-Branch	X	X	X
	Eastern Bluebird	*Sialia sialis*	O	Ground Gleaner	Tree Cavity-Crevice		X	
	Wood Thrush	*Hylocichla mustelina*	O	Ground Gleaner	Tree-Branch			X
Tyrannidae	Eastern Kingbird	*Tyrannus tyrannus*	I	Air Sallier	Tree-Twig	X	X	
	Eastern Phoebe	*Sayornis phoebe*	I	Air Sallier	Buildings	X	X	
	Eastern Wood-Pewee	*Contopus virens*	I	Air Sallier	Tree Branch			X
Tytonidae	Common Barn-Owl	*Tyto alba*	C	Ground Pouncer	Buildings		X	
Vireonidae	Red-eyed Vireo	*Vireo olivaceus*	I	Upper Canopy Gleaner	Tree-Twig			X
Mammals								
Canidae	Coyote	*Canis latrans*	O	Ground Forager	Terrestrial Subsurface			X
	Red Fox	*Vulpes vulpes*	O	Ground Forager	Terrestrial Subsurface		X	X
Cervidae	White-tailed Deer	*Odocoileus virginianus*	H	Ground Grazer	Ground-Herb		X	X
Cricetidae	Meadow Vole	*Microtus pennsylvanicus*	H	Ground Grazer	Terrestrial Subsurface		X	
	Muskrat	*Ondatra zibethicus*	H	Water Grazer	Riparian Subsurface	X		
	White-footed Mouse	*Peromyscus leucopus*	O	Ground Forager	Terrestrial Subsurface		X	X
	Woodland Vole	*Microtus pinetorum*	H	Ground Grazer	Terrestrial Subsurface			X
Didelphidae	Virginia Opossum	*Didelphis virginiana*	O	Ground Forager	Tree Cavity-Crevice	X	X	X

TABLE G-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
Leporidae	Eastern Cottontail	*Sylvilagus floridanus*	H	Ground Grazer	Ground-Herb		X	X
Muridae	House Mouse	*Mus musculus*	O	Ground Forager	Buildings		X	
	Norway Rat	*Rattus norvegicus*	O	Ground Forager	Terrestrial Subsurface		X	
Mustelidae	Ermine	*Mustela erminea*	C	Ground Pursuer	Ground-Herb			X
	Long-tailed Weasel	*Mustela frenata*	C	Ground Pursuer	Terrestrial Subsurface			X
	Striped Skunk	*Mephitis mephitis*	O	Ground Forager	Terrestrial Subsurface		X	X
Procyonidae	Raccoon	*Procyon lotor*	O	Ground Forager	Tree Cavity-Crevice	X	X	X
Sciuridae	Red Squirrel	*Tamiasciurus hudsonicus*	G	Upper Canopy Forager	Tree Cavity-Crevice			X
	Woodchuck	*Marmota monax*	H	Ground Grazer	Terrestrial Subsurface		X	
Soricidae	Masked Shrew	*Sorex cinereus*	I	Ground Gleaner	Terrestrial Subsurface		X	X
	N. Short-tailed Shrew	*Blarina brevicauda*	I	Ground Gleaner	Terrestrial Subsurface		X	X
Talpidae	Eastern Mole	*Scalopus aquaticus*	I	Ground Gleaner	Terrestrial Subsurface		X	
Vespertilionidae	Big Brown Bat	*Eptesicus fuscus*	I	Air Hawker	Buildings	X	X	
	Little Brown Bat	*Myotis lucifugus*	I	Air Hawker	Buildings	X	X	
	Red Bat	*Lasiurus borealis*	I	Air Hawker	Tree-Twig	X	X	X
Zapodidae	Meadow Jumping Mouse	*Zapus hudsonius*	O	Ground Forager	Ground-Herb		X	X
	Woodland Jumping Mouse	*Napaeozapus insignis*	O	Ground Forager	Ground-Herb			X
Reptiles								
Chelydridae	Snapping Turtle	*Chelydra serpentina*	O	Bottom Forager	Riparian Subsurface	X		
Colubridae	Black Rat Snake	*Elaphe o. obsoleta*	C	Ground Ambusher	Terrestrial Subsurface			X
	Eastern Garter Snake	*Thamnophia s. sirtalis*	C	Ground Ambusher	Terrestrial Subsurface	X	X	X
	Eastern Hognose Snake	*Heterodon platyrhinos*	C	Ground Ambusher	Terrestrial Subsurface		X	
	Eastern Kingsnake	*Lampropeltis getulus*	C	Ground Ambusher	Terrestrial Subsurface	X		X
	Eastern Milk Snake	*Lampropeltis t. triangulum*	C	Ground Ambusher	Terrestrial Subsurface		X	X
	Eastern Ribbon Snake	*Thamnophis s. sauritus*	C	Water Ambusher	Riparian Subsurface	X		
	Northern Black Racer	*Coluber c. constrictor*	C	Ground Ambusher	Terrestrial Subsurface		X	X
	Northern Brown Snake	*Storeria d. dekayi*	I	Ground Ambusher	Terrestrial Subsurface		X	X
	Northern Redbelly Snake	*Storeria o. occipitomaculata*	I	Ground Ambusher	Terrestrial Subsurface		X	X

TABLE G-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
	Northern Ringneck Snake	*Diadophis punctatus edwardsi*	C	Ground Ambusher	Terrestrial Subsurface		X	X
	Northern Water Snake	*Nerodia s. sipedon*	C	Water Ambusher	Riparian Subsurface	X		X
	Rough Green Snake	*Opheodrys aestivus*	C	Ground Ambusher	Riparian Subsurface	X		X
Emydidae	Eastern Box Turtle	*Terrapene c. carolina*	O	Ground Forager	Terrestrial Subsurface		X	X
	Eastern Painted Turtle	*Chrysemys p. picta*	O	Bottom Forager	Terrestrial Subsurface	X		
	Red-bellied Turtle	*Chrysemys rubriventris*	O	Bottom Forager	Terrestrial Subsurface	X		
	Spotted Turtle	*Clemmys guttata*	O	Bottom Forager	Riparian Subsurface	X		
Kinosternidae	Musk Turtle	*Sternotherus odoratus*	C	Bottom Forager	Riparian Subsurface	X		
	Mud Turtle	*Kinosternon subrubrum*	O	Bottom Forager	Riparian Subsurface	X		
Scincidae	Five-lined Skink	*Eumeces fasciatus*	I	Ground Ambusher	Terrestrial Subsurface			X

(1) Includes resident and breeding amphibian, avian, mammalian, and reptilian species within the areas of aquatic habitat, grassland, and forest. Migratory and wintering species are also likely to use the area; however, these species would have a lesser potential for exposure to site contaminants than species inhabiting the site for extended periods.

(2) Guilds include:
C: Carnivore I: Insectivore P: Piscivore
H: Herbivore O: Omnivore G: Granivore
F: Frugivore (fruit-eating)

TABLE G-3

MACROBENTHIC SURVEY RESULTS

	Functional Group	Sample ID							
		SD-9A	SD-10	SD-14	SD-17	SD-19	SD-23	SD-30	SD-35
EPHEMEROPTERA									
Caenis	COLLECTOR	97	34	0	1	9	0	0	0
Baetis	COLLECTOR	0	0	0	19	4	0	0	1
Callibaetis	COLLECTOR	6	6	5	0	3	0	0	0
Siphlonurus	COLLECTOR	0	0	1	0	0	0	0	0
TOTAL		103	40	6	20	16	0	0	1
ODONATA									
Enallagma	PREDATOR	131	74	1	0	36	0	0	16
Tetragoneuria	PREDATOR	1	0	0	0	0	0	0	0
Calopteryx	PREDATOR	0	0	0	1	0	0	1	8
Argia	PREDATOR	0	0	0	3	0	0	0	0
Erythemis	PREDATOR	1	0	0	0	0	0	0	0
Aeshna	PREDATOR	4	0	0	0	0	0	0	0
Anax	PREDATOR	0	5	0	0	0	0	0	0
Pantala	PREDATOR	0	2	0	0	6	0	0	0
Tramea	PREDATOR	0	3	0	0	1	0	0	0
Libellula	PREDATOR	0	0	4	0	0	0	1	0
Neurocordulia	PREDATOR	0	0	0	0	0	0	0	1
Basiaeschna	PREDATOR	0	0	0	0	0	0	0	4
TOTAL		137	84	5	4	43	0	2	29
HEMIPTERA									
Ranatra	PREDATOR	1	0	0	0	0	0	0	0
Pelocoris	PREDATOR	0	4	0	0	1	0	1	0
Belostoma	PREDATOR	0	1	0	1	0	0	0	0
Buenoa	PREDATOR	0	1	0	0	0	0	0	0
Notonecta	PREDATOR	0	2	0	0	0	0	0	5
Rheumatobates	PREDATOR	0	1	0	0	0	0	0	0
Limnogonus	PREDATOR	0	0	1	0	1	0	6	6
Callecorixia	PREDATOR	0	0	0	1	0	0	0	0
TOTAL		1	9	1	2	2	0	7	11
MEGALOPTERA									
Sialis	PREDATOR	1	0	0	0	2	0	0	0
TOTAL		1	0	0	0	2	0	0	0
TRICHOPTERA									
Ptilostomis	SHREDDER	0	0	2	1	0	0	0	0
Cheumatopsyche	COLLECTOR	0	0	1	6	0	0	0	0
Oecitis	PREDATOR	0	0	1	0	0	0	0	0
Polycentropus	PREDATOR	0	0	0	0	0	0	0	2
Platycentropus	PREDATOR	0	0	0	0	0	0	0	1
Limnephilus	SHREDDER	0	0	0	0	0	0	0	4
TOTAL		0	0	4	7	0	0	0	7
LEPIDOPTERA									
Paraponynx	SHREDDER	0	0	0	0	0	0	0	1
TOTAL		0	0	0	0	0	0	0	1
COLEOPTERA									
Dineutus	PREDATOR	0	1	0	1	0	0	0	0
Peltodytes	PREDATOR	0	1	0	4	3	0	0	0
Laccophilus	PREDATOR	0	1	0	0	0	0	0	0
Agabus	PREDATOR	0	0	0	0	0	0	0	6
Elmidae(?)	SCRAPER	0	0	0	0	0	0	1	0

TABLE G-3

MACROBENTHIC SURVEY RESULTS

	Functional Group	Sample ID							
		SD-9A	SD-10	SD-14	SD-17	SD-19	SD-23	SD-30	SD-35
TOTAL		0	3	0	5	3	0	1	6
DIPTERA									
Chironomidae	COLLECTOR	93	186	48	19	46	0	5	14
Tipula	SHREDDER	0	0	0	0	0	0	1	0
Tabanus	PREDATOR	0	0	1	0	0	0	0	0
Bezzia	PREDATOR	0	0	1	0	0	0	0	0
Stratiomys	COLLECTOR	1	0	0	0	0	0	0	0
TOTAL		94	186	50	19	46	0	6	14
OLIGOCHAETA	COLLECTOR	2	4	1	2	1	0	24	15
MOLLUSCA									
Pisidium	FILTERER	0	0	0	0	0	113	15	15
Planorbidae	SCRAPER	0	0	0	0	0	0	0	1
Physidae	SCRAPER	31	37	2	0	3	184	1	5
TOTAL		31	37	2	0	3	297	16	21
CRUSTACEA									
Orconectes	COLLECTOR	0	0	0	3	0	0	0	0
Hyalella	COLLECTOR	17	20	0	1	0	0	62	0
Caecidotea	COLLECTOR	0	0	0	0	0	0	0	6
TOTAL		17	20	0	4	0	0	62	6
HIRUDINEA	PARASITE	0	1	0	0	0	1	2	0
HYDRACHNIDIA									
Rhyncholimnochares	PARASITE	5	0	0	1	3	0	0	0
Protzia	PARASITE	0	1	0	0	0	0	0	0
TOTAL		5	1	0	1	3	0	0	0

NA = Not Available

Richard J. Codey
Acting Governor

State of New Jersey

Department of Environmental Protection
Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

Bradley M. Campbell
Commissioner

January 20, 2005

Jean Oliva
TRC Environmental Corporation
5 Waterside Crossing
Windsor, CT 06095-1563

Re: Shieldalloy Metallurgical Corporation, 12 West Boulevard, Newfield, NJ

Dear Ms. Oliva:

Thank you for your data request regarding rare species information for the above referenced project site in Newfield Borough and Vineland City, Gloucester and Cumberland Counties.

Searches of the Natural Heritage Database and the Landscape Project (Version 2) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
eastern box turtle	*Terrapene carolina*		Special Concern	G5	S5B

Neither the Natural Heritage Database nor the Landscape Project has records for any additional rare wildlife species or wildlife habitat within 1/4 mile of the referenced site.

We have also checked the Natural Heritage Database for occurrences of rare plant species or natural communities. The Natural Heritage Data Base does not have any records for rare plants or natural communities on or within 1/4 mile of the site.

Attached are lists of rare species and natural communities that have been documented from Gloucester and Cumberland Counties. If suitable habitat is present at the project site, these species have potential to be present.

Status and rank codes used in the tables and lists are defined in the attached EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, http://www.state.nj.us/dep/gis/imapnj/imapnj.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
Lawrence Niles
NHP File No. 05-3907551

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. Some of the rare species data in the Landscape Project is in the Natural Heritage Database, while other records were obtained from other sources. Natural Heritage Database response letters will list all species (if any) found during a search of the Landscape Project. However, any reports that are included with the response letter will only reference specific records if they are in the Natural Heritage Database. This office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.

NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

LE	Taxa formally listed as endangered.
LT	Taxa formally listed as threatened.
PE	Taxa already proposed to be formally listed as endangered.
PT	Taxa already proposed to be formally listed as threatened.
C	Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
S/A	Similarity of appearance species.

STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

D	Declining species-a species which has exhibited a continued decline in population numbers over the years.
E	Endangered species-an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
EX	Extirpated species-a species that formerly occurred in New Jersey, but is not now known to exist within the state.
I	Introduced species-a species not native to New Jersey that could not have established itself here without the assistance of man.
INC	Increasing species-a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
T	Threatened species-a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
P	Peripheral species-a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
S	Stable species-a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
U	Undetermined species-a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a duel status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

Plant taxa listed as endangered are from New Jersey's official Endangered Plant Species List N.J.S.A. 131B-15.151 et seq.

E Native New Jersey plant species whose survival in the State or nation is in jeopardy.

REGIONAL STATUS CODES FOR PLANTS

LP Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan.

EXPLANATION OF GLOBAL AND STATE ELEMENT RANKS

The Nature Conservancy has developed a ranking system for use in identifying elements (rare species and natural communities) of natural diversity most endangered with extinction. Each element is ranked according to its global, national, and state (or subnational in other countries) rarity. These ranks are used to prioritize conservation work so that the most endangered elements receive attention first. Definitions for element ranks are after The Nature Conservancy (1982: Chapter 4, 4.1-1 through 4.4.1.3-3).

GLOBAL ELEMENT RANKS

G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout it's range; with the number of occurrences in the range of 21 to 100.

G4 Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.

G5 Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.

GH Of historical occurrence throughout its range i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU Possibly in peril range-wide but status uncertain; more information needed.

GX Believed to be extinct throughout range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? Species has not yet been ranked.

STATE ELEMENT RANKS

S1 Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.

S2	Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.
S3	Rare in state with 21 to 100 occurrences (plant species in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.
S4	Apparently secure in state, with many occurrences.
S5	Demonstrably secure in state and essentially ineradicable under present conditions.
SA	Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.
SE	Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).
SH	Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.
SP	Element has potential to occur in New Jersey, but no occurrences have been reported.
SR	Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.
SRF	Elements erroneously reported from New Jersey, but this error persists in the literature.
SU	Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.
SX	Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.
SXC	Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.
SZ	Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined. Typically, the SZ rank applies to a non-breeding population (N) in the state - for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ will only apply when the migrants occur in an irregular, transitory and dispersed manner.

B Refers to the breeding population of the element in the state.

N Refers to the non-breeding population of the element in the state.

T Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species. For example *Stachys palustris* var. *homotricha* is ranked "G5T? SH" meaning the full species is globally secure but the global rarity of the var. *homotricha* has not been determined; in New Jersey the variety is ranked historic.

Q Elements containing a "Q" in the global portion of its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level.

.1 Elements documented from a single location.

Note: To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).

IDENTIFICATION CODES

codes refer to whether the identification of the species or community has been checked by a reliable individual and is indicative of significant habitat.

Y Identification has been verified and is indicative of significant habitat.

BLANK Identification has not been verified but there is no reason to believe it is not indicative of significant habitat.

? Either it has not been determined if the record is indicative of significant habitat or the identification of the species or community may be confusing or disputed.

CUMBERLAND COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
*** Vertebrates						
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B,S4N
AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER		E		G5T5	S2
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW		E		G4	S1B
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
ARDEA HERODIAS	GREAT BLUE HERON		S/S		G5	S2B,S4N
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5	S1B,S2N
CALIDRIS CANUTUS	RED KNOT		T		G5	S3N
CIRCUS CYANEUS	NORTHERN HARRIER		E/U		G5	S1B,S3N
CISTOTHORUS PLATENSIS	SEDGE WREN		E		G5	S1B
CROTALUS HORRIDUS HORRIDUS	TIMBER RATTLESNAKE		E		G4T4	S2
ELAPHE GUTTATA GUTTATA	CORN SNAKE		E		G5T5	S1
EUMECES FASCIATUS	FIVE-LINED SKINK		U		G5	S3
FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B,S?N
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E		G4	S1B,S2N
HYLA ANDERSONII	PINE BARRENS TREEFROG		T		G4	S3
HYLA CHRYSOSCELIS	COPE'S GRAY TREEFROG		E		G5	S2
IXOBRYCHUS EXILIS	LEAST BITTERN		D/S		G5	S3B
LATERALLUS JAMAICENSIS	BLACK RAIL		T/T		G4	S2B
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B,S2N
NOTROPIS CHALYBAEUS	IRONCOLOR SHINER				G4	S1S2
PANDION HALIAETUS	OSPREY		T/T		G5	S2B
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2B,S4N
PITUOPHIS MELANOLEUCUS MELANOLEUCUS	NORTHERN PINE SNAKE		T		G4T4	S3
POOECETES GRAMINEUS	VESPER SPARROW		E		G5	S1B,S2N
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B
STRIX VARIA	BARRED OWL		T/T		G5	S3B
SYNAPTOMYS COOPERI	SOUTHERN BOG LEMMING		U		G5	S2
VIRGINIA VALERIAE VALERIAE	EASTERN SMOOTH EARTH SNAKE		U		G5T5	SU

CUMBERLAND COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
*** Ecosystems						
BRACKISH TIDAL MARSH COMPLEX	BRACKISH TIDAL MARSH COMPLEX				G4	S2?
CAREX STRIATA VAR BREVIS HERBACEOUS VEGETATION	WALTER'S SEDGE COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G?	S1S3
COASTAL PLAIN INTERMITTENT POND	VERNAL POND				G3?	S2S3
FRESHWATER TIDAL MARSH COMPLEX	FRESHWATER TIDAL MARSH COMPLEX				G4?	S3?
PANICUM RIGIDULUM VAR PUBESCENS - DICHANTHELIUM SP / SPHAGNUM SPP HERBACEOUS VEGETATION	REDTOP PANICGRASS - ROSETTE GRASS / SPHAGNUM MOSS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2	S2
PANICUM VIRGATUM HERBACEOUS VEGETATION	SWITCHGRASS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G?	S1?
RHEXIA VIRGINICA - PANICUM VERRUCOSUM HERBACEOUS VEGETATION	VIRGINIA MEADOW-BEAUTY - WARTY PANICGRASS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2G3	S1S3
*** Invertebrates						
ANAX LONGIPES	COMET DARNER				G5	S2S3
APAMEA APAMIFORMIS	A NOCTUID MOTH				G4	S2S4
APAMEA INEBRIATA	A NOCTUID MOTH				G3G4	S2S4
BOLORIA SELENE MYRINA	A SILVER-BORDERED FRITILLARY		T		G5T5	S2
CALLOPHRYS HENRICI	HENRY'S ELFIN				G5	S3S4
CALLOPHRYS HESSELI	HESSEL'S HAIRSTREAK				G3G4	S3S4
CALLOPHRYS IRUS	FROSTED ELFIN		T		G3	S2S3
CATOCALA CONSORS SORSCONI	THE CONSORT UNDERWING				G4T2T4	S1S3

CUMBERLAND COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
CATOCALA PRETIOSA PRETIOSA	PRECIOUS UNDERWING				G4T2T3	S2S3
CELITHEMIS MARTHA	MARTHA'S PENNANT				G4	S3S4
CELITHEMIS VERNA	DOUBLE-RINGED PENNANT				G5	S2
CHLOROPTERYX TEPPERARIA	ANGLE WINGED EMERALD MOTH				G4	SU
CISTHENE KENTUCKIENSIS	KENTUCKY LICHEN MOTH				G4	SH
ENALLAGMA PICTUM	SCARLET BLUET				G3	S3
ENALLAGMA RECURVATUM	PINE BARRENS BLUET				G3	S3
EUSARCA FUNDARIA	A GEOMETRID MOTH				G4	S2S3
FARONTA RUBRIPENNIS	PINK STREAK				G3G4	S3
GOMPHUS APOMYIUS	BANNER CLUBTAIL				G4	S1
HEMARIS GRACILIS	GRACEFUL CLEARWING				G3G4	SU
HESPERIA ATTALUS SLOSSONAE	DOTTED SKIPPER				G3G4T3	S2S3
HESPERIA LEONARDUS	LEONARD'S SKIPPER				G4	S2
IDAEA OBFUSARIA	RIPPLED WAVE				G4G5	S2S4
IDAEA VIOLACEARIA	A GEOMETRID MOTH				G4	S1S3
LIBELLULA AURIPENNIS	GOLDEN-WINGED SKIMMER				G5	S1S2
LIBELLULA AXILENA	BAR-WINGED SKIMMER				G5	S3B,S2N
LIGUMIA NASUTA	EASTERN PONDMUSSEL		T		G4G5	S1
LITHOPHANE LEMMERI	LEMMER'S NOCTUID MOTH				G3G4	S2
LITHOPHANE LEPIDA ADIPEL	A NOCTUID MOTH				G4T4	S3S4
LYCAENA HYLLUS	BRONZE COPPER		E		G5	S2
MACROCHILO HYPOCRITALIS	A NOCTUID MOTH				G4	S3S4
MACROCHILO SANTERIVALIS	A NOCTUID MOTH				G3G4	S1S3
MACROCHILO SP 1	A NOCTUID MOTH				G3	S3
MEROPLEON TITAN	A NOCTUID MOTH				G2G4	S1
METARRANTHIS PILOSARIA	COASTAL BOG METARRANTHIS				G3G4	S3S4
METARRANTHIS SP 1	A GEOMETRID MOTH				G3	S2
PAPAIPEMA STENOCELIS	CHAIN FERN BORER MOTH				G4	S3
PROBLEMA BULENTA	RARE SKIPPER				G2G3	S2
SOMATOCHLORA PROVOCANS	TREETOP EMERALD				G4	S2S3

CUMBERLAND COUNTY
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	NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
	SPEYERIA IDALIA	REGAL FRITILLARY				G3	SH
	SYMPETRUM AMBIGUUM	BLUE-FACED MEADOWHAWK				G5	S2
	TARACHIDIA SEMIFLAVA	HALF YELLOW MOTH				G4	S2S4
*** Other types							
	BALD EAGLE WINTERING SITE	BALD EAGLE WINTERING SITE				G?	S?
	MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?
	PRIMEVAL FOREST	PRIMEVAL FOREST				G3?	S1
*** Vascular plants							
	AESCHYNOMENE VIRGINICA	SENSITIVE JOINT-VETCH	LT	E	LP	G2	S1
	AGASTACHE SCROPHULARIIFOLIA	PURPLE GIANT-HYSSOP				G4	S2
	ARETHUSA BULBOSA	DRAGON MOUTH				G4	S2
	ARISTIDA VIRGATA	WAND-LIKE THREE-AWN GRASS				G5T4T5	S2
	ASCLEPIAS RUBRA	RED MILKWEED			LP	G4G5	S2
	ASCLEPIAS VARIEGATA	WHITE MILKWEED				G5	S2
	ASTER CONCOLOR	EASTERN SILVERY ASTER			LP	G4?	S2
	BIDENS BIDENTOIDES	ESTUARY BURR-MARIGOLD				G3	S2
	BOLTONIA ASTEROIDES VAR ASTEROIDES	ASTER-LIKE BOLTONIA				G5T4T5	S2
	CALYSTEGIA SPITHAMAEA	ERECT BINDWEED		E		G4G5T4T5	S1
	CAREX BARRATTII	BARRATT'S SEDGE			LP	G4	S4
	CAREX MITCHELLIANA	MITCHELL'S SEDGE				G3G4	S2
	CAREX TYPHINA	CAT-TAIL SEDGE				G5	S3
	CAREX UTRICULATA	BOTTLE-SHAPED SEDGE				G5	S2
	CHENOPODIUM PRATERICOLA	NARROW-LEAF GOOSEFOOT				G5	S2
	CHIONANTHUS VIRGINICUS	FRINGETREE				G5	S3
	CLITORIA MARIANA	BUTTERFLY-PEA		E		G5	S1
	COREOPSIS ROSEA	ROSE-COLOR COREOPSIS			LP	G3	S2

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
CROTON WILLDENOWII	ELLIPTICAL RUSHFOIL			LP	G5	S2
CUSCUTA CORYLI	HAZEL DODDER				G5	S2
CUSCUTA POLYGONORUM	SMARTWEED DODDER				G5	S2
CYPERUS ENGELMANNII	ENGELMANN'S FLAT SEDGE				G4Q	S2
CYPERUS POLYSTACHYOS	COAST FLAT SEDGE		E		G5T5	S1
DESMODIUM LAEVIGATUM	SMOOTH TICK-TREFOIL				G5	S3
DESMODIUM STRICTUM	PINELAND TICK-TREFOIL			LP	G4	S2
DESMODIUM VIRIDIFLORUM	VELVETY TICK-TREEFOIL				G5?	S2
DIOSCOREA VILLOSA VAR HIRTICAULIS	HAIRY-STEM WILD YAM				G4G5T3Q	S2
ELATINE AMERICANA	AMERICAN WATERWORT				G4	S2
ELATINE MINIMA	SMALL WATERWORT				G5	S2
ELEOCHARIS EQUISETOIDES	KNOTTED SPIKE-RUSH		E	LP	G4	S1
ELEOCHARIS MELANOCARPA	BLACK-FRUIT SPIKE-RUSH		E		G4	S1
ELEOCHARIS QUADRANGULATA	ANGLED SPIKE-RUSH				G4	S2
ELEOCHARIS TORTILIS	TWISTED SPIKE-RUSH		E		G5	S1
ERAGROSTIS HIRSUTA	STOUT LOVE GRASS				G5	S1.1
ERIOCAULON PARKERI	PARKER'S PIPEWORT				G3	S2
ERIOPHORUM TENELLUM	ROUGH COTTON-GRASS		E		G5	S1
EUPATORIUM AROMATICUM VAR AROMATICUM	SMALLER WHITE SNAKEROOT				G5T5	S1
EUPATORIUM CAPILLIFOLIUM	DOG-FENNEL THOROUGHWORT		E		G5	S1
EUPATORIUM RESINOSUM	PINE BARREN BONESET		E	LP	G3	S2
GALACTIA VOLUBILIS	DOWNY MILK-PEA		E		G5	SH
GENTIANA AUTUMNALIS	PINE BARREN GENTIAN			LP	G3	S3
GENTIANA VILLOSA	STRIPED GENTIAN				G4	SX.1
GNAPHALIUM HELLERI	SMALL EVERLASTING		E		G4G5T3?	SH
GRATIOLA VIRGINIANA	ROUND-FRUIT HEDGE-HYSSOP				G5	S2
HELONIAS BULLATA	SWAMP-PINK	LT	E	LP	G3	S3
HYPERICUM ADPRESSUM	BARTON'S ST. JOHN'S-WORT		E		G2G3	S2

CUMBERLAND COUNTY

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THE NEW JERSEY NATURAL HERITAGE DATABASE

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HYPERICUM GYMNANTHUM	CLASPING-LEAF ST. JOHN'S-WORT				G4	S1
JUNCUS CAESARIENSIS	NEW JERSEY RUSH		E	LP	G2	S2
LESPEDEZA STUEVEI	STUEVE'S DOWNY BUSH-CLOVER				G4?	S2
LOBELIA CANBYI	CANBY'S LOBELIA			LP	G4	S3
MALUS ANGUSTIFOLIA VAR PUBERULA	SPINY WILD CRABAPPLE				G5?T2T4	S2
MUHLENBERGIA TORREYANA	PINE BARREN SMOKE GRASS			LP	G3	S3
MYRIOPHYLLUM PINNATUM	CUTLEAF WATER-MILFOIL		E		G5	S1
MYRIOPHYLLUM VERTICILLATUM	WHORLED WATER-MILFOIL		E		G5	SH
NUPHAR MICROPHYLLUM	SMALL YELLOW POND-LILY		E		G5T4T5	SH
NYMPHOIDES CORDATA	FLOATINGHEART			LP	G5	S3
OBOLARIA VIRGINICA	VIRGINIA PENNYWORT				G5	S2
ONOSMODIUM VIRGINIANUM	VIRGINIA FALSE-GROMWELL		E		G4	S1
OPHIOGLOSSUM VULGATUM VAR PYCNOSTICHUM	SOUTHERN ADDER'S-TONGUE		E		G5	S1
PANICUM HEMITOMON	MAIDEN-CANE			LP	G5?	S2
PANICUM WRIGHTIANUM	WRIGHT'S PANIC GRASS				G4	S2
PASPALUM DISSECTUM	MUDBANK CROWN GRASS				G4?	S2
PENSTEMON LAEVIGATUS	SMOOTH BEARDTONGUE		E		G5	S1
PHORADENDRON LEUCARPUM	AMERICAN MISTLETOE			LP	G5	S2
PINUS SEROTINA	POND PINE				G5	S2
PINUS TAEDA	LOBLOLLY PINE				G5	S2
PLATANTHERA CILIARIS	YELLOW FRINGED ORCHID			LP	G5	S2
POLYGALA INCARNATA	PINK MILKWORT		E		G5	SH
POLYGALA MARIANA	MARYLAND MILKWORT			LP	G5	S2
POLYGALA POLYGAMA	RACEMED MILKWORT				G5	S2
POLYGONUM DENSIFLORUM	DENSE-FLOWER KNOTWEED		E		G5	S1
POTAMOGETON OAKESIANUS	OAKES' PONDWEED				G4	S2
PRENANTHES AUTUMNALIS	PINE BARREN RATTLESNAKE-ROOT			LP	G4G5	S2
PRUNUS ANGUSTIFOLIA	CHICKASAW PLUM		E		G5T4T5	S2

CUMBERLAND COUNTY
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
PUCCINELLIA FASCICULATA	SALTMARSH ALKALI GRASS				G3G5	S2
QUERCUS LYRATA	OVERCUP OAK		E		G5	S1
QUERCUS NIGRA	WATER OAK		E		G5	S1
RHODODENDRON ATLANTICUM	DWARF AZALEA		E		G4G5	S1
RHYNCHOSPORA MICROCEPHALA	SMALL-HEAD BEAKED-RUSH		E		G5T5	S1
RHYNCHOSPORA NITENS	SHORT-BEAKED BALD-RUSH				G4?	S2
RHYNCHOSPORA PALLIDA	PALE BEAKED-RUSH				G3	S3
RUELLIA CAROLINIENSIS	CAROLINA PETUNIA		E		G5	SH
SAGITTARIA SUBULATA	AWL-LEAF ARROWHEAD				G4	S2
SCHIZAEA PUSILLA	CURLY GRASS FERN			LP	G3	S3
SCHOENOPLECTUS NOVAE-ANGLIAE	NEW ENGLAND BULRUSH				G5	S2
SCHWALBEA AMERICANA	CHAFFSEED	LE	E	LP	G2	S1
SCIRPUS MARITIMUS	SALTMARSH BULRUSH		E		G5	SH
SCLERIA MINOR	SLENDER NUT-RUSH			LP	G4	S4
SENECIO TOMENTOSUS	WOOLLY RAGWORT				G4G5	S2
SETARIA MAGNA	GIANT FOX-TAIL				G4G5	S2
SISYRINCHIUM FUSCATUM	SAND-PLAIN BLUE-EYED GRASS				G5?	S2
SPIRANTHES ODORATA	FRAGRANT LADIES'-TRESSES				G5	S2
SPOROBOLUS COMPOSITUS VAR COMPOSITUS	LONG-LEAF RUSH-GRASS				G5T5	S2
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE				G5	S2
STYLOSANTHES BIFLORA	PENCIL-FLOWER				G5	S3
TRICHOSTEMA SETACEUM	NARROW-LEAF BLUECURLS				G5	S2
UTRICULARIA PURPUREA	PURPLE BLADDERWORT			LP	G5	S3
VALERIANELLA RADIATA	BEAKED CORNSALAD		E		G5	S1
VERNONIA GLAUCA	BROAD-LEAF IRONWEED		E		G5	S1
VIOLA BRITTONIANA VAR BRITTONIANA	BRITTON'S COAST VIOLET				G4G5T4T5	S3

179 Records Processed

GLOUCESTER COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

	NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
*** Vertebrates							
	ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B,S4N
	AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER		E		G5T5	S2
	AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW		E		G4	S1B
	AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
	ARDEA HERODIAS	GREAT BLUE HERON		S/S		G5	S2B,S4N
	BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1B
	BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5	S1B,S2N
	CLEMMYS INSCULPTA	WOOD TURTLE		T		G4	S3
	CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E		G3	S2
	DOLICHONYX ORYZIVORUS	BOBOLINK		T/T		G5	S2B
	FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B,S?N
	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E		G4	S1B,S2N
	HYLA ANDERSONII	PINE BARRENS TREEFROG		T		G4	S3
	MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B,S2N
	PANDION HALIAETUS	OSPREY		T/T		G5	S2B
	PITUOPHIS MELANOLEUCUS MELANOLEUCUS	NORTHERN PINE SNAKE		T		G4T4	S3
	PODILYMBUS PODICEPS	PIED-BILLED GREBE		E/S		G5	S1B,S3N
	POOECETES GRAMINEUS	VESPER SPARROW		E		G5	S1B,S2N
	STRIX VARIA	BARRED OWL		T/T		G5	S3B
*** Ecosystems							
	CLADIUM MARISCOIDES HERBACEOUS VEGETATION	TWIG-RUSH COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G3	S2

GLOUCESTER COUNTY

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ELEOCHARIS (OLIVACEA, MICROCARPA, ROBBINSII) - XYRIS (DIFFORMIS VAR DIFFORMIS, SMALLIANA) HERBACEOUS VEGETATION	SPIKERUSH (SMALLFRUIT, BRIGHT GREEN, ROBBIN'S) - YELLOWEYED GRASS (BOG, SMALL'S) COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2	S2
FRESHWATER TIDAL MARSH COMPLEX	FRESHWATER TIDAL MARSH COMPLEX				G4?	S3?
RHEXIA VIRGINICA - PANICUM VERRUCOSUM HERBACEOUS VEGETATION	VIRGINIA MEADOW-BEAUTY - WARTY PANICGRASS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2G3	S1S3
*** Invertebrates						
ALASMIDONTA UNDULATA	TRIANGLE FLOATER		T		G4	S3
CATOCALA PRETIOSA PRETIOSA	PRECIOUS UNDERWING				G4T2T3	S2S3
CELITHEMIS MARTHA	MARTHA'S PENNANT				G4	S3S4
ENALLAGMA PICTUM	SCARLET BLUET				G3	S3
FARONTA RUBRIPENNIS	PINK STREAK				G3G4	S3
GOMPHUS APOMYIUS	BANNER CLUBTAIL				G4	S1
ITAME SP 1	BARRENS ITAME				G3	S3
LAMPSILIS CARIOSA	YELLOW LAMPMUSSEL		T		G3G4	S1
LAMPSILIS RADIATA	EASTERN LAMPMUSSEL		T		G5	S3
LEPTODEA OCHRACEA	TIDEWATER MUCKET		T		G4	S1
LIBELLULA AURIPENNIS	GOLDEN-WINGED SKIMMER				G5	S1S2
LIGUMIA NASUTA	EASTERN PONDMUSSEL		T		G4G5	S1
LITHOPHANE LEMMERI	LEMMER'S NOCTUID MOTH				G3G4	S2
MACROCHILO LOUISIANA	A NOCTUID MOTH				G4	S2S3
MACROCHILO SANTERIVALIS	A NOCTUID MOTH				G3G4	S1S3
MONOLEUCA SEMIFASCIA	A SLUG MOTH				G4G5	S2S3
NICROPHORUS AMERICANUS	AMERICAN BURYING BEETLE	LE	E		G2G3	SH

GLOUCESTER COUNTY

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THE NEW JERSEY NATURAL HERITAGE DATABASE

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PYRGUS WYANDOT	APPALACHIAN GRIZZLED SKIPPER		E		G2	SH
ZANCLOGNATHA SP 1	A NOCTUID MOTH				G3G4	S3
*** Other types						
BALD EAGLE WINTERING SITE	BALD EAGLE WINTERING SITE				G?	S?
*** Vascular plants						
AESCHYNOMENE VIRGINICA	SENSITIVE JOINT-VETCH	LT	E	LP	G2	S1
AGASTACHE NEPETOIDES	YELLOW GIANT-HYSSOP				G5	S2
ALOPECURUS CAROLINIANUS	TUFTED MEADOW-FOXTAIL				G5	S3S4
AMIANTHIUM MUSCITOXICUM	FLY POISON				G4G5	S2
ANEMONE CANADENSIS	CANADA ANEMONE				G5	SX
APLECTRUM HYEMALE	PUTTYROOT		E		G5	S1
ARISTIDA DICHOTOMA VAR CURTISSII	CURTISS' THREE-AWN GRASS				G5T5	S2
ASCLEPIAS RUBRA	RED MILKWEED			LP	G4G5	S2
ASCLEPIAS VARIEGATA	WHITE MILKWEED				G5	S2
ASCLEPIAS VERTICILLATA	WHORLED MILKWEED				G5	S2
ASIMINA TRILOBA	PAWPAW		E		G5	S1
ASTER CONCOLOR	EASTERN SILVERY ASTER			LP	G4?	S2
ASTER RADULA	LOW ROUGH ASTER		E		G5	S1
BIDENS BIDENTOIDES	ESTUARY BURR-MARIGOLD				G3	S2
BOUTELOUA CURTIPENDULA	SIDE-OATS GRAMA GRASS		E		G5T5	S1
CACALIA ATRIPLICIFOLIA	PALE INDIAN PLANTAIN		E		G4G5	S1
CALLITRICHE PALUSTRIS	MARSH WATER-STARWORT				G5	S2
CARDAMINE LONGII	LONG'S BITTERCRESS		E		G3	SH
CAREX BARRATTII	BARRATT'S SEDGE			LP	G4	S4
CAREX FRANKII	FRANK'S SEDGE				G5	S3
CAREX LIMOSA	MUD SEDGE		E		G5	S1
CAREX MITCHELLIANA	MITCHELL'S SEDGE				G3G4	S2

GLOUCESTER COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
CAREX POLYMORPHA	VARIABLE SEDGE		E		G3	S1
CAREX PRAIREA	PRAIRIE SEDGE				G5?	S2
CAREX UTRICULATA	BOTTLE-SHAPED SEDGE				G5	S2
CASTANEA PUMILA	CHINQUAPIN		E		G5	S1
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH				G5	S2
CORALLORHIZA WISTERIANA	SPRING CORALROOT				G5	SX
COREOPSIS ROSEA	ROSE-COLOR COREOPSIS			LP	G3	S2
CROTON WILLDENOWII	ELLIPTICAL RUSHFOIL			LP	G5	S2
CUPHEA VISCOSISSIMA	BLUE WAXWEED				G5?	S3
CYPERUS ENGELMANNII	ENGELMANN'S FLAT SEDGE				G4Q	S2
CYPERUS LANCASTRIENSIS	LANCASTER FLAT SEDGE		E		G5	S1
CYPERUS RETROFRACTUS	ROUGH FLATSEDGE		E		G5	SH
DALIBARDA REPENS	ROBIN-RUN-AWAY		E		G5	SH.1
DESMODIUM LAEVIGATUM	SMOOTH TICK-TREFOIL				G5	S3
DESMODIUM STRICTUM	PINELAND TICK-TREFOIL			LP	G4	S2
DESMODIUM VIRIDIFLORUM	VELVETY TICK-TREEFOIL				G5?	S2
DOELLINGERIA INFIRMA	CORNEL-LEAF ASTER				G5	S2
DRABA REPTANS	CAROLINA WHITLOW-GRASS		E		G5	SH
ELEOCHARIS EQUISETOIDES	KNOTTED SPIKE-RUSH		E	LP	G4	S1
ELEOCHARIS TORTILIS	TWISTED SPIKE-RUSH		E		G5	S1
ELEPHANTOPUS CAROLINIANUS	CAROLINA ELEPHANT-FOOT		E		G5	SH
EPILOBIUM ANGUSTIFOLIUM SSP CIRCUMVAGUM	NARROW-LEAF FIREWEED				G5T5	S1
EPILOBIUM STRICTUM	DOWNY WILLOWHERB				G5?	S2
ERIOCAULON PARKERI	PARKER'S PIPEWORT				G3	S2
ERIOPHORUM GRACILE	SLENDER COTTON-GRASS		E		G5T?	SH
ERIOPHORUM TENELLUM	ROUGH COTTON-GRASS		E		G5	S1
EUPATORIUM RESINOSUM	PINE BARREN BONESET		E	LP	G3	S2
GLYCERIA LAXA	NORTHERN MANNA GRASS				G5	S1
GYMNOPOGON BREVIFOLIUS	SHORT-LEAF SKELETON GRASS		E		G5	S1

GLOUCESTER COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
HELONIAS BULLATA	SWAMP-PINK	LT	E	LP	G3	S3
HETERANTHERA MULTIFLORA	BOUQUET MUD-PLANTAIN				G4	S2
LESPEDEZA STUEVEI	STUEVE'S DOWNY BUSH-CLOVER				G4?	S2
LUDWIGIA LINEARIS	NARROW-LEAF PRIMROSE-WILLOW			LP	G5	S2
LUZULA ACUMINATA	HAIRY WOOD-RUSH		E		G5T4T5	S2
LYCOPODIELLA INUNDATA	NORTHERN BOG CLUB-MOSS				G5	S2
LYGODIUM PALMATUM	CLIMBING FERN			LP	G4	S2
LYSIMACHIA HYBRIDA	LOWLAND LOOSESTRIFE				G5	S3
MALAXIS UNIFOLIA	GREEN ADDER'S-MOUTH				G5	S2
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5	S1
MICRANTHEMUM MICRANTHEMOIDES	NUTTALL'S MUDWORT		E		GH	SH
MUHLENBERGIA CAPILLARIS	LONG-AWN SMOKE GRASS		E		G5T?	S1
MUHLENBERGIA TORREYANA	PINE BARREN SMOKE GRASS			LP	G3	S3
NYMPHOIDES CORDATA	FLOATINGHEART			LP	G5	S3
OBOLARIA VIRGINICA	VIRGINIA PENNYWORT				G5	S2
ONOSMODIUM VIRGINIANUM	VIRGINIA FALSE-GROMWELL		E		G4	S1
PANICUM ACICULARE	BRISTLING PANIC GRASS		E		G4G5	S1
PASPALUM DISSECTUM	MUDBANK CROWN GRASS				G4?	S2
PENSTEMON LAEVIGATUS	SMOOTH BEARDTONGUE		E		G5	S1
PHASEOLUS POLYSTACHIOS VAR POLYSTACHIOS	WILD KIDNEY BEAN				G4T?	S2
PHLOX MACULATA VAR MACULATA	SPOTTED PHLOX				G5T?	S3
PHORADENDRON LEUCARPUM	AMERICAN MISTLETOE			LP	G5	S2
PINUS SEROTINA	POND PINE				G5	S2
PLATANTHERA CILIARIS	YELLOW FRINGED ORCHID			LP	G5	S2
POLYGALA INCARNATA	PINK MILKWORT		E		G5	SH
POLYGALA MARIANA	MARYLAND MILKWORT			LP	G5	S2
POLYGONUM HYDROPIPEROIDES VAR OPELOUSANUM	OPELOUSAS WATER-PEPPER				G5T?Q	S2
PRUNUS ANGUSTIFOLIA	CHICKASAW PLUM		E		G5T4T5	S2

GLOUCESTER COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
PUCCINELLIA FASCICULATA	SALTMARSH ALKALI GRASS				G3G5	S2
PYCNANTHEMUM TORREI	TORREY'S MOUNTAIN-MINT		E		G2	S1
QUERCUS IMBRICARIA	SHINGLE OAK		E		G5	S1.1
QUERCUS MUEHLENBERGII	YELLOW OAK				G5	S3
RANUNCULUS AMBIGENS	WATER-PLANTAIN SPEARWORT				G4	S2
RANUNCULUS LONGIROSTRIS	LONG-BEAK WATER BUTTERCUP				G5	S2
RHYNCHOSPORA GLOBULARIS	COARSE GRASS-LIKE BEAKED-RUSH		E		G5?	S1
RHYNCHOSPORA INUNDATA	SLENDER HORNED-RUSH			LP	G3G4	S2
RHYNCHOSPORA NITENS	SHORT-BEAKED BALD-RUSH				G4?	S2
RHYNCHOSPORA PALLIDA	PALE BEAKED-RUSH				G3	S3
RHYNCHOSPORA SCIRPOIDES	LONG-BEAK BALD-RUSH				G4	S2
ROTALA RAMOSIOR	TOOTHCUP				G5	S3
SAGITTARIA SUBULATA	AWL-LEAF ARROWHEAD				G4	S2
SCHEUCHZERIA PALUSTRIS	ARROW-GRASS		E		G5T5	SH
SCHIZAEA PUSILLA	CURLY GRASS FERN			LP	G3	S3
SCUTELLARIA NERVOSA	VEINED SKULLCAP				G5	S2
SISYRINCHIUM FUSCATUM	SAND-PLAIN BLUE-EYED GRASS				G5?	S2
SPHENOPHOLIS PENSYLVANICA	SWAMP OATS				G4	S2
SPIRANTHES LACINIATA	LACE-LIP LADIES'-TRESSES		E		G4G5	S1
SPIRANTHES ODORATA	FRAGRANT LADIES'-TRESSES				G5	S2
SPOROBOLUS COMPOSITUS VAR COMPOSITUS	LONG-LEAF RUSH-GRASS				G5T5	S2
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE				G5	S2
STACHYS TENUIFOLIA	SMOOTH HEDGE-NETTLE				G5	S3
THASPIUM BARBINODE	HAIRY-JOINT MEADOW-PARSNIP				G5	SX
TIPULARIA DISCOLOR	CRANEFLY ORCHID				G4G5	S3
TRICHOSTEMA SETACEUM	NARROW-LEAF BLUECURLS				G5	S2
UTRICULARIA BIFLORA	TWO-FLOWER BLADDERWORT		E		G5	S1
UTRICULARIA GIBBA	HUMPED BLADDERWORT			LP	G5	S3
VALERIANELLA RADIATA	BEAKED CORNSALAD		E		G5	S1

GLOUCESTER COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
VERBENA SIMPLEX	NARROW-LEAF VERVAIN		E		G5	S1
VERNONIA GLAUCA	BROAD-LEAF IRONWEED		E		G5	S1
VULPIA ELLIOTEA	SQUIRREL-TAIL SIX-WEEKS GRASS		E		G5	SH

154 Records Processed

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Service
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609-646-9310
Fax: 609-646-0352
http://njfieldoffice.fws.gov

IN REPLY REFER TO:
ES-05-NE-010

JAN 31 2005

Jean M. Oliva, Senior Consulting Engineer
TRC
5 Waterside Crossing
Windsor, Connecticut 06095-1563
Fax number: (860) 298-6399

Reference: Threatened and endangered species review within the vicinity of the proposed Shieldalloy Metallurgical Corporation radio logical remedial action (TRC Project No. 26770-0100-00000), located within Newfield, Gloucester County New Jersey

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to Section 7 of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

Except for an occasional transient bald eagle (*Haliaeetus leucocephalus*), no other federally listed or proposed endangered or threatened flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site. Therefore, no further consultation pursuant to Section 7 of the Endangered Species Act is required by the Service. This determination is based on the best available information. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered. Please be aware that this determination is valid for 90 days; therefore, if the project is not initiated within this time, the Service should be contacted prior to project implementation to verify the accuracy of this information. The Service will review current information to ensure that no federally listed threatened or endangered species will be adversely affected by the proposed project.

Enclosed is current information regarding federally listed and candidate species occurring in New Jersey. The Service encourages federal agencies and other planners to consider candidate species in project planning. The addresses of State agencies that may be contacted for current site-specific information regarding federal candidate and State-listed species are also enclosed.

Authorizing Supervisor: [signature]

Enclosures: Current summaries of federally listed and candidate species in New Jersey
Addresses for additional information on candidate and State-listed species

Sect 7 (es-NEsect7.fax) 11/24/03

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW JERSEY

An ENDANGERED species is any species that is in danger of extinction throughout all or a significant portion of its range.

A THREATENED species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

	COMMON NAME	SCIENTIFIC NAME	STATUS
FISHES	Shortnose sturgeon	*Acipenser brevirostrum*	E
REPTILES	Bog turtle	*Clemmys muhlenbergii*	T
	Atlantic Ridley turtle	*Lepidochelys kempii*	E
	Green turtle	*Chelonia mydas*	T
	Hawksbill turtle	*Eretmochelys imbricata*	E
	Leatherback turtle	*Dermochelys coriacea*	E
	Loggerhead turtle	*Caretta caretta*	T
BIRDS	Bald eagle	*Haliaeetus leucocephalus*	T
	Piping plover	*Charadrius melodus*	T
	Roseate tern	*Sterna dougallii dougallii*	E
MAMMALS	Eastern cougar	*Felis concolor couguar*	E+
	Indiana bat	*Myotis sodalis*	E
	Gray wolf	*Canis lupus*	E+
	Delmarva fox squirrel	*Sciurus niger cinereus*	E+
	Blue whale*	*Balaenoptera musculus*	E
	Finback whale*	*Balaenoptera physalus*	E
	Humpback whale*	*Megaptera novaeangliae*	E
	Right whale*	*Balaena glacialis*	E
	Sei whale*	*Balaenoptera borealis*	E
	Sperm whale*	*Physeter macrocephalus*	E

	COMMON NAME	SCIENTIFIC NAME	STATUS
INVERTEBRATES	Dwarf wedgemussel	*Alasmidonta heterodon*	E
	Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	T
	Mitchell's satyr butterfly	*Neonympha m. mitchellii*	E+
	American burying beetle	*Nicrophorus americanus*	E+
PLANTS	Small whorled pogonia	*Isotria medeoloides*	T
	Swamp pink	*Helonias bullata*	T
	Knieskern's beaked-rush	*Rhynchospora knieskernii*	T
	American chaffseed	*Schwalbea americana*	E
	Sensitive joint-vetch	*Aeschynomene virginica*	T
	Seabeach amaranth	*Amaranthus pumilus*	T

STATUS			
E	endangered species	PE	proposed endangered
T	threatened species	PT	proposed threatened
+	presumed extirpated**		

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

** Current records indicate the species does not presently occur in New Jersey, although the species did occur in the State historically.

Note: for a complete listing of Endangered and Threatened Wildlife and Plants, refer to 50 CFR 17.11 and 17.12.

For further information, please contact:

U.S. Fish and Wildlife Service
New Jersey Field Office
927 N. Main Street, Building D
Pleasantville, New Jersey 08232
Phone: (609) 646-9310
Fax: (609) 646-0352

Revised 12/15/04

FEDERAL CANDIDATE SPECIES IN NEW JERSEY

CANDIDATE SPECIES are species that appear to warrant consideration for addition to the federal List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the U.S. Fish and Wildlife Service encourages federal agencies and other planners to give consideration to these species in the environmental planning process.

SPECIES	SCIENTIFIC NAME
Bog asphodel	*Narthecium americanum*
Hirst's panic grass	*Dichanthelium hirstii*

Note: For complete listings of taxa under review as candidate species, refer to <u>*Federal Register*</u> *Vol. 69, No. 86, May 4, 2004 (Endangered and Threatened Wildlife and Plants; Review of Species that are Candidates or Proposed for Listing as Endangered or Threatened).*

Revised June 2004

FEDERAL CANDIDATE AND STATE-LISTED SPECIES

Candidate species are species under consideration by the U.S. Fish and Wildlife Service (Service) for possible inclusion on the List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the Service encourages federal agencies and other planners to consider federal candidate species in project planning.

The New Jersey Natural Heritage Program maintains the most up-to-date information on federal candidate species and State-listed species in New Jersey and may be contacted at the following address:

Coordinator
Natural Heritage Program
Division of Parks and Forestry
P.O. Box 404
Trenton, New Jersey 08625
(609) 984-0097

Additionally, information on New Jersey's State-listed wildlife species may be obtained from the following office:

Dr. Larry Niles
Endangered and Nongame Species Program
Division of Fish and Wildlife
P.O. Box 400
Trenton, New Jersey 08625
(609) 292-9400

If information from either of the aforementioned sources reveals the presence of any federal candidate species within a project area, the Service should be contacted to ensure that these species are not adversely affected by project activities.

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.
18 COMMERCE STREET PLAZA • FLEMINGTON, NJ 08822
(908) 788-9676 • FAX (908) 788-6788
PA (610) 250-0773

June 14, 1994

Mr. Sean Hayden
TRC Environmental Corporation
5 Waterside Crossing
Windsor, CT 06095

Re: Endangered and Threatened Plant Species Survey and Stressed Vegetation Survey
Shieldalloy Metallurgical Corporation Superfund Site
Newfield Borough, Gloucester County, NJ
City of Vineland, Cumberland County, NJ
ASGECI Project #1111

Dear Mr. Hayden:

We are pleased to submit this Endangered and Threatened Plant Species Survey and Stressed Vegetation Survey Report for the above referenced site. The objective of these Surveys is to determine the presence or absence of the following species of concern: Barratt's sedge (*Carex barrattii*), pink tickseed (*Coreopsis rosea*), Pine Barren boneset (*Eupatorium resinosum*) and swamp pink (*Helonias bullata*) and analysis of the existence of stressed vegetation. Resumes of preparers of this report have been included.

The following summarizes the findings of the field investigation and review of existing information for the Shieldalloy Metallurgical Corporation Superfund Site located in Newfield Borough, Gloucester County, and the City of Vineland, Cumberland County, New Jersey. The field investigation was performed on June 6, 1994.

I. Introduction

The survey was conducted over approximately 100 acres, of which the manufacturing facility occupies approximately 60 acres. The northern property, containing the facility, is an irregularly shaped parcel located in Newfield Borough (Figure 1-2). The study area included adjacent wetlands in Newfield and Vineland that are primarily forested and associated with the Hudson Branch (Figure 3-1). The overall

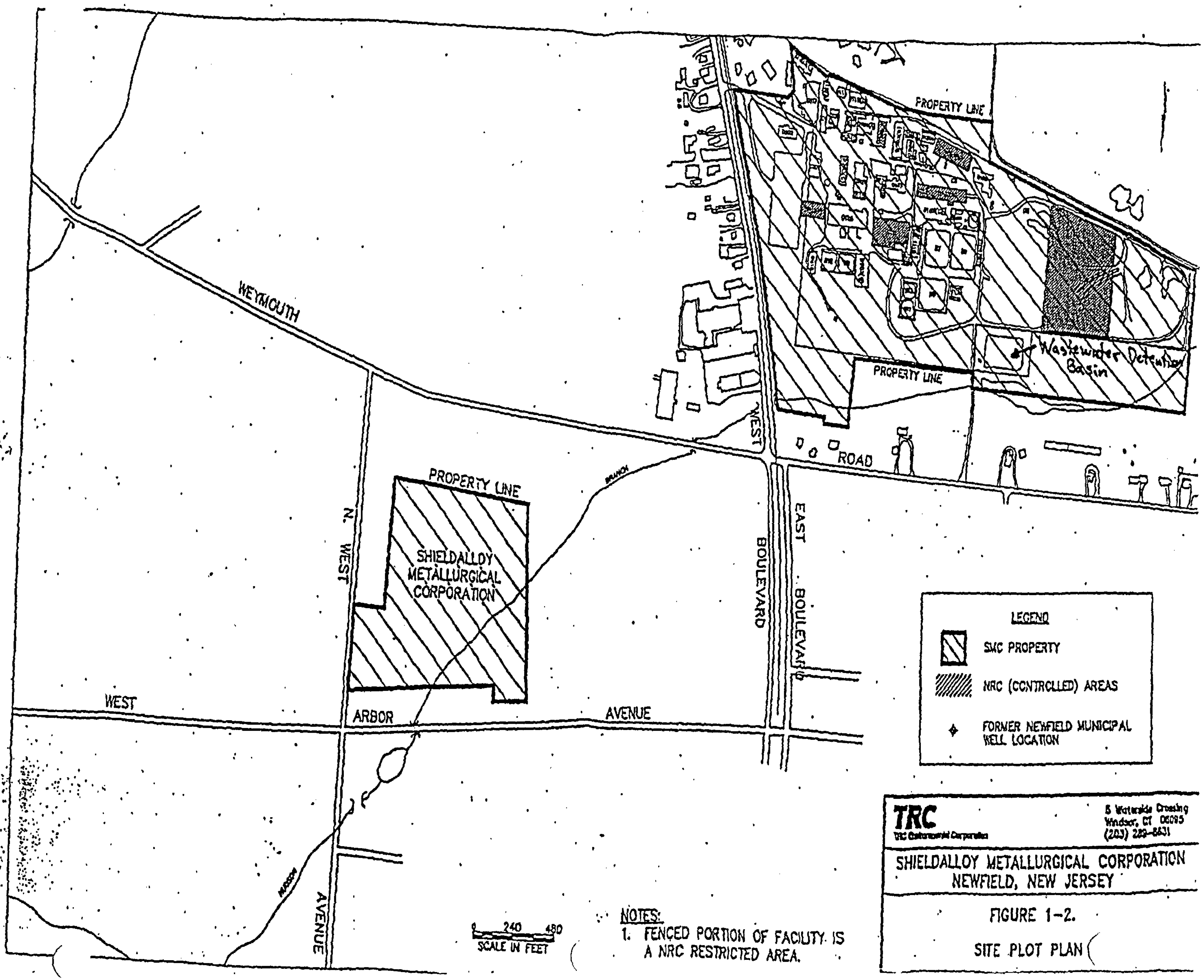
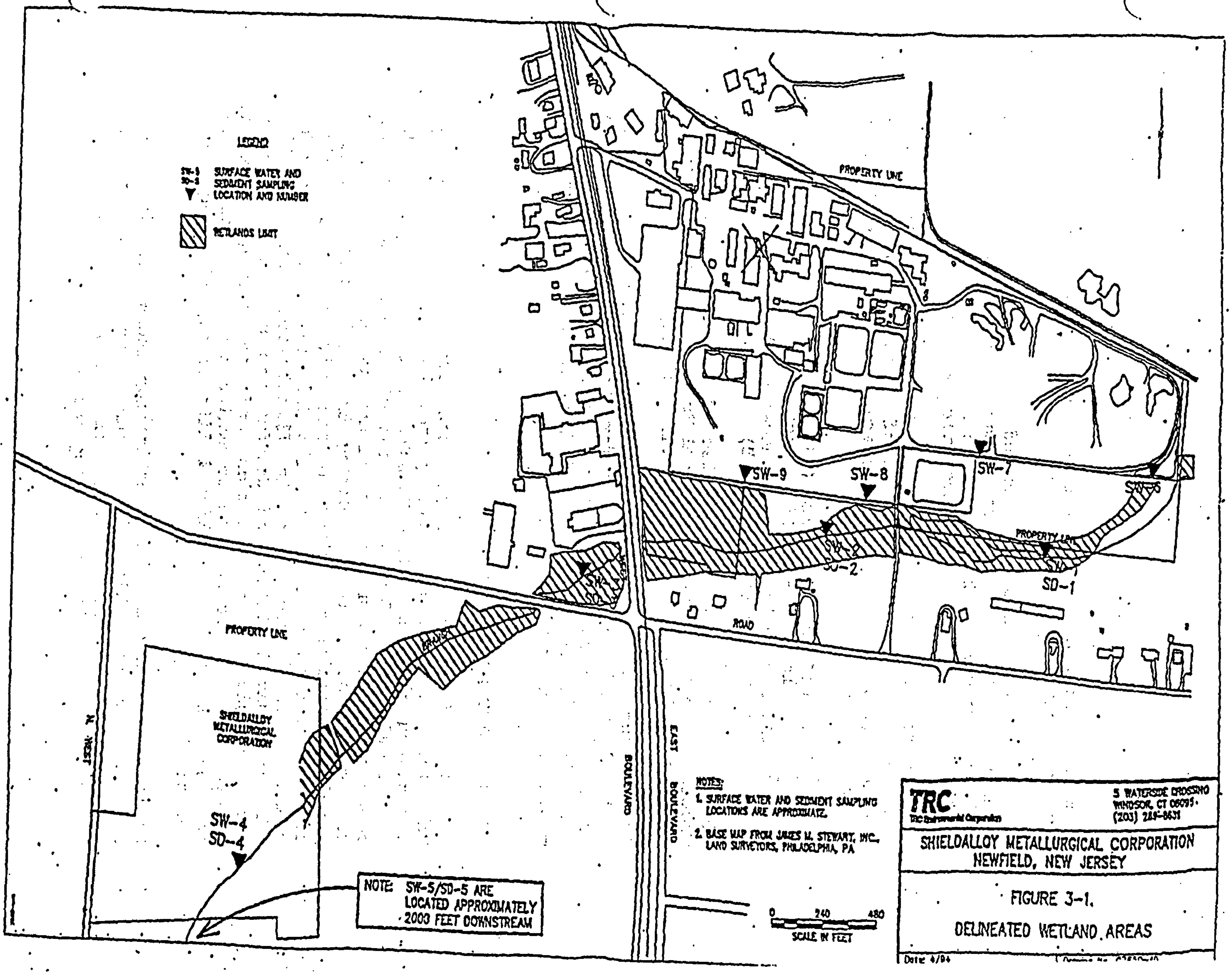


FIGURE 1-2.

SITE PLOT PLAN


LEGEND
SW-5 SD-5 SURFACE WATER AND SEDIMENT SAMPLING LOCATION AND NUMBER
WETLANDS LIMIT
PROPERTY LINE
SW-9
SW-8
SW-7
SW-6
PROPERTY LINE
SW-2
SD-2
SW-1
SD-1
SW-3
ROAD
PROPERTY LINE
SHIELDALLOY METALLURGICAL CORPORATION
WEST
BOULEVARD
EAST BOULEVARD
SW-4
SD-4
NOTE: SW-5/SD-5 ARE LOCATED APPROXIMATELY 2000 FEET DOWNSTREAM
NOTES:
1. SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS ARE APPROXIMATE.
2. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA
0 240 480
SCALE IN FEET
TRC
TRC Environmental Corporation
5 WATERSIDE CROSSING WINDSOR, CT 06095 (203) 289-8631
SHIELDALLOY METALLURGICAL CORPORATION NEWFIELD, NEW JERSEY
FIGURE 3-1.
DELINEATED WETLAND AREAS

topography of the study area consisted of relatively flat to gently sloping terrain.

The study area is located in the Maurice River Watershed within the Delaware Bay Drainage Basin. The wetlands are drained by the Hudson Branch which is tributary to the Burnt Mill Branch of the Maurice River.

According to the State of New Jersey List of Endangered Plant Species and Plant Species of Concern (N.J.A.C. 7:5C-1.1 et seq.), the species of concern have been classified as follows:

- Barratt's sedge - rare (S3)
- pink tickseed - imperiled (S2)
- Pine Barren boneset - endangered (E)
- swamp pink - endangered (E)

Additionally, swamp pink is also classified as threatened according to the Federally Listed Endangered and Threatened Species in New Jersey (50 CFR 17.11 & 17.12, 1990).

Evaluations of the study area were made as to the suitability of existing habitat for these rare species. The stressed vegetation survey was conducted in order to visually identify evidence of the effects of potential contamination on plant species.

II. SAMPLING METHODOLOGY

A habitat evaluation was conducted over the Shield Metallurgy Corporation facility including adjacent wetlands associated with the Hudson Branch. In order to perform the biological survey for the species of concern and stressed vegetation survey, a meander survey was conducted to cover the entire study area. During the field investigation, special attention was given to areas with suitable habitat for the species of concern. The Britton and Brown (1970) plant identification key "An Illustrated Flora of the Northern United States and Canada" was used to determine plant species characteristics and to provide habitat information. Other sources to evaluate the habitat onsite included the use of published literature, site maps and topographic maps.

During the course of the investigation items including, but not limited to, chlorosis, stunted growth and abnormal physiological characteristics were used as criteria to evaluate evidence of stressed vegetation.

III. RESULTS OF STUDY

Our findings of the biological survey indicate that there were no occurrences of Barratt's sedge, pink tickseed, Pine Barren boneset and swamp pink within the study area.

The stressed vegetation survey conducted in conjunction with the biological survey indicated relatively normal growth over the study area, although the site has been subject to manmade disturbances in the past. These disturbances have led to invasive plant species becoming dominant in some portions of wetland and upland areas.

The forested wetlands onsite supported a dominant canopy layer of red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*) and black willow (*Salix nigra*). An often dense, understory growth included southern arrowwood (*Viburnum dentatum*), silky dogwood (*Cornus amomum*), highbush blueberry (*Vaccinium corymbosum*), sweet pepperbush (*Clethra alnifolia*), elderberry (*Sambucus canadensis*) and greenbrier (*Smilax rotundifolia*). The herbaceous layer consisted of an abundance of cinnamon fern (*Osmunda cinnamomea*), tussock sedge (*Carex stricta*) and spotted jewelweed (*Impatiens capensis*). Scrub/shrub wetlands also observed onsite were generally overgrown with similar understory species including fetterbush (*Leucothoe racemosa*).

Emergent wetlands located on the facility site, within a wastewater detention pond, and associated with the Hudson Branch contained a dominance of spike rush (*Eleocharis* spp.), bog rush (*Juncus pelocarpus*), common rush, three square (*Scirpus americanus*), whitened sedge (*Carex albolutescens*), Canada rush (*Juncus canadensis*), slender rush (*Juncus tenuis*), common reedgrass (*Phragmites australis*), tussock sedge (*Carex stricta*), pointed broom sedge (*Carex scoparia*), sallow sedge (*Carex lurida*), larger water-starwort (*Callitriche heterophylla*) and spotted jewelweed.

Forested upland areas throughout the study area contained a dominant canopy layer of southern red oak (*Quercus falcata*), scarlet oak (*Quercus coccinea*), white oak (*Quercus alba*), red maple, black locust (*Robinia psuedoacacia*), mockernut (*Carya tomentosa*) and sand hickory (*Carya pallida*). The understory was supported by similar species in the sapling layer and the dominant vegetation in the shrub layer consisted of black huckleberry (*Gaylussacia baccata*), dangleberry (*Gaylussacia frondosa*), lowbush blueberry (*Vaccinium vacillans*), mountain laurel (*Kalmia latifolia*), sheep laurel (*Kalmia angustifolia*), multiflora rose (*Rosa multiflora*), greenbrier (*Smilax rotundifolia*) and Japanese honeysuckle (*Lonicera Japonica*).

The forested areas in the study area appeared to be secondary growth, not mature, which have undergone disturbances in the past. Based on professional judgement, the trees appeared to be the proper height for their age. Other vegetation did not show signs of stunted growth or chlorosis.

The biological survey for Barratt's sedge revealed no findings of this rare species within the study area. Habitat requirements are open, undisturbed, emergent wetlands; not usually occurring in standing water. This habitat was not found due to the sites' disturbed nature. Barratt's sedge is commonly associated with Pineland swamps and bogs, blooming and fruiting from late April to July.

No species of pink tickseed were found over the study area. Pink tickseed habitat requirements are vernal ponds (i.e., shallow, isolated ponds not fed by a spring or stream) or open, emergent wetland areas which are ponded for most of the year and dry up in the summer. The biological survey for this species was conducted at a time of year when sufficient growth for identification may not be present. Pink tickseed flowers from July through late September. The only potential habitat identified within the study area was on the facility site within the wastewater detention basin (reference Figure 1-2). This area was observed to contain emergent wetland species and ponding. An additional site visit later in the growing season may be warranted in order to definitively assess the presence or absence of pink tickseed.

Pine Barren boneset was not identified within the study area limits. Habitat for this species of concern is open, undisturbed, emergent wetland communities and streamsides; located mostly in the Pine Barrens. Flowering of this species occurs from early July to October.

The biological survey for swamp pink was conducted at a time of the year when it would be in flower; the evergreen leaves, which grow in a basal rosette, are also readily identifiable. No swamp pink populations were found. The habitat type that supports swamp pink consists of deciduous, forested wetland communities and stands of Atlantic white cedar (*Chamaecyparis thyoides*). The forested wetland areas onsite would not provide habitat for swamp pink due to their disturbed nature and lack of Atlantic white cedar occurrences. Additionally, dense scrub/shrub wetland areas provided inadequate sunlight and increased competition among plant species thereby creating poor habitat for swamp pink.

IV. Conclusion

In summary, habitats specific to the species of concern (Barratt's sedge, pink tickseed, Pine Barren boneset and swamp pink) were thoroughly searched and no specimens were identified as a result of our detailed biological survey. No suitable habitat was found onsite for Barratt's sedge, Pine Barren boneset and swamp pink. However, based on the field survey, the facility portion of the study area may contain potentially suitable habitat within the wastewater detention basin (emergent wetland) to support pink tickseed; although no individuals were identified during the site investigation.

No evidence of stressed vegetation within the wetland and upland communities was observed during the meander survey.

If you have any questions or comments concerning this submission please contact me.

Sincerely,
AMY S. GREENE ENVIRONMENTAL
CONSULTANTS, INC.

Thomas S. Brodde

Thomas S. Brodde
Project Manager

enc.

APPENDIX H - CULTURAL RESOURCE INFORMATION

APPENDIX H - CULTURAL RESOURCE INFORMATION

NJDEP State Historic Preservation Office Correspondence
NJDEP Comments on TRC 1995 Feasibility Study

Pam / Donna

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection
DIVISION OF PARKS AND FORESTRY
HISTORIC PRESERVATION OFFICE
CN-404
TRENTON, N.J. 08625-0404
TEL: (609) 292-2023
FAX: (609) 984-0578

Robert C. Shinn, Jr.
Commissioner

HPO-A96-37

MEMORANDUM

TO: Bruce Venner, Chief
Bureau of Federal Case Management, NJ DEP

FROM: Dorothy Guzzo, Administrator, Historic Preservation Office,
Deputy State Historic Preservation Officer

DATE: January 5, 1995

RE: Gloucester County, Newfield Borough
Shieldalloy Metallurgical Superfund Site
Section 106 Consultation Comments

I am offering consultation comments on this proposed undertaking under Section 106 of the National Historic Preservation Act in response to your memorandum of October 24, 1995 requesting review of the following report:

The Cultural Resource Consulting Group
August 1995 Phase II Cultural Resources Study, Specialty Glass Corporation Melting Tank, Proposed Remediation of Shieldalloy Metallurgical Corporation Property

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published in the Federal Register 2 September 1986 (51 31115-31125), I am providing the following comments.

800.4 Identifying Historic Properties

I concur with the Phase II Cultural Resource Study's conclusion that the stack/melting tank is eligible for the National Register under Criteria C and D. The stack/melting tank is eligible under Criterion C as a well preserved, and rare, example of a glass stack/melting tank. The stack is eligible under Criterion D because of the information it may convey about New Jersey's historic glass industry given its rarity as a surviving glass melting stack.

800.5 **Assessing Effects**

The demolition of the stack will, of course, have an **adverse effect** on the stack/melting tank. Given the deteriorating condition of the stack, the high cost associated with stabilization of tall masonry stacks, and the groundwater pollution problems which are related to the metallurgical use of the stack since the 1950's, I see no feasible alternative to demolition of the stack.

Because the project will have an adverse effect on the stack, the Advisory Council on Historic Preservation must be notified of the adverse effect and sent the documentation listed under 800.8 (b) (copy attached). I have enclosed a draft Memorandum of Agreement (MOA) for the project for consideration. As mitigation for the demolition of the stack, the MOA calls for documentation of the stack to HABS/HAER Standards. The level of HABS/HAER documentation for a property is determined by the National Park Service (see the attached sheet). I suggest that a copy of the Phase II Cultural Resource Study be sent to the NPS to help in their determination of the appropriate level of documentation.

Should you have any questions, please contact Dan Saunders of my staff at (609) 984-0140.

Sincerely,

Dorothy P. Guzzo

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

DPG/ds96226

c: Advisory Council On Historic Preservation
Joseph Gowers, EPA
John Vetter, EPA
Donna Gaffigan, NJDEP-BFCM
David R. Smith, SMC

MEMORANDUM OF AGREEMENT
AMONG
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY,
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, BUREAU OF FEDERAL CASE MANAGEMENT, SHIELDALLOY METALLURGICAL CORPORATION
AND
THE NEW JERSEY STATE HISTORIC PRESERVATION OFFICER
SUBMITTED TO THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
PURSUANT TO 36 CFR 800.6(A)

WHEREAS, the Environmental Protection Agency (EPA) has determined that the remediation of the Shieldalloy Metallurgical Corporation (SMC) site will have an adverse effect on the Specialty Glass Corporation Melting Tank, a property which is eligible for listing on the National Register of Historic Places, and has consulted with the New Jersey State Historic Preservation Officer (SHPO) pursuant to the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (16 U.S.C> Part 470f0; and

WHEREAS, EPA has considered the alternatives to demolition of the Specialty Glass Corporation Melting Tank and concluded, in concurrence with the New Jersey SHPO, that there is no reasonable way to avoid the adverse effect of demolition of the Glass Melting Tank; and

WHEREAS, New Jersey Department of Environmental Protection, Bureau of Federal Case Management (NJDEP-BCA) and SMC, the owner of the site, have participated in the consultation and have been invited to concur in this Memorandum of Agreement,

NOW, THEREFORE, the EPA, NJDEP-BCA, the New Jersey SHPO, and SMC agree that the undertaking shall be implemented in accordance with the following stipulation in order to take into account the effect of the undertaking on historic properties.

Stipulations

EPA will ensure that the following measures are carried out:

1. The applicant shall contact the National Park Service (NPS), Northeast Field Office to determine what level and kind of HABS/HAER recordation is required for the Melting Tank. The applicant will complete all required recordation and secure NPS approval prior to initiating demolition of the Melting Tank. Copies of this documentation with original photographs will be provided to the Corps, the NJ SHPO, and Wheaton Village.

Execution of this Memorandum of agreement and implementation of its terms evidence that EPA has afforded the Council an opportunity to comment on the demolition of the Specialty Glass Corporation Melting tank, and that EPA taken into account the effect of the undertaking on historic properties.

DRAFT

ENVIRONMENTAL PROTECTION AGENCY

BY:____DATE:___________

NEW JERSEY STATE HISTORIC PRESERVATION OFFICER

BY:____DATE:___________

CONCUR:

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, BUREAU OF FEDERAL CASE MANAGEMENT

BY:____DATE:___________

SHIELDALLOY METTALURGICAL CORPORATION

BY:____DATE:___________

ACCEPTED:

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY:____DATE:___________

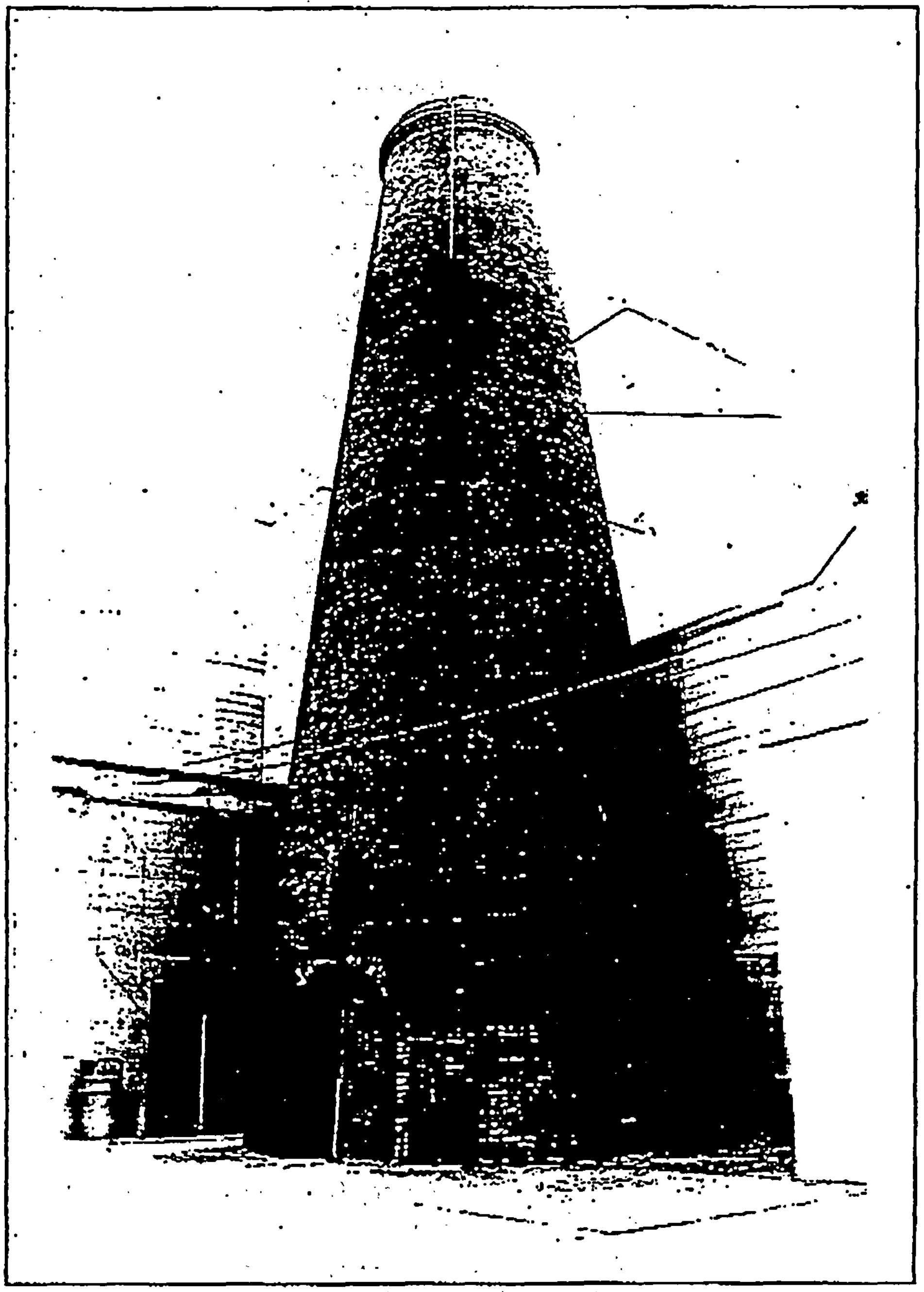


Illustration 13: Current condition of the glassworks stack (August 1995).

photographer: Richard Veit
date: August 1995
roll 3, neg. 9, exp. 21

Documentation required for consultation

(b) Finding of adverse effect. The required documentation is as follows:

(1) A description of the undertaking, including photographs, maps, and drawings, as necessary;

(2) A description of the efforts to identify historic properties;

(3) A description of the affected historic properties, using materials already compiled during the evaluation of significance, as appropriate; and

(4) A description of the undertaking's effects on historic properties.

Documentation required for submitting a signed MOA for Council review

(c) Memorandum of Agreement. When a memorandum is submitted for review in accordance with Section 800.6(a)(1), the documentation, in addition to that specified in Section 800.8(b), shall also include a description and evaluation of any proposed mitigation measures or alternatives that were considered to deal with the undertaking's effects and a summary of the views of the State Historic Preservation Officer and any interested persons.

Documentation required for requesting written Council comment, absent an MOA

(d) Requests for comment when there is no agreement. The purpose of this documentation is to provide the Council with sufficient information to make an independent review of the undertaking's effects on historic properties as the basis for informed and meaningful comments to the Agency Official. The required documentation is as follows:

(1) A description of the undertaking, with photographs, maps, and drawings, as necessary;

(2) A description of the efforts to identify historic properties;

(3) A description of the affected historic properties, with information on the significant characteristics of each property;

(4) A description of the effects of the undertaking on historic properties and the basis for the determinations;

(5) A description and evaluation of any alternatives or mitigation measures that the Agency Official proposes for dealing with the undertaking's effects;

(6) A description of any alternatives or mitigation measures that were considered but not chosen and the reasons for their rejection;

(7) Documentation of consultation with the State Historic Preservation Officer regarding the identification and evaluation of historic properties, assessment of effect, and any consideration of alternatives or mitigation measures;

(8) A description of the Agency Official's efforts to obtain and consider the views of affected local governments, Indian tribes, and other interested persons;

(9) The planning and approval schedule for the undertaking; and

United States Department of the Interior

NATIONAL PARK SERVICE
MID-ATLANTIC REGION
NATIONAL REGISTER PROGRAMS DIVISION
U.S. CUSTOM HOUSE, ROOM 251
2ND & CHESTNUT STREET
PHILADELPHIA, PA 19106

IN REPLY REFER TO:

Information Needed to Obtain a Level of Documentation for the Historic American Building Survey / Historic American Engineering Record (HABS/HAER)

To provide a level of documentation, the National Park Service (NPS) Regional Office requires concise information on the property's appearance and significance. Information on the condition of the property is only necessary when it can help determine whether there is original material that can still be documented; this is most often applicable to interiors of buildings. Lengthy reports or justifications of why the property must be demolished are not necessary; once the decision to document the property has been reached between the Federal Agency and the State Historic Preservation Office, the NPS's only role is to determine the level of documentation, which is based on the property's significance and complexity.

Please write to this office to request a level of HABS/HAER documentation for the property. Include with your request:

1. **A copy of the signed Memorandum of Agreement or other document requiring HABS/HAER documentation.** If some or all signatures are still pending, include correspondence from the State Historic Preservation Office indicating that HABS/HAER documentation will be required. Other correspondence on the project is generally not necessary, unless it provides other required information.

2. **The name, address/location of the property, and the county in which it is located.** If it is not located in a town or city, please identify the nearest town or city, (not a township) in the same State.

3. **Concise information on the history and appearance of the property.** This can usually be excerpted from existing documents (such as a survey report, National Register nomination, or correspondence from the State Historic Preservation Office) without doing additional work. Snapshots (not Polaroids) are usually necessary to convey the scale, and the amount of architectural or engineering detail, of the property. When there are no photographs of a building's interior, indicate how much original detailing, furnishings and/or equipment are inside; this will help us determine how much of the interior needs to be documented.

If you have questions about what to send, call the National Park Service at (215) 597-6484. You should receive a Schedule of Documentation, including guidelines for preparing the required documentation, within 30 days of our receipt of your request.

(November 1994)

State of New Jersey

Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

JUL 24 1996

Jean Oliva
Senior Consulting Engineer
TRC Environmental Corporation
5 Waterside Crossing
Windsor CT 06095

Dear Ms. Oliva:

Enclosed please find a disk containing NJDEP's comments on the Feasibility Study and Ecological Risk Assessment for the Shieldalloy Metallurgical Corporation site. The file is named FS&ERA.SMC.

If you have any questions, you may contact me at (609) 633-1394.

Sincerely,

Donna L. Gaffigan

Donna L. Gaffigan, Case Manager
Bureau of Federal Case Management

Enclosure

Draft Final
FEASIBILITY STUDY REPORT - VOLUME II
Soil Feasibility Study

1. <u>General</u>
NJDEP's Guidance Document for the Remediation of Contaminated Soils dated June 1994 contains information on capping as a remedial action. Of particular importance is the section on post-capping operation, maintenance and monitoring since such actions will be required after implementation of the remedy.

2. <u>Risk Commission Report</u>
TRC has elected to support its proposal to use a one in one hundred thousand (1×10^{-5}) cancer risk endpoint based on a draft report issued by the Environmental Risk Assessment and Risk Management Study Commission. This Commission was established in 1994 pursuant to a provision in HSRA. The NJDEP's cancer risk endpoint is currently 1×10^{-6}. The Commission's proposal to modify the cancer risk value for developing soil remediation standards is still only a draft recommendation. Until such time that a new risk level is promulgated by the New Jersey legislature, the Department will continue to require the 1×10^{-6} value.

3. <u>Compliance Averaging, Section 2.1</u>
It should be noted that although "guidance" has been developed for compliance averaging, the concept and the particular conditions for implementing compliance averaging have a regulatory basis and are contained in the *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E-4.9(c)3i).

4. <u>Compliance in Manufacturing Area - Dept 102, Section 2.1.1</u>
Elevated chromium and hexavalent chromium contamination has been detected in the Department 102 area. Based on the minimum exceedances, TRC has proposed no further action. This is acceptable provided the existing containment (pavement) is properly maintained as part of the remedial action and the subsequent O&M phase.

5. <u>Compliance in Manufacturing Area - RR Siding, Section 2.1.1</u>
Elevated arsenic contamination has been detected in one sample collected in the Railroad Siding area. Based on the minimum exceedances, TRC has proposed no further action. This is acceptable provided the existing containment (pavement) is properly maintained as part of the remedial action and the subsequent O&M phase.

6. <u>Compliance in Manufacturing Area - Beryllium, Section 2.1.1</u>
a. The FS states that the compliance averaging ceiling for beryllium is 2 ppm. While this is true using the RDCSCC, SMC is utilizing the NRDCSCC values for the interior of the site (not off-

site). Since the health-based criteria for beryllium at non-residential sites is 0.7 ppm, the compliance averaging ceiling is 7 ppm. This adjusted many of the calculations for beryllium and thus reduced the total area of soil requiring remediation. This issue was discussed at a meeting held on May 19, 1996 between NJDEP and TRC. The agreements reached will be summarized in a letter from TRC, however, they must be reflected in the FS as well, unless superseded by the results of the bioavailability study discussed below.

b. There have been discussions with TRC/SMC regarding an Alternate Cleanup Standard (ACS) application for beryllium based on bioavailability. At NJDEP recommendation, SMC submitted a work plan on May 24, 1996 outlining how they proposed to determine site-specific bioavailability percentages. This data will assist the NJDEP in making a risk management decision based on the strength of evidence surrounding the beryllium contaminant levels at the site and the appropriateness of an ACS.

7. <u>Compliance - Former Material Storage Area, Section 2.1.2</u>
PCB contamination in excess of the NRDCSCC values has been discovered in the Former Material Storage Area. The FS Report must include this area of concern (AOC) as an area requiring remediation. Pre-design sampling can be employed to further define the limits of contamination.

8. <u>Compliance - North/South Subsurface DDT Areas, Section 2.1.2</u>
Due to the depth of the reported contamination and the inability to reconfirm the results, the DDT contamination in these two AOCs is either very limited or non-existent. Therefore, the existing soil "cap" is sufficient and SMC may consider no further action for these. However, the "presence" of these AOCs must be documented in the DER.

9. <u>Compliance - On-Site Delineated Wetlands Area, Section 2.1.2</u>
Elevated contaminant levels at RA-12 were compared to the SCC values in the FS Report. Since this area is within the delineated wetlands, it can be questioned whether these results should be compared to soil or sediment criteria. It is recommended that the results should be compared to both criteria. When compared to the SCC, there are exceedances for several inorganic parameters, therefore, the recommendation on page 2-12 with respect to no further action in this area is not acceptable. Further, this statement is inconsistent with Section 2.4.3 (page 2-43) which defers the remediation of this area to Volume III of the FS (Surface Water and Sediment) and is also inconsistent with Volume III, itself.

10. <u>Compliance - Other Areas of Concern, Section 2.1.2</u>
Due to the depth of the reported contamination and the inability to reconfirm the results, the beryllium contamination at SB-25 and SB-12 is either very limited or non-existent. Therefore, the existing soil "cap" is sufficient and SMC may consider no further action for these areas. However, the "presence" of these AOCs must be documented in the DER.

12. Compliance - Off-Site Delineated Wetlands Area, Section 2.1.5, p. 2-25
Elevated contaminant levels at RA-13 and RA-14, located on SMC's property boundary, were compared to the SCC values in the FS Report. Since this area is within the delineated wetlands, it can be questioned whether these results should be compared to soil or sediment criteria. It is recommended that the results should be compared to both criteria. Two issues are involved here, the on-site and the off-site areas adjacent to the site.

a. On-site - Based on the SCC, there are exceedances for several inorganic parameters. Therefore, the on-site portion of this area requires remediation, but is not discussed in the document. This is inconsistent with Volume III which show that remediation of this area is proposed.

b. Off-site - Based on the RDCSCC no further action is acceptable, but it may not be acceptable based on the sediment criteria and may be inconsistent with Volume III of the FS Report (see Figure 3-2 of Volume III).

13. Department 106, Section 2.1.1
There is no discussion regarding the Department 106 building and the level of contamination coating the building materials. As identified in NJDEP's letter dated November 3, 1995, SMC must discuss the need to remediate the building as a source of chromium contamination to soil and/or groundwater.

Alternative S-4-1 (Glass Stack), Section 4.2.7
a. There is concern about the proposal under recommended Soil Alternative S-4-1 to remediate potential chromium contaminated soil in the Department 101(b) Glass Stack Area. The Glass Stack was determined to be eligible for inclusion in the National Register of historic Places and is, therefore, subject to National Historic Preservation Act (NHPA) requirements. The proposal is to raze the stack and to excavate the soil in its footprint. The need for remedial action in this area seems to be based primarily upon the results of one soil sample (RA-64) collected from the tunnel adjacent to the stack. Additional soil samples should be collected from beneath the stack to show that the remedial action proposed is justified as discussed in the May 7 meeting.

b. It is indicated on page 4-16 that the cultural resource survey was submitted to the New Jersey State Historic Preservation Office (SHPO) with a request for determination of Historic American Building Survey (HABS) documentation required prior to the stack's demolition. It should be noted that the National Park Service (NPS) makes the determination of what level of documentation is required and whether HABS or Historic American Engineering Record (HAER) criteria are appropriate. Furthermore, it is the function of EPA to request a HABS/HAER determination from the NPS. The Soil FS shall be revised to reflect that the ARAR requirements with respect to the NHPA have not yet been completed.

14. <u>Remedial Alternative Recommendation, Section 4.5</u>

NJDEP partially concurs with TRC's recommendation for the remediation of soils at the SMC site. Alternative S-4-1 (Remediation of Chromium Source Areas and Landfill Containment with Institutional Controls) will adequately address soil contamination at the site. However, Option A (10^{-6} risk-based) is dictated by HSRA and must be employed instead of the recommended Option B (10^{-5} risk-based).

APPENDIX I - VISUAL RESOURCE SURVEY

APPENDIX I - VISUAL RESOURCE SURVEY

Details of Visual Site Analysis Process

Figure I-1	Projected Existing Viewshed Relative to Agricultural and Forested Areas
Figure I-2	Projected Proposed Action Viewshed Relative to Agricultural and Forested Areas

Photo Log

Photos - Existing Conditions

DETAILS OF VISUAL SITE ANALYSIS PROCESS

Geographic Information Systems (GIS) are proven tools in the evaluation of the relationship between land-use and development. TRC uses GIS methodologies to analytically evaluate potential visibility issues. These methods include viewshed analyses and photosimulations or renderings of proposed projects, as described in more detail below.

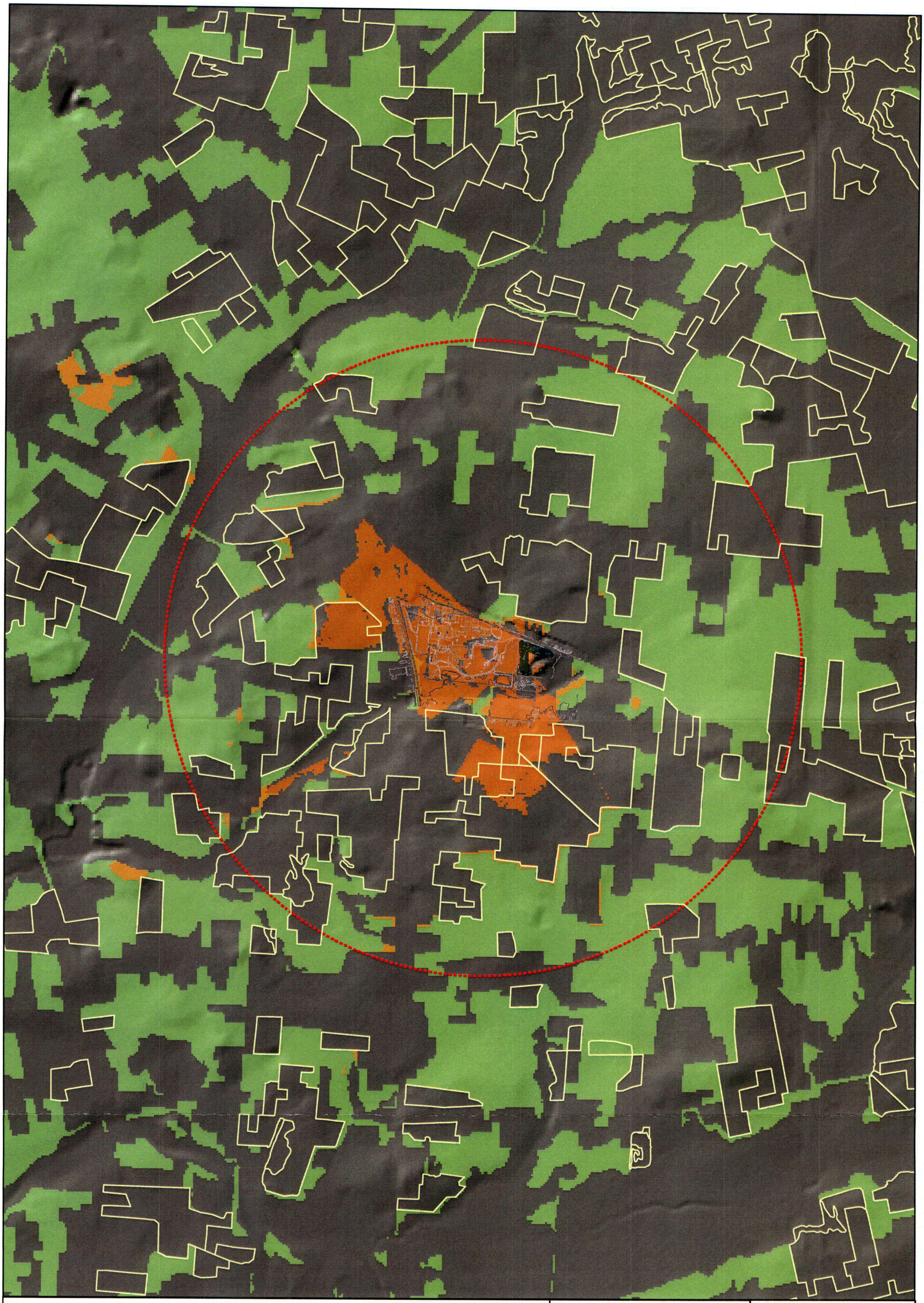
Viewshed Mapping - A viewshed analysis was completed to predict the existing visual impact of current conditions at the SMC facility as well as evaluate the potential visual impact of the decommissioning alternatives. The study area consisted of a 1-mile radius, using the center of the facility as the reference point. Base mapping and analytical data were acquired from the State of New Jersey GIS office. Site-specific existing and proposed topography was based on current site survey data and information developed in support of the evaluation of the Decommissioning Plan alternatives. State-issued Digital Elevation grids (DEM 10M) were merged with the site-specific survey (1-foot resolution) to attain an accurate representation of the landscape. Once the elevation data were merged, vegetation coverage was processed as an impediment layer. The vegetation layer assigns a conservative vegetation height to areas containing vegetation cover exceeding 3 meters in height. Based on this information the visibility of the existing conditions is evaluated, as indicated in Figure I-1. For the alternatives undergoing analysis, the proposed elevation change is added and the visibility analysis is recomputed for the proposed conditions. The visibility analysis for the proposed action is presented in Figure I-2. The output mapping is used to determine potential visibility of the project from areas within the 1-mile radius. It is also used as a guide for the selection of potential visual vantage points for renderings.

Photosimulation Methodologies - Computer-assisted photo simulations create very accurate representations of what a proposed project will look like. The process uses sophisticated computer imaging technology to allow decision-makers to evaluate the visibility and visual effect of a proposed project from a number of locations. It is critical that the process used is rigorous and scientifically accurate. In general, computerized perspective views rely on three-dimensional engineering models of proposed structures in a geo-referenced real-world environment. The model positions the viewer at the approximate receptor point, and specifies a field of view equal to that of the lens used to capture the actual photograph upon which the rendering is based. The computerized perspective views are then superimposed on the photographs to represent a visual depiction of the proposed changes at the site.

The photosimulation process begins with the collection of photographic images in the field at selected visual vantage points, referred to as viewpoints. Because photographic simulations are typically presented from a variety of prominent views and at different distances, photographs are taken at a variety of viewpoints based on the information gathered during the viewshed analysis. Information noted in the field during the collection of photographic images includes global positioning system (GPS) coordinates for the photo location, the compass angle of the camera at each location, the focal length of the camera, the time of day and date of the photo, the general direction of the target view of concern (in this instance, the Storage Yard area), and the height of the camera. The GPS position measured in the field determines the exact location of the camera and the location of specific reference points in the foreground to ensure accurate camera alignment. The day and time information is used to adjust for sun angle in the simulations, allowing computer graphics specialists to simulate lighting conditions for different times of day or days of the year.

Simulating a proposed project initially involves the input of information about the project's "structures," such as the location and size of structures, as well as proposed changes to the landscape. For the proposed action (the LTC alternative), the model of the stabilized pile was created based on the pile's engineering dimensions, while the model of the off-site disposal with license termination (LT) alternative was based on the total removal of all licensed materials and the return of the Storage Yard area to natural site elevations. This information, along with the field-collected data, is entered and accurately plotted within an AutoCAD® environment. This ensures that the positioning data (two-dimensional or 2D) is based on representative geographic coordinates. Next, the 2D data is converted to three-dimensional (3D) data to account for the height information (i.e., camera locations, existing structures, existing topography, and proposed changes in topography). The 3D data is processed using a computer program called Studio VIZ® 4.0. At this point, the alignment of all known points (longitude, latitude and height) is confirmed. Next, the lighting is calculated by creating a "sun" for a specific time and day of year. This information is used to create highlights and shadows for each of the photo elements. Finally, once the lighting is created, the overall image is rendered. The resulting renderings are intended to show not only the form and scale of the proposed changes, but also the texture and materials proposed in the design. The final image is checked to ensure its accuracy in terms of location, scale and perspective.

When simulated and actual photos are placed side-by-side, the positioning and visibility of the simulated elements are often nearly identical. Because of their accuracy, visual simulations developed using such methods are well-received and accepted by regulatory agencies as an appropriate way to evaluate visual impacts.



New Jersey 2002 High Resolution
February-April, 2002.
The ortho-rectification process achieved a +/-4.0 ft. horizontal accuracy at a 95% confidence level
Publication_Date: 20030731

Abstract:

Visibility Analysis was produced using a bare earth Digital Elevation Model (DEM) with New Jersey Land Cover Data Set added to compensate for areas with vegetation. Site specific survey information for the proposed and existing footprints was utilized to adjust for elevation differences in this vicinity.

DEM Information: (10- by 10-m data spacing, elevations in decimeters) Elevation_resolution_ is 1 decimeter (0.1 meter). Elevation accuracy is 24,000 contour data, i.e. plus/minus half the contour interval.

POTENTIAL INCREMENTAL CAPPED PILE VIEWSHED POSITION AND ELEVATION ACQUIRED FROM FIGURE 1-1 ANALYSIS ASSUMED A CAPPED PILE HEIGHT OF 30'

ASSUMED MIXED FOREST APPROXIMATE 35 FOOT STAND

AGRICULTURAL AREAS

1 - MILE RADIUS

0 0.125 0.25 0.5 Miles

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

Projected Proposed Action Viewshed Relative to Agricultural and Forested Areas

FIGURE I-2

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
(978)970-5600

PROJ.26770-0100

C36

PHOTO LOG NOTES

Photos were taken on March 14, 2005, looking towards the SMC facility, as indicated in the attached photo log. In some cases, upon completion of the initial photographic effort, it was determined that the direction in which the original photo was taken might capture the view towards the manufacturing portion of the facility, but would not necessarily completely capture the view in the direction of the Storage Yard. Therefore, on May 17, 2005, additional photos were taken from several of the viewpoints in a compass direction more reflective of the view towards the Storage Yard. These photos verified that the view of the Storage Yard from these locations would be blocked, mainly by existing vegetation.

Photo Log
Shieldalloy Metallurgical Corporation, March 14, 2005

Photo #	Location	GPS Location	Compass heading	Distance of location from Storage Yard area	Land Use	Height of Camera	Focal Length for 35mm
1	Shieldalloy on-site-directly west of the pile	39°32 539N 075° 01.100W	130°	~600 feet west	Industrial	5.2'	35mm (f.stop 16)
2	Shieldalloy on-site – southwest of pile	39°32 428N 075° 01.115W	75°	~650 feet southwest	Industrial	5.2'	35mm (f.stop 16) Digital
3	Shieldalloy on-site - near Water Treatment Bldg	39°32 447N 075° 01.241W	88°	~1300 feet west and looking West	Industrial	5.2'	Digital
4 (2 digital photos)	Shieldalloy on-site - near Water Treatment Bldg	39°32 446N 075° 01.250W	88°	~1320 feet west	Industrial	5.2'	35mm (f.stop 16) Digital
5	Shieldalloy on-site - Truck entry roadway	39°32 559N 075° 01.296W	113°	~1450 feet west	Industrial	5.2'	35mm (f.stop 16) Digital
6	Strawberry Ave- development site for Genco Homes	39°31 964N 075° 00.862W	338°	~2950 feet south	Residential	5.2'	35mm (f.stop 16)
7	West Blvd north of power line	39°31 741N 075° 01.371W	8°	~4650 feet southwest	Highway/ Residential	5.2'	35mm (f.stop 16) Digital
8 (2 digital	West Blvd near Arbor Avenue	39°32 118N 075° 01.343W	6°	~2400 feet southwest	Residential	5.2'	35mm (f.stop 16) Digital

Photo Log
Shieldalloy Metallurgical Corporation, March 14, 2005

Photo #	Location	GPS Location	Compass heading	Distance of location from Storage Yard area	Land Use	Height of Camera	Focal Length for 35mm
photos)							
9	Arbor Avenue and North West Avenue	39°32 070N 075° 01.903W	30°	~4800 feet southwest	Residential	5.2'	35mm (f.stop 16) Digital
10	North West Avenue north of Arbor Avenue intersection	39°32 162N 075° 01.894W	60°	~4600 feet southwest	Residential	5.5'	Digital only
11	Weymouth Road at Salem Avenue	39°32 461N 075° 02.213W	100°	~5100 feet west	Residential	5.2'	Digital only
12 (2 digital photos)	Catawba Avenue and West Blvd.	39°32 790N 075° 01.504W	146°	~3100 feet north west	Commercial	5.2'	35mm (f.stop 16) Digital
13	Church Street south of Catawba Avenue	39°32 818N 075° 01.334W	162°	~5100 feet north	Residential	5.2'	Digital only
14	Edgarton School at Madison/Catawba Ave	39°32 847N 075° 01.051W	182°	~1900 feet north	Institutional	5.2'	Digital only
15	Edgarton School parking lot on Catawba Ave	39°32 857N 075° 01.128W	191°	~2100 feet north	Institutional	5.2'	Digital only

Photo Log
Shieldalloy Metallurgical Corporation, March 14, 2005

Photo #	Location	GPS Location	Compass heading	Distance of location from Storage Yard area	Land Use	Height of Camera	Focal Length for 35mm
16	Rosemont Avenue and Fawn Drive	39°33 320N 075° 01.251W	172°	~5200 feet north	Residential	5.2'	Digital only
17	Woodlawn Avenue at Covey Lane	39°32 975N 075° 00.433W	193°	~3700 feet northeast	Residential	5.2'	Digital only
18 (3 -35 mm & Dig. Photos)	Gorgo Lane south of Newfield water tower	39°32 540N 075° 00.730W	228° to 280°	~1300 feet northeast	Residential/ Undeveloped	5.2'	35mm (f.stop 16) Digital
19	Grace Orthodox Church – Weymouth near West Blvd	39°32 317N 075° 01.320W	41°	~1600 feet southwest	Mixed Residential	5.2'	Digital
20 (3 digital photos)	Columbia Avenue at County Bridge	39°32 797N 075° 02.121W	128° to 159°	~5280 feet northwest	Residential	5.2'	Digital
21	Christ Community Church parking lot-Salem Avenue west of West Blvd.	39°32 662N 075° 01.620W	130°	~3300 feet northwest	Residential	5.2'	35mm (f.stop 16) Digital
22	Notre Dame School on Church Street south of Conwell	39°32 922N 075° 01.362W	160°	~3300 feet north-northwest	Institutional/ Residential	5.2'	Digital
23	46 West Blvd-Cabinet Source Store	39°32 539N 075° 01.416W	98°	~1980 feet west	Mixed Residential	5.2'	35mm (f.stop 16) Digital

Photo Log
Shieldalloy Metallurgical Corporation, March 14, 2005

Photo #	Location	GPS Location	Compass heading	Distance of location from Storage Yard area	Land Use	Height of Camera	Focal Length for 35mm
24 (2 digital photos)	West Blvd and Sandy Drive	39°33 132N 075° 01.680W	140°	~5280 feet northwest	Residential	5.2'	Digital
25	Strawberry Avenue east of City Line Avenue	39°31 934N 075° 00.355W	295°	~3900 feet southeast	Residential	5.2'	35mm (f.stop 16)

Supplemental Photo Log
Shieldalloy Metallurgical Corporation, May 17, 2005

Supplemental Photo #	Location	Compass heading	Distance of location from Storage Yard area
15A	Edgarton School parking lot on Catawba Ave	165°	~2100 feet north
19A	Grace Orthodox Church – Weymouth near West Blvd	55°	~1600 feet southwest
20A	Columbia Avenue at County Bridge	120°	~5280 feet northwest
25A	Strawberry Avenue east of City Line Avenue	325°	~3900 feet southeast

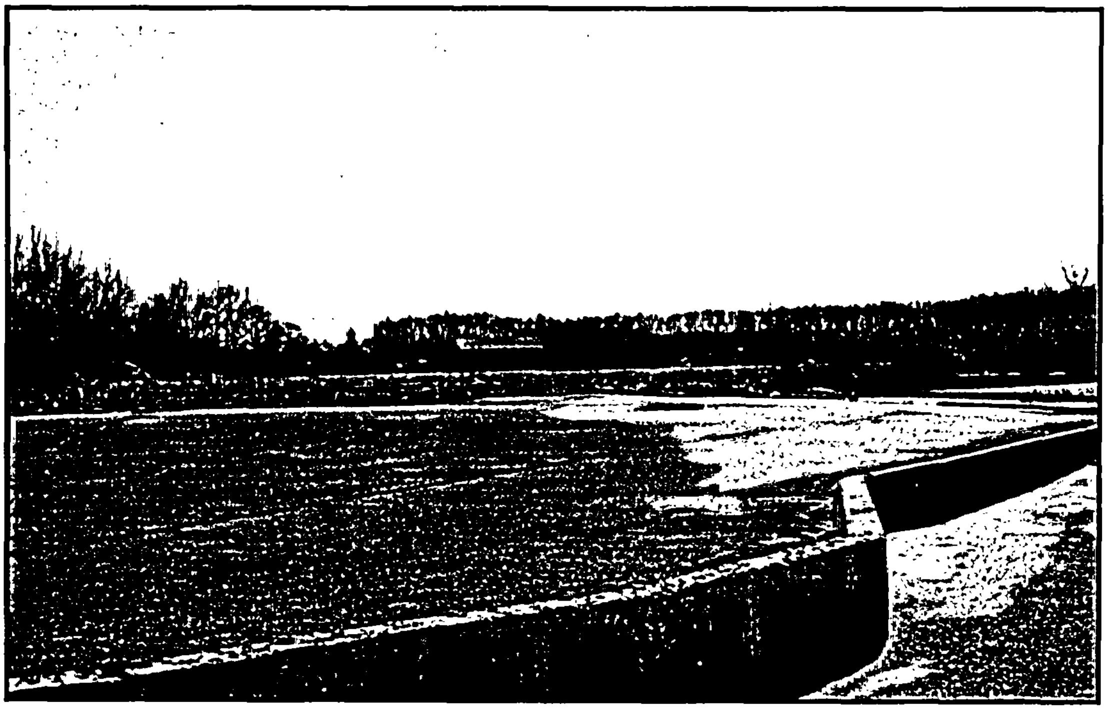


Photo 1. View of northern portion of Storage Yard taken just west of the Storage Yard.

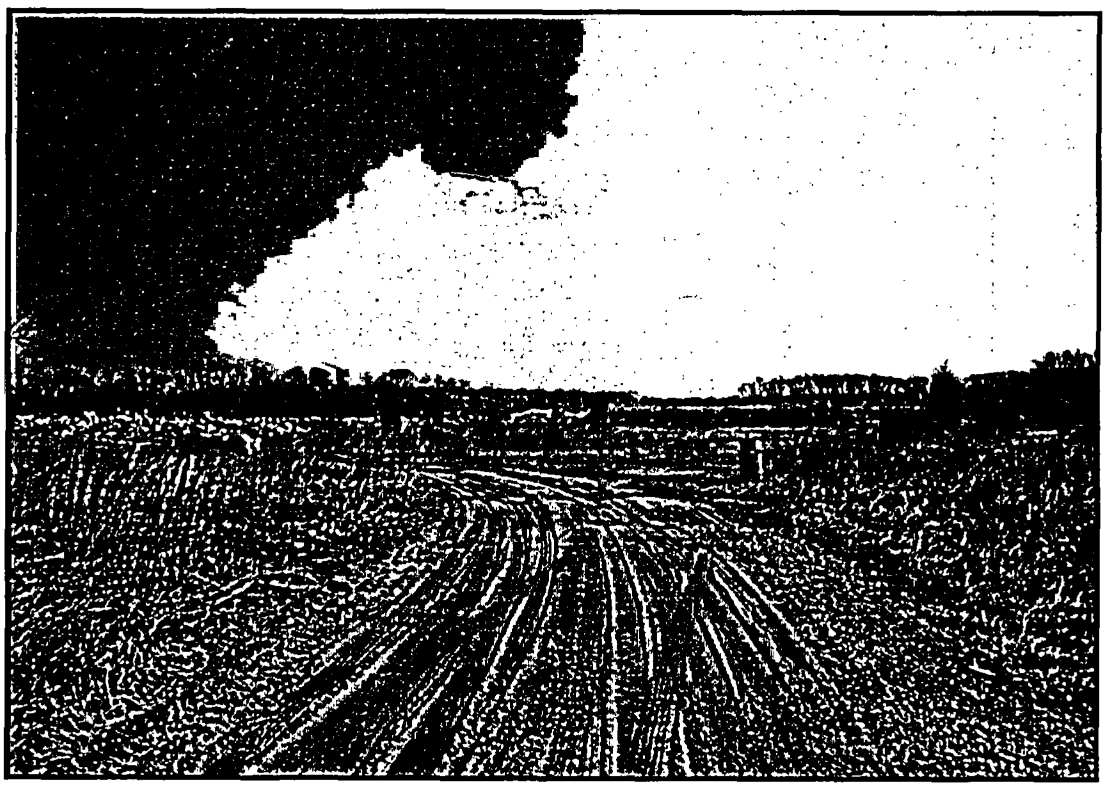


Photo 2. View of southern portion of Storage Yard taken from the unpaved SMC access road.

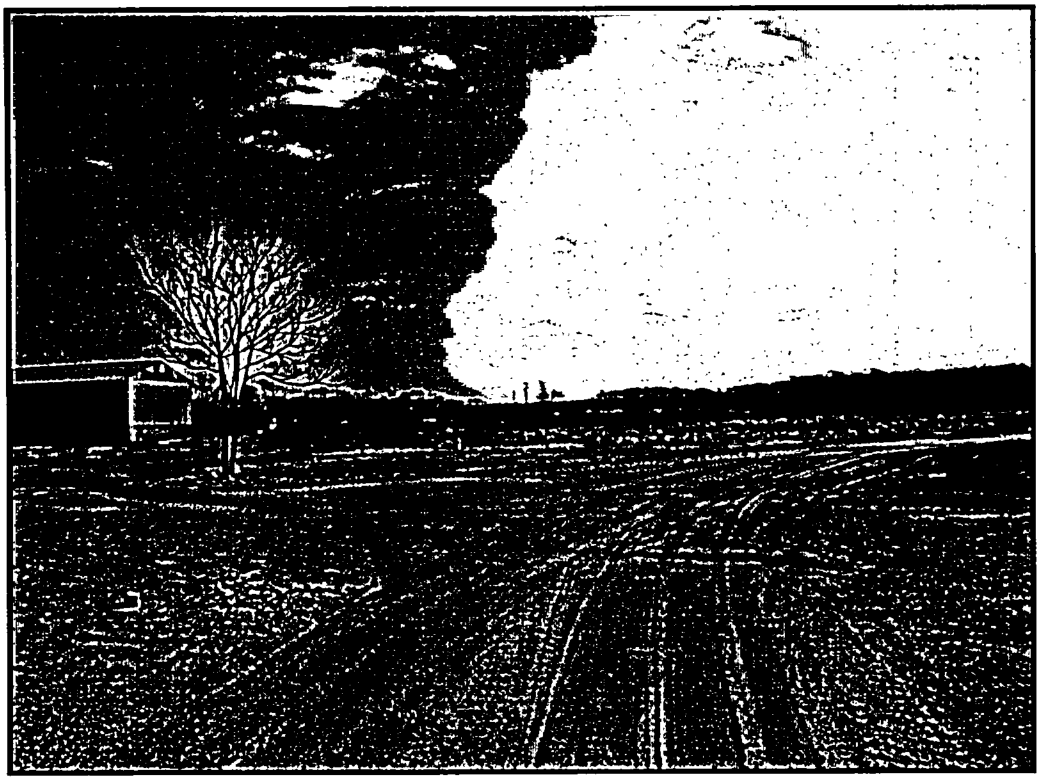


Photo 3. View toward the Storage Yard, taken near the SMC pond.

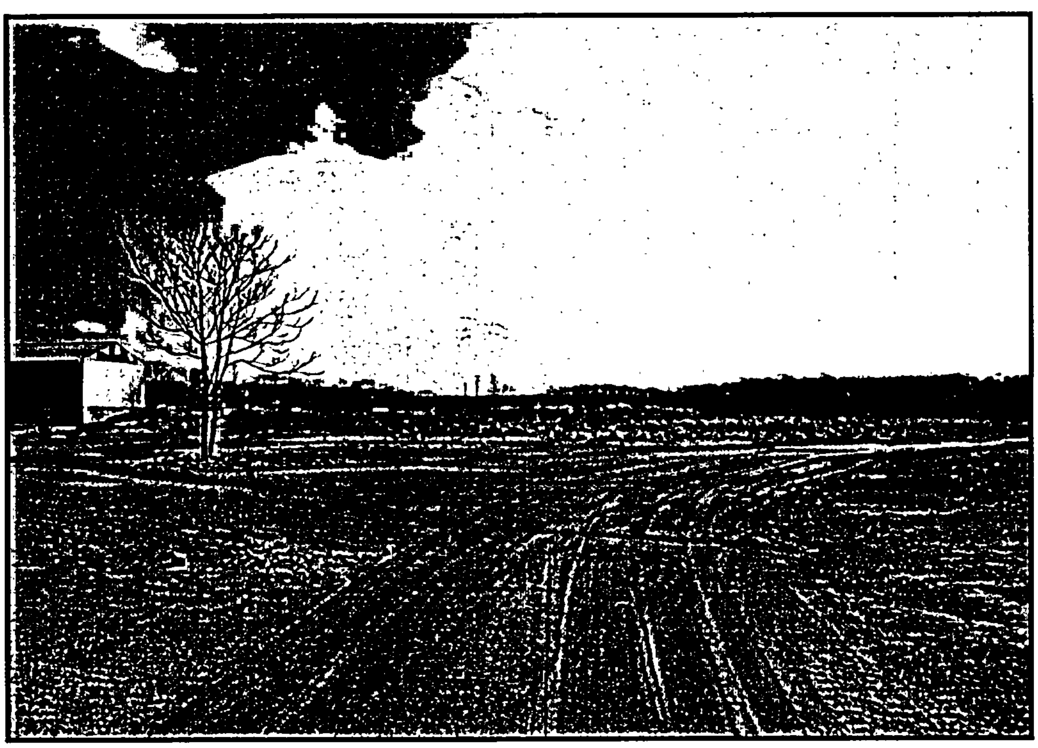


Photo 4. View toward the Storage Yard, taken near the SMC pond.

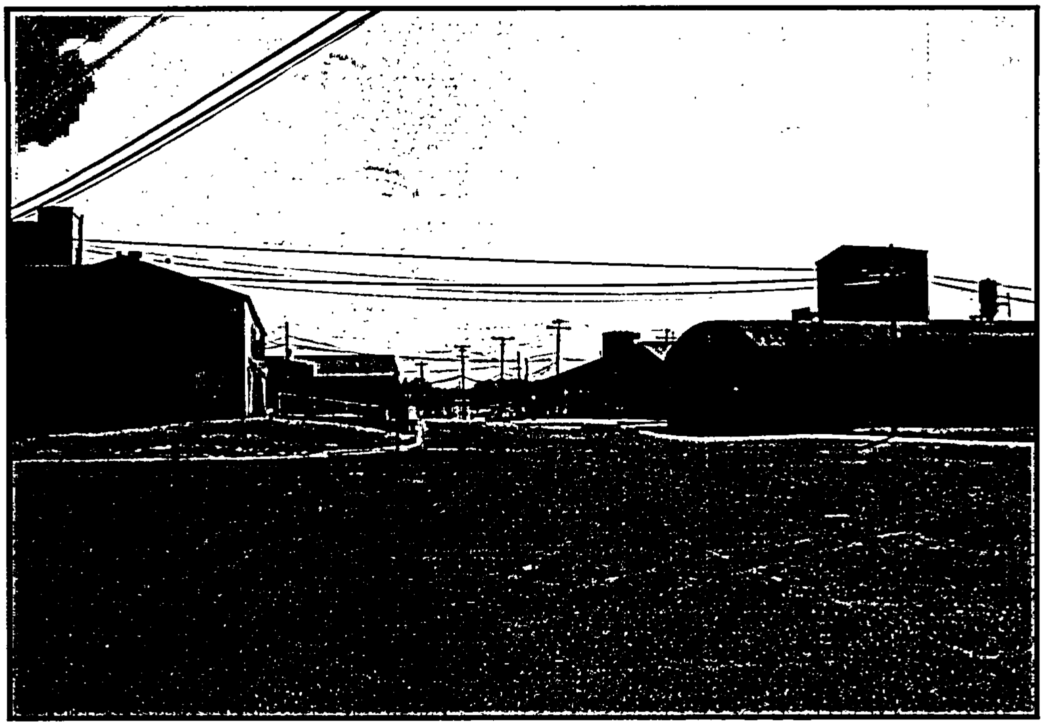


Photo 5. View toward the Storage Yard, from near the SMC administration building.

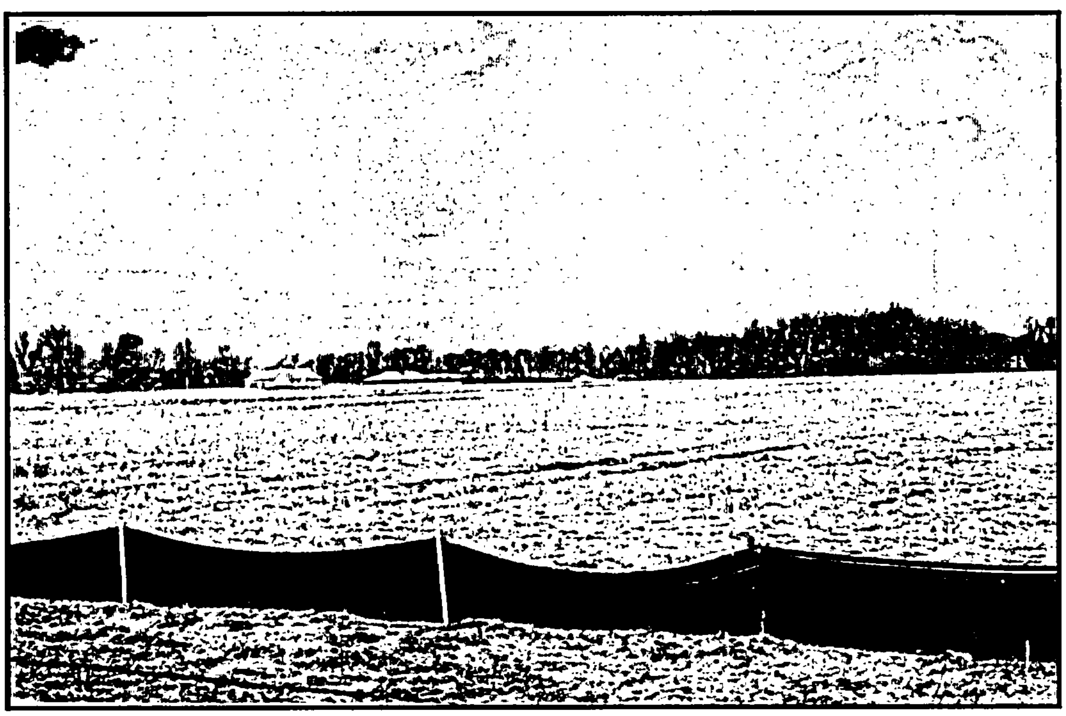


Photo 6. View toward the SMC site from Strawberry Ave- development site for Genco Homes.

Photo 7. View toward the SMC site from West Blvd north of power line.

Photo 8. View toward the SMC site from West Blvd near Arbor Avenue

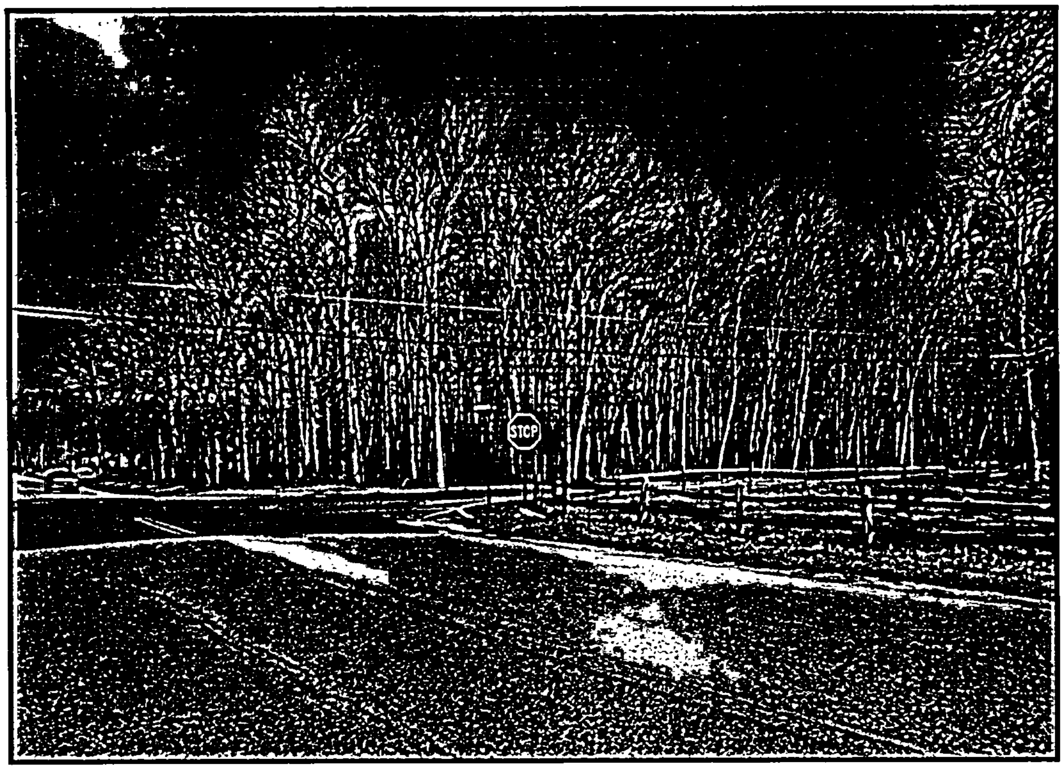


Photo 9. View toward the SMC site from Arbor Avenue and North West Avenue

Photo 10. View toward the SMC site from North West Avenue north of Arbor Avenue intersection

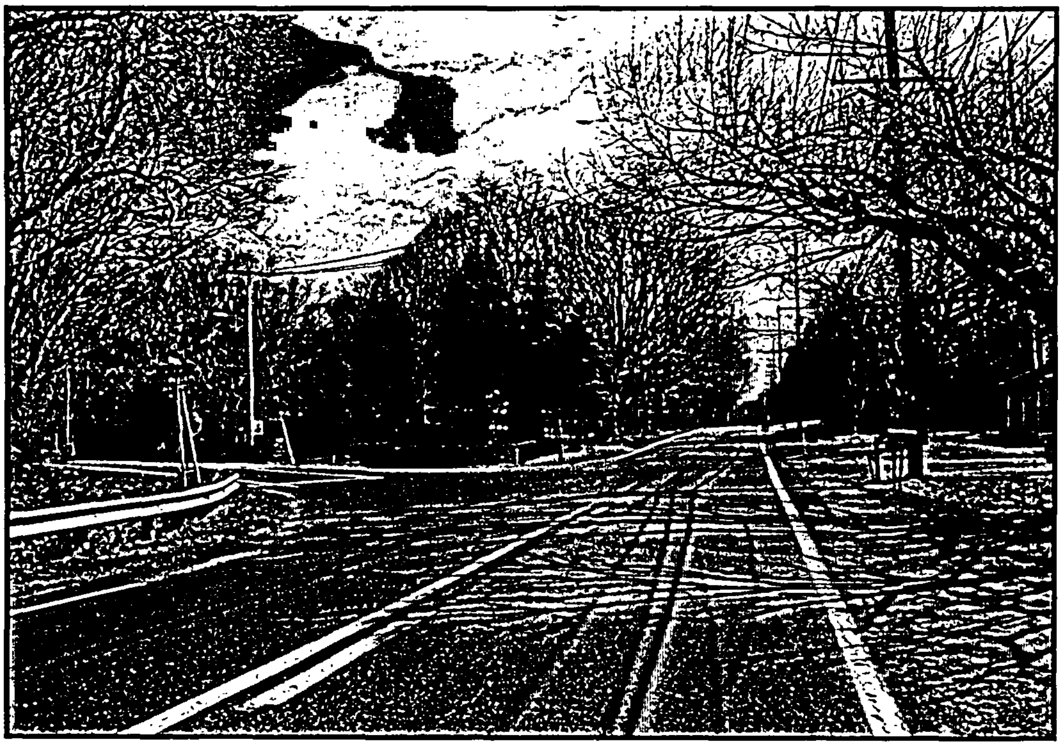


Photo 11. View toward the SMC site from Weymouth Road at Salem Avenue

Photo 12. View toward the SMC site from Catawba Avenue and West Blvd.

Photo 13. View toward the SMC site from Church Street south of Catawba Avenue.

Photo 14. View toward the SMC site from Edgarton School at Madison/Catawba Ave

Photo 15. View toward the SMC site from Edgarton School parking lot on Catawba Ave.

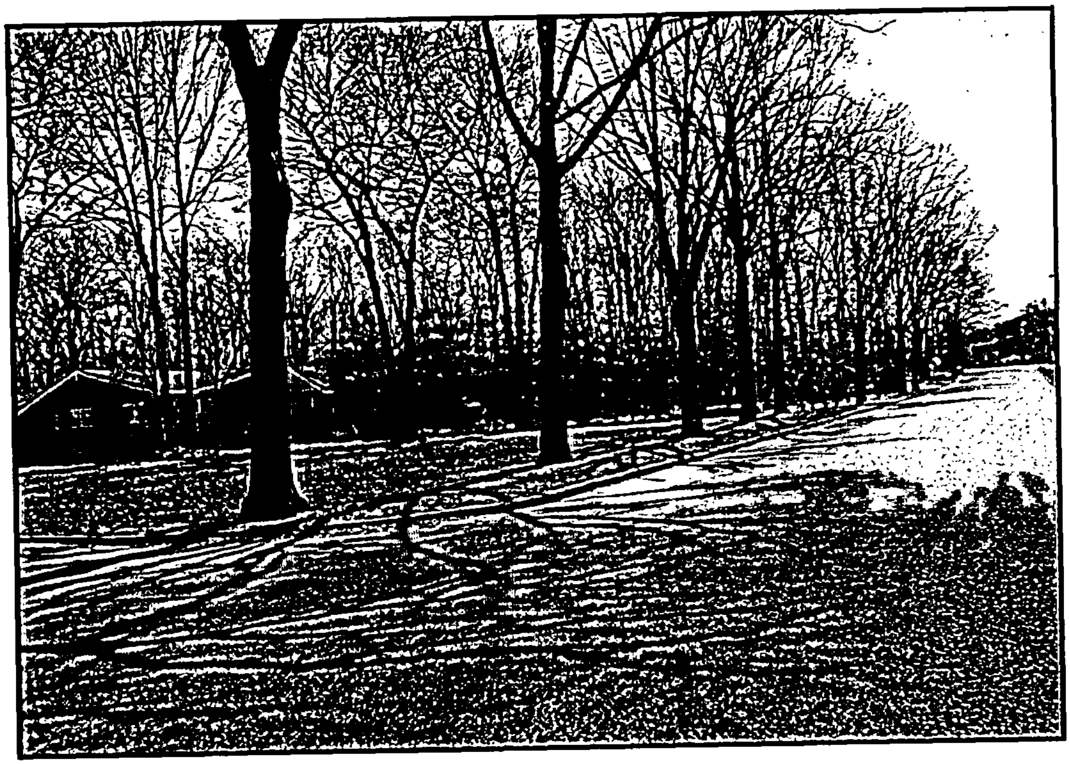


Photo 16. View toward the SMC site from Rosemont Avenue and Fawn Drive.

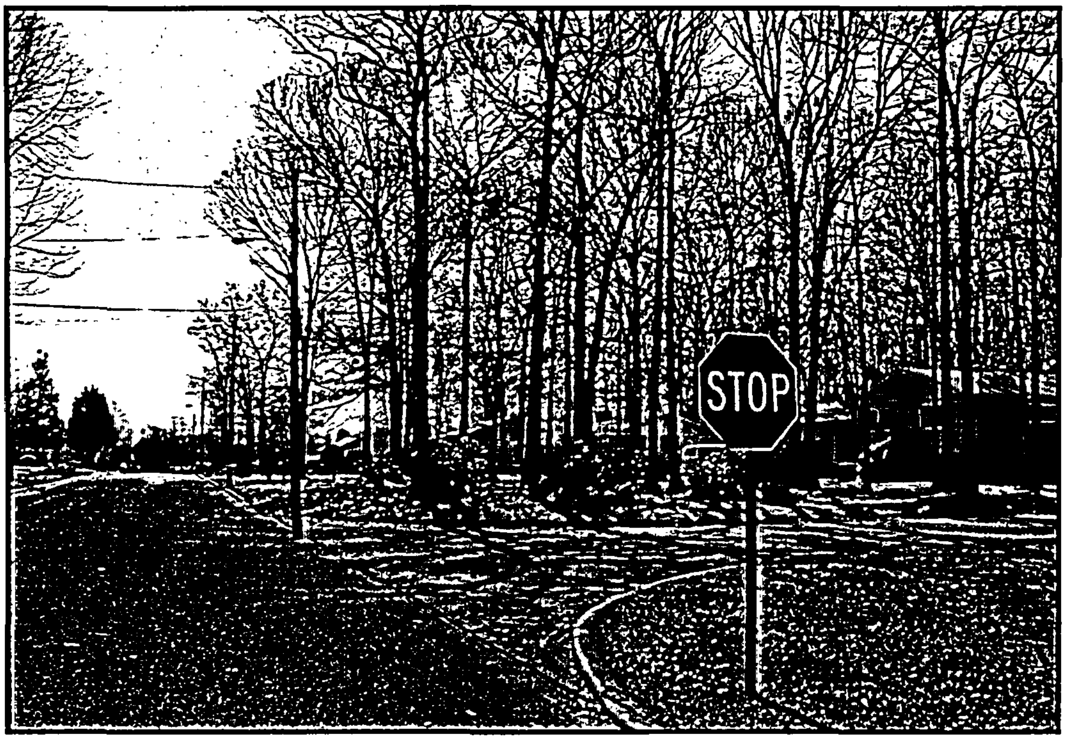


Photo 17. View toward the SMC site from Woodlawn Avenue at Covey Lane

Photo 18. View toward the SMC site from Gorgo Lane south of Newfield water tower

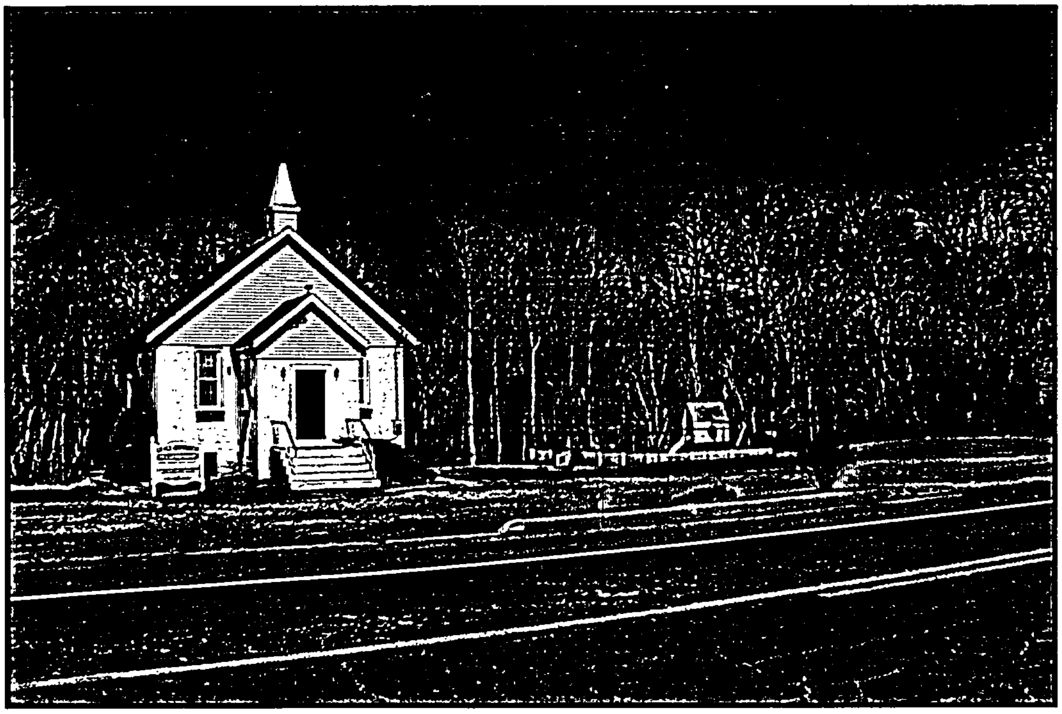


Photo 19. View toward the SMC site from Grace Orthodox Church at Weymouth near West Blvd

Photo 20. View toward the SMC site from Columbia Avenue at County Bridge

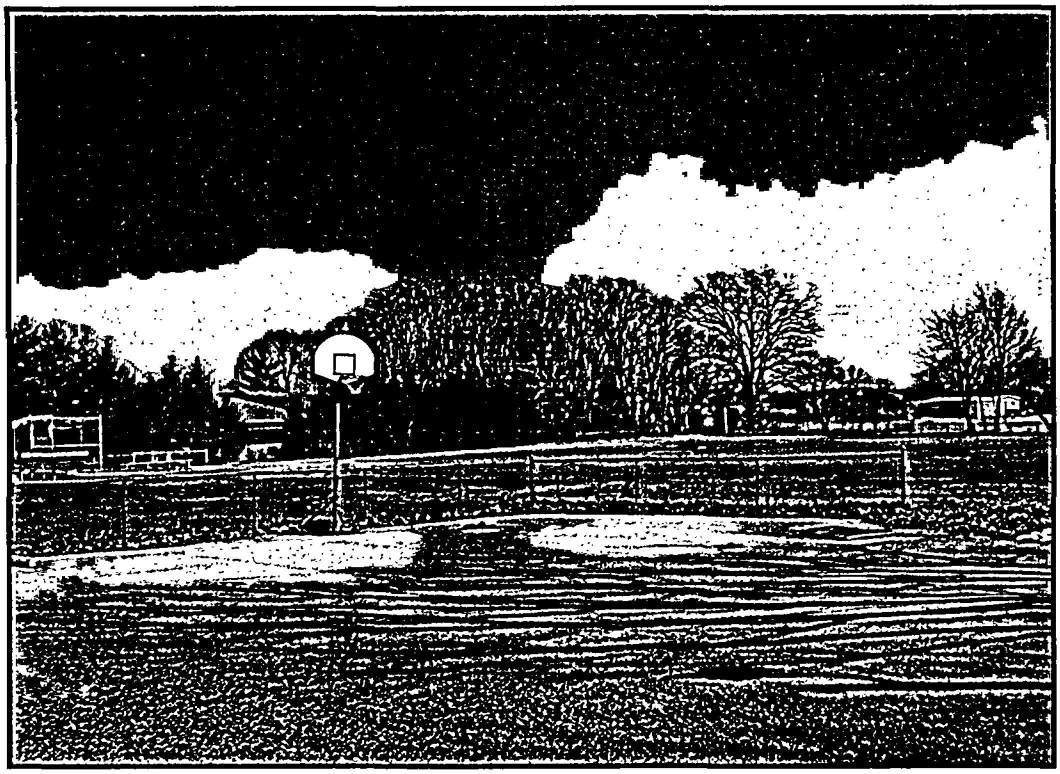


Photo 21. View toward the SMC site from Christ Community on Church Salem Avenue.

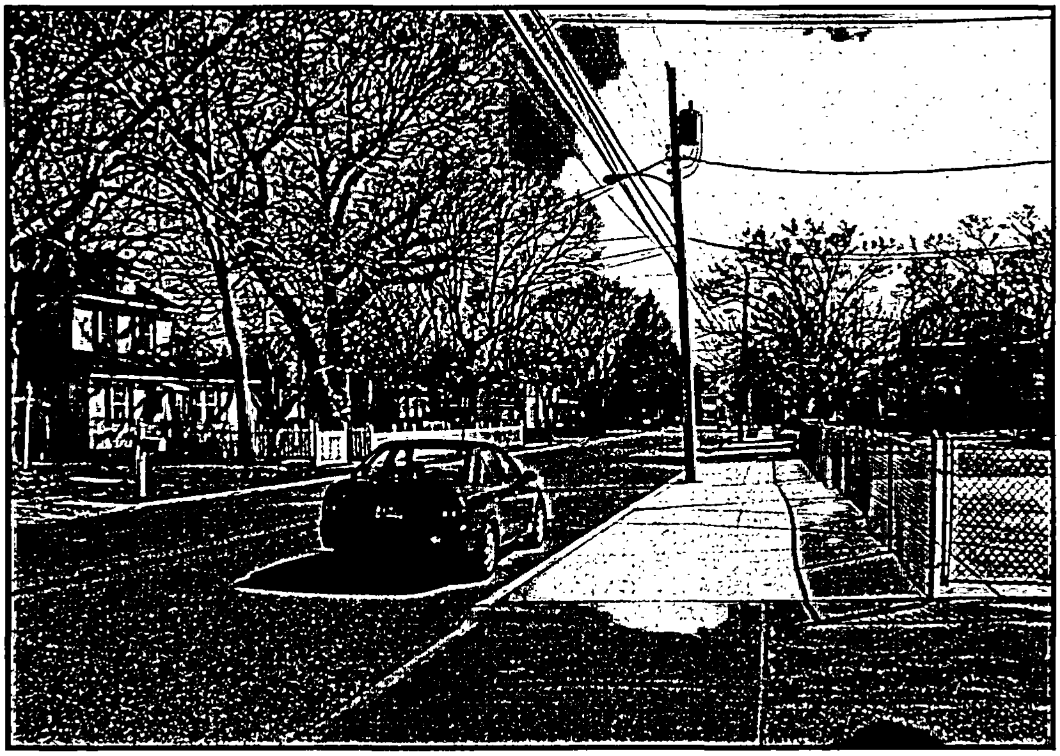


Photo 22. View toward the SMC site from Notre Dame School on Church Street.

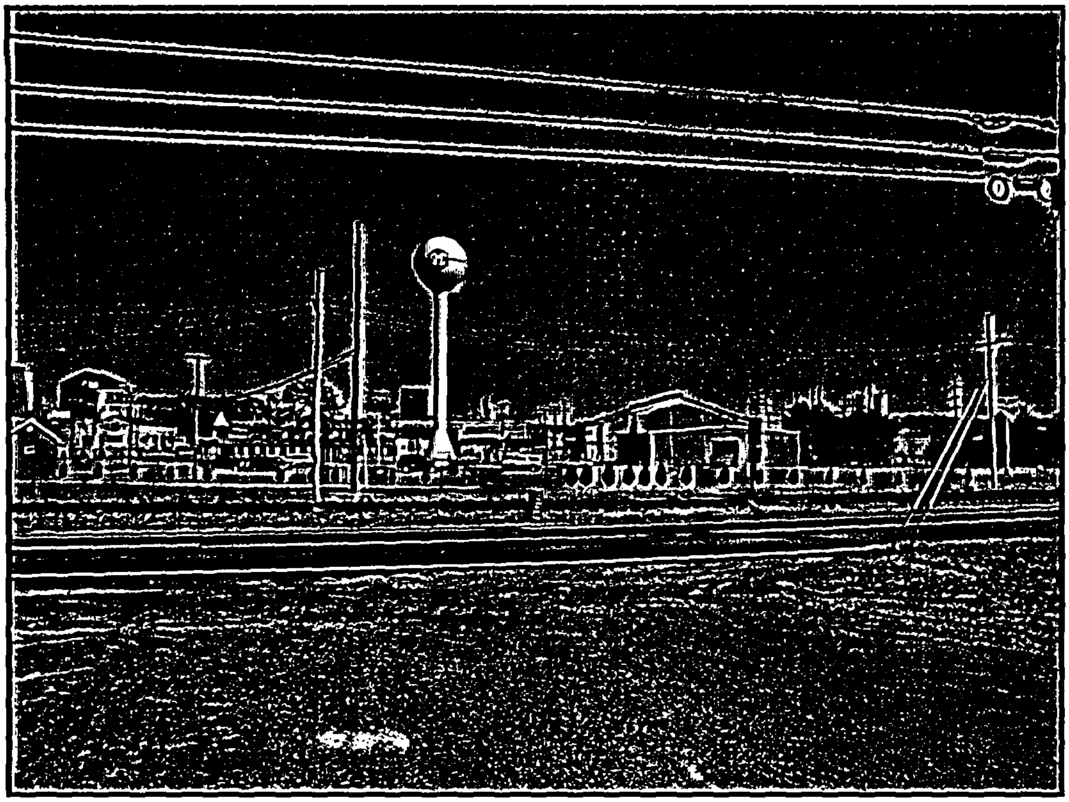


Photo 23. View toward the SMC site from 46 West Blvd- Cabinet Source Store.

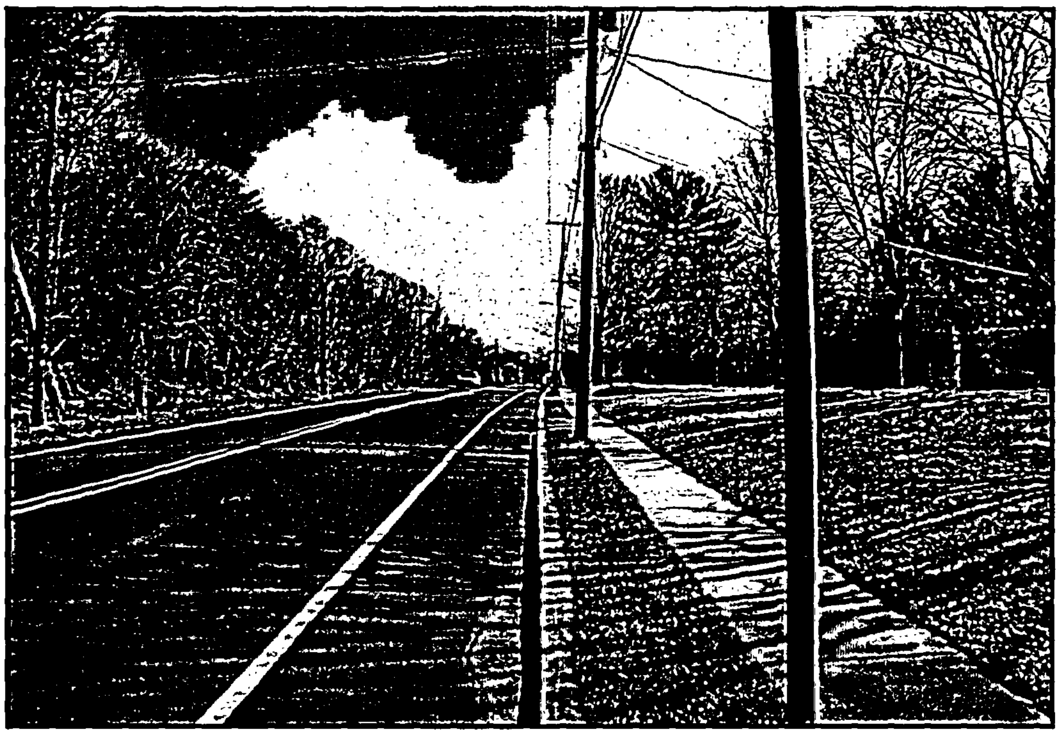


Photo 24. View toward the SMC site from West Blvd and Sandy Drive.

Photo 25. View toward the SMC site from Strawberry Avenue, east City Line Avenue.

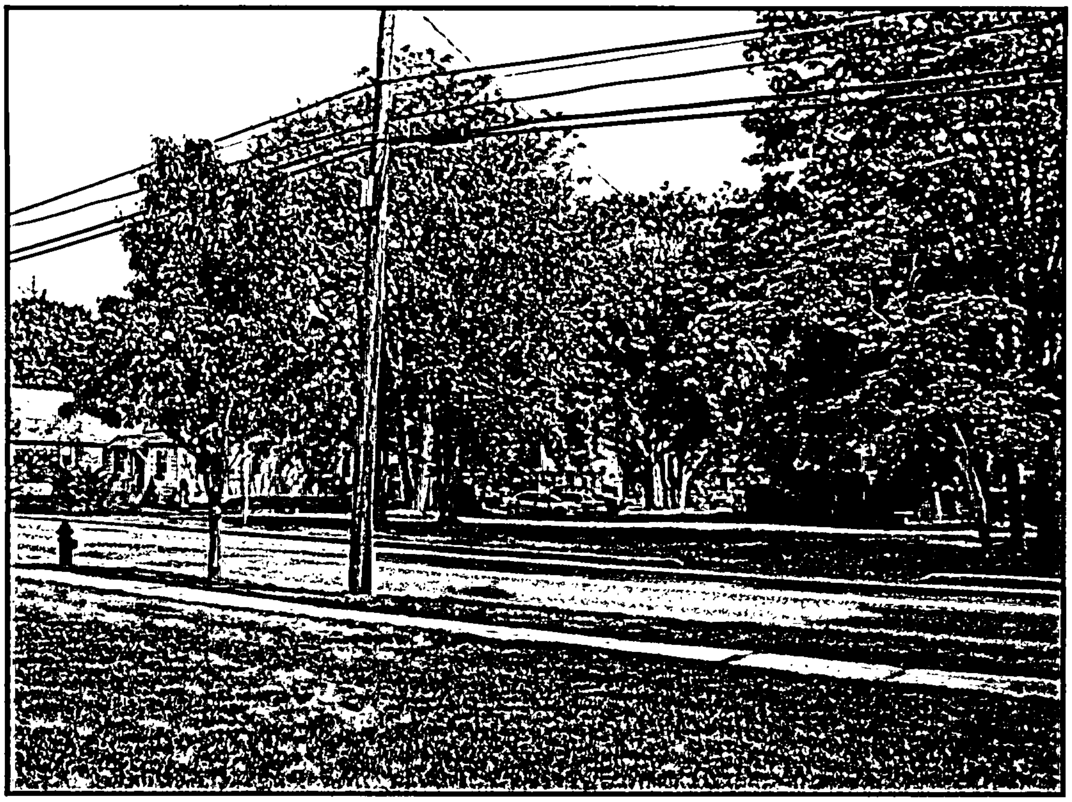


Photo 15A. View toward Storage Yard at the SMC site from Edgarton School parking lot on Catawba Avenue.

Photo 19A. View toward Storage Yard at the SMC site from Grace Orthodox Church at Weymouth near West Blvd.

Photo 20A. View toward Storage Yard at the SMC site from Columbia Avenue at County Bridge.

Photo 25A. View toward Storage Yard at the SMC site from Strawberry Avenue east of City Line Avenue.

APPENDIX J - SELECT SOCIOECONOMIC DATA

APPENDIX J - SELECT SOCIOECONOMIC DATA

Census Data

- Total Population – by State, County and Block
- Hispanic and Latino, or Not Hispanic or Latino, by Race – by State, County and Block Group
- Poverty Status in 1999 by Age Race – by State, County and Block Group
- Poverty Status in 1999 of Families by Family Type Race – by State, County and Block Group

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	New Jersey	Cumberland County, New Jersey	Gloucester County, New Jersey	Block 1000, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1001, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1002, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1003, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1017, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1018, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 2007, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey
Total	8,414,350	146,438	254,673	6	0	78	45	0	2	50

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 2008, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2009, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2010, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2011, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2012, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2019, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2020, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2021, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2022, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2023, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey
Total	32	0	0	38	16	56	0	0	31	32

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 2024, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 1006, Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block 1007, Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block 1006, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1007, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1008, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1012, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1013, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1014, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1015, Block Group 1, Census Tract 5018, Gloucester County, New Jersey
Total	112	202	0	92	62	35	15	13	64	0

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 1016, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1017, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1018, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1019, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1020, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1021, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1022, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1023, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 2000, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2003, Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total	0	51	61	25	21	25	22	0	289	68

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 2004, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2005, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2006, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2007, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2008, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2009, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2014, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2015, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2016, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2017, Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total	51	35	0	0	0	8	17	32	39	25

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 2018, Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total	66

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, and definitions, see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	New Jersey	Cumberland County, New Jersey	Gloucester County, New Jersey	Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total:	8,414,350	146,438	254,673	1,264	1,527	1,018	731	885
Hispanic or Latino	1,117,191	27,823	6,583	273	132	58	20	42
Not Hispanic or Latino:	7,297,159	118,615	248,090	991	1,395	960	711	843
Population of one race:	7,163,470	116,234	245,294	966	1,377	950	706	830
White alone	5,557,209	85,510	218,262	509	1,304	926	693	810
Black or African American alone	1,096,171	28,134	22,562	445	71	17	9	12
American Indian and Alaska Native alone	11,338	1,077	426	4	0	1	1	1
Asian alone	477,012	1,338	3,763	2	2	6	3	6
Native Hawaiian and Other Pacific Islander alone	2,175	39	60	1	0	0	0	0
Some other race alone	19,565	136	221	5	0	0	0	1
Population of two or more races:	133,689	2,381	2,796	25	18	10	5	13
Population of two races:	126,411	2,171	2,588	22	18	8	5	13
White; Black or African American	18,066	487	921	2	3	0	2	1
White; American Indian and Alaska Native	9,760	377	421	7	3	3	2	3
White; Asian	21,700	195	478	2	3	0	1	2
White; Native Hawaiian and Other Pacific Islander	1,008	16	40	0	0	0	0	0
White; Some other race	35,669	400	317	4	2	5	0	5
Black or African American; American Indian and Alaska Native	6,538	330	171	3	2	0	0	2
Black or African American; Asian	3,482	49	45	1	0	0	0	0
Black or African American; Native Hawaiian and Other Pacific Islander	1,307	35	12	0	0	0	0	0
Black or African American; Some other race	16,291	203	72	3	1	0	0	0
American Indian and Alaska Native; Asian	2,067	10	13	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	40	5	0	0	0	0	0	0

White; Black or African American; Asian	555	10	13	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	57	4	0	0	0	0	0	0
White; Black or African American; Some other race	837	17	30	0	0	0	0	0
White; American Indian and Alaska Native; Asian	235	1	3	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	35	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Some other race	144	8	15	0	0	2	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	286	2	3	0	0	0	0	0
White; Asian; Some other race	647	4	16	0	0	0	0	0
White; Native Hawaiian and Other Pacific Islander; Some other race	36	0	2	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian	138	5	2	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	45	1	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Some other race	187	6	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	78	3	2	2	0	0	0	0
Black or African American; Asian;Some other race	232	2	3	0	0	0	0	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	70	1	1	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	19	1	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Some other race	32	0	1	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	1	0	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	48	1	0	0	0	0	0	0
Population of four races:	535	9	14	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian	349	4	8	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	17	1	4	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	55	2	1	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	28	0	1	0	0	0	0	0
White; Black or African American; Asian; Some other race	30	0	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	5	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	16	2	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Some other race	4	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	1	0	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	11	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	5	0	0	0	0	0	0	0

Black or African American; American Indian and Alaska Native; Asian; Some other race	4	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	3	0	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	5	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	2	0	0	0	0	0	0	0
Population of five races:	193	4	2	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	148	1	1	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	26	3	1	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	11	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	6	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	2	0	0	0	0	0	0	0
Population of six races:	16	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	16	0	0	0	0	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

P87. POVERTY STATUS IN 1999 BY AGE [17] - Universe: Population for whom poverty status is determined
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definitions see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	New Jersey	Cumberland County, New Jersey	Gloucester County, New Jersey	Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total:	8,232,588	135,350	249,843	755	1,492	1,002	721	889
Income in 1999 below poverty level:	699,668	20,367	15,395	92	56	26	61	44
Under 5 years	63,044	2,000	1,167	20	0	0	7	7
5 years	13,402	472	190	17	0	0	2	0
6 to 11 years	82,757	2,775	1,605	0	0	0	12	8
12 to 17 years	68,551	2,286	1,618	0	0	0	2	0
18 to 64 years	388,578	10,537	8,809	21	31	26	27	26
65 to 74 years	38,435	1,115	838	8	0	0	2	1
75 years and over	44,901	1,182	1,168	26	25	0	9	2
Income in 1999 at or above poverty level:	7,532,920	114,983	234,448	663	1,436	976	660	845
Under 5 years	486,798	6,667	14,993	22	90	31	34	46
5 years	103,544	1,445	3,059	0	48	0	13	11
6 to 11 years	644,822	10,376	21,829	39	111	67	62	66
12 to 17 years	592,171	10,396	21,631	111	60	74	57	62
18 to 64 years	4,724,939	70,598	146,407	410	934	680	386	552
65 to 74 years	531,283	8,276	15,034	42	94	63	53	50
75 years and over	449,363	7,225	11,495	39	99	61	55	58

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 3 (SF 3) - Sample Data (PDF 141.5KB)

P90. POVERTY STATUS IN 1999 OF FAMILIES BY FAMILY TYPE BY PRESENCE OF RELATED CHILDREN UNDER 18 YEARS BY AGE OF RELATED CHILDREN [41] - Universe: Families
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definitions see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	New Jersey	Cumberland County, New Jersey	Gloucester County, New Jersey	Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total:	2,167,577	35,373	67,528	204	426	272	216	261
Income in 1999 below poverty level:	135,549	4,004	2,873	12	0	0	12	14
Married-couple family:	50,751	1,157	946	6	0	0	6	7
With related children under 18 years:	32,125	718	551	6	0	0	6	2
Under 5 years only	6,588	157	97	0	0	0	2	0
Under 5 years and 5 to 17 years	9,897	257	164	6	0	0	2	2
5 to 17 years only	15,640	304	290	0	0	0	2	0
No related children under 18 years	18,626	439	395	0	0	0	0	5
Other family:	84,798	2,847	1,927	6	0	0	6	7
Male householder, no wife present:	12,537	416	268	0	0	0	0	0
With related children under 18 years:	9,128	353	217	0	0	0	0	0
Under 5 years only	2,275	102	46	0	0	0	0	0
Under 5 years and 5 to 17 years	2,183	107	49	0	0	0	0	0
5 to 17 years only	4,670	144	122	0	0	0	0	0
No related children under 18 years	3,409	63	51	0	0	0	0	0
Female householder, no husband present:	72,261	2,431	1,659	6	0	0	6	7
With related children under 18 years:	62,646	2,155	1,472	6	0	0	6	7
Under 5 years only	10,266	391	263	0	0	0	0	2
Under 5 years and 5 to 17 years	17,521	661	340	0	0	0	0	2
5 to 17 years only	34,859	1,103	869	6	0	0	6	3
No related children under 18 years	9,615	276	187	0	0	0	0	0
Income in 1999 at or above poverty level:	2,032,028	31,369	64,655	192	426	272	204	247
Married-couple family:	1,617,865	22,993	53,061	120	362	230	167	210
With related children under 18 years:	803,675	10,959	27,617	81	153	83	59	95
Under 5 years only	165,127	1,744	4,760	0	26	17	3	11
Under 5 years and 5 to 17 years	166,268	2,238	5,430	26	48	0	17	16
5 to 17 years only	472,280	6,977	17,427	55	79	66	39	68
No related children under 18 years	814,190	12,034	25,444	39	209	147	108	115
Other family:	414,163	8,376	11,594	72	64	42	37	37

Male householder, no wife present:	113,465	2,247	3,181	20	8	0	9	13
With related children under 18 years:	53,687	1,392	1,892	5	0	0	8	10
Under 5 years only	12,813	373	337	0	0	0	4	3
Under 5 years and 5 to 17 years	7,667	206	215	0	0	0	3	0
5 to 17 years only	33,207	813	1,340	5	0	0	1	7
No related children under 18 years	59,778	855	1,289	15	8	0	1	3
Female householder, no husband present:	300,698	6,129	8,413	52	56	42	28	24
With related children under 18 years:	165,656	3,734	4,665	8	5	19	15	15
Under 5 years only	23,885	496	718	0	5	7	0	3
Under 5 years and 5 to 17 years	22,926	611	425	0	0	0	2	2
5 to 17 years only	118,845	2,627	3,522	8	0	12	13	10
No related children under 18 years	135,042	2,395	3,748	44	51	23	13	9

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 3 (SF 3) - Sample Data (PDF 141.5KB)

APPENDIX K – AIR MODELING INFORMATION

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Air Quality Modeling Information
Figure K-1 Map Showing Geometry of Potential Emission Sources for the Proposed Decommissioning Alternatives
On-Site Stabilization and Long-Term Control (LTC) Alternative Spreadsheets
Off-Site Disposal and License Termination (LT) Alternative Spreadsheets
Visual Effects Screening Analysis Output Sheet

APPENDIX K
AIR QUALITY MODELING INFORMATION

Project Emissions

For the two active alternatives, air pollutant emissions will be generated from multiple operations and equipment. Combustion source emissions will be generated from engine exhaust systems, which, depending on the alternative being evaluated, have been assumed to include: tri-axle dump trucks, loader(s), dozer, dust control vehicle, and rock crusher's engine, and/or locomotive engine. Fugitive emissions will be generated from material handling (storage piles, heavy equipment operation, drop emissions), wind erosion of exposed material surfaces, and vehicle travel on paved and unpaved roadways. Daily and annual emissions have been estimated for each alternative. The estimate of daily emissions conservatively represents a "worst-case" day of operations that includes the expected number of construction vehicles and fugitive emissions sources.

Of potential concern for this proposed project are nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter less than or equal to 10 micrometers in aerodynamic diameter (PM_{10}). National Ambient Air Quality Standards (NAAQS) have been established for PM_{10}, SO_2, and NO_2.

Emission estimation methodologies for each of the alternatives are presented below.

On-Site Stabilization and Long-Term Control Alternative (LTC)

This alternative involves consolidating the radioactive materials within a section of the Storage Yard and constructing a multi-layer engineered barrier over the final consolidated pile. These calculations conservatively assume that areas from which stored materials are removed that are located outside of the footprint of the final pile will be covered with clean soil following material consolidation activities (associated materials are referred to herein as cover materials). To analyze emissions generated from this alternative, the following operational areas have been considered (see Figure K-1):

Area 1 Existing Storage Yard

The existing consolidated radioactive material pile will be consolidated within this area.

Area 2 Temporary D111 and D102/D112 Demolition Material Storage Area

The demolition materials will be moved from this area to the consolidated pile area located in Area 1.

Area 4 Roadways

The roadways are comprised of the paved and unpaved roads the construction vehicles associated with this alternative will utilize.

As Area 3, the Staging Area, is used only for materials crushing and train loading for the Off-Site Disposal and License Termination Alternative, it is not considered under the LTC alternative.

Emissions for the project steps that are expected to occur during implementation of this alternative, from material relocation through the placement of soil cover materials, were estimated. Multiple spreadsheets were used to estimate emissions, as presented in the attached tables. The following is a summary of the emission estimation methodologies and emission factors presented in each of the tables:

Table 1: Air Emission Details

The operational assumptions that are common to multiple aspects of the various emission estimates are summarized on Table 1. Included in the operational assumptions are operational times and material amounts handled.

Table 2: Material Description

The Storage Yard consists of several subpiles of different types of materials. This table presents the area, volume, mass, and physical characteristics of each subpile. The D111 and D102/D112 piles and the materials needed for the engineered barrier and soil cover are also listed in this table. Based on material composition the material density, silt content, and moisture content have been estimated for each subpile. Each material was matched with a similar material found in the USEPA Compilation of Air Pollutant Emission Factors AP-42 Table 13.2.4-1. Table 2 also presents a weighted average of the materials' physical characteristics that is used in some of the emission estimation tables.

Table 3: Material Handling – "Drop Emissions"

Fugitive PM_{10} "drop emissions" are created when a truck dumps material onto a pile or when material is loaded from a pile into a truck. The equation to estimate drop emissions is found in AP-42 Chapter 13.2.4, Aggregate Handling and Storage Piles. For this alternative, it is assumed that the drop emissions will occur when soil materials for the engineered barrier and soil cover are dumped on-site and when a loader moves material from an existing pile to the consolidated pile. One of the variables used in the equation, mean wind speed, is from the table of "Normals, Means, and Extremes for Philadelphia PA (PHL)" from Local Climatological Data (ISSN 0198-4535) published by the National Climatic Data Center (NCDC)(see Table 3-5). The pound per day emission estimate for each subpile assumes that every subpile has some material handling; therefore, the "Active 8-Hour Day" is a total of all the subpiles in each area.

Table 4: Material Handling – Active/Inactive Pile Emissions

Fugitive PM_{10} emissions are generated once a pile is disturbed and becomes "active," which is when pile material is dumped, loaded or otherwise handled. Per AP-42 Chapter 13.2.4, once a pile is disturbed the fines are may be disaggregated and released by wind events. There are also fugitive PM_{10} emissions generated when a disturbed pile is inactive due to wind erosion. As the undisturbed pile weathers, the potential for emissions is greatly reduced.

The emissions are estimated by using two emission factors published in the Air Pollution Engineering Manual 1992 (AP-40), Chapter 15, Table 1 (page 779), "Uncontrolled Particulate Emission Factors for Sand and Gravel Processing." One emission factor is for active storage piles during an active day. The active storage pile emission factor includes the following operations: loading (drop emissions), equipment traffic, and wind erosion. As there is no loading onto the storage piles being relocated, the emissions estimated using these factors will be conservative. The emission factor assumes that there is 8 to 10 hours of activity per 24 hours. The second emission factor is for a disturbed pile (recently active) that is inactive for the entire day. This emission factor represents wind erosion emissions. Both emission factors are for sand and gravel processing plants; the materials that are stored in Area 1 and Area 2 are similar to the types of materials associated with such operations.

The estimated daily emissions assume that only two subpiles have been disturbed and become active. Since the emission factor is based on the pile size, the daily emissions from the two largest subpiles are estimated (only the disturbed portion of the pile that will be removed and consolidated within the footprint of the final pile is considered). For the purposes of modeling each hour of the day, the wind erosion portion of the active emission factor was extracted. Material handling is assumed to occur for 8 work hours each day and thus material handling emissions are calculated based on 8 hours per day. Wind erosion is assumed to occur 24 hours per day. The emission factor was then adjusted to represent the 8 hour portion of the day that is active and the 16 hour inactive portion of the day when only wind erosion is a source of emissions.

Table 5: Heavy Equipment Operation

The emission factor used to estimate the fugitive PM_{10} emissions due to the operation of heavy equipment is from AP-42 Chapter 11.9 Western Surface Coal Mining. The heavy equipment assumed to be in use includes a dozer, loader and excavator. A dozer and loader are assumed to be used in Area 1 to consolidate the existing piles. The excavator and dozer are assumed to be used to shape the final pile and place the soil cap material. Only the loader is expected to be used in Area 2 to relocate the two piles. Dozer emissions are estimated using an equation for estimating emissions associated with the bulldozing of overburden. It is assumed that the emission rates for the loader and the excavator are the same as the dozer.

Table 6: Unpaved Roadways – Access Road

The emission estimates for fugitive PM_{10} from the unpaved access road are based on emission factors from AP-42 Chapter 13.2.2 Unpaved Roads. It is assumed that the vehicles using the road will be represented by heavy duty tri-axle trucks. The equation for unpaved surfaces at industrial sites is used for this project. Included in the equation is the number of days with precipitation greater than 0.01 inches. The precipitation data is from "Normals, Means, and Extremes for Philadelphia PA (PHL)" from Local Climatological Data (ISSN 0198-4535) published by NCDC (Table 3-5). The silt loading value is the weighted average of the materials' physical characteristics from Table 2. These calculations assume the unpaved roads will be treated each month with a chemical dust suppressant (palliative), which is expected to reduce PM_{10} emissions by 80% per AP-42 Figure 13.2.2-5. The daily number of vehicles assumes that the deliveries for the engineered barrier soils and cover soils occur on the same days.

Table 7: Paved Roadway Emissions

The emission estimates for fugitive PM_{10} from the paved road are based on AP-42 Chapter 13.2.1 Paved Roads. It is assumed that the vehicles using the road will be represented by heavy duty tri-axle trucks. AP-42 Chapter 13.2.1 Equation 1 is used to estimate emissions from the paved roads and the silt loading is the value for iron and steel production as presented in AP-42 Table 13.2.1-3. The daily number of vehicles assumes that the deliveries for the engineered barrier soil materials and cover materials occur on the same days.

Table 8: Exposed Ground Area Emissions

The emission factor for fugitive PM_{10} from the exposed ground area is presented in AP-42 Chapter 11.9.1, Table 11.9.4. Following USEPA guidance, the emission estimates assume that the wind erosion emissions from the exposed ground area will end during the revegetation period, 7 months after the start of material relocation. The emission factor is for PM_{30}, but the AP-42 table refers to Chapter 13.2.5 which has a particle distribution table that states typically 50% of PM_{30} emissions are PM_{10} when wind speed is a factor.

Table 9: Off-Road Diesel Engine Emissions

The emissions estimated and presented in this table are combustion emissions from off-road vehicle engines. Off-road vehicles have different emission factors than on-road vehicles because the manufacturers are subject to different emission standards for engine designs. The emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Non-Road Engine Modeling – Compression-Ignition, dated February 13, 1998, revised June 15, 1998. It is assumed that the engines were manufactured between 2003 and 2006 and are regulated by Tier 2 emission standards for PM and NO_x. Due to expected USEPA implementation of the Ultra-Low Sulfur Diesel Rule in June 2006, it is assumed that the diesel fuel has a sulfur content of 15 parts per million.

Table 10: On-Road Engine Emissions

The emissions estimated and presented in this table are emissions from the on-road vehicle engines. Emission estimates include exhaust, brake, and tire wear. Emissions estimates are based on MOBILE6.2, a computerized model that provides emission estimates of present and future emissions from highway motor vehicles and is available through the EPA Office of Transportation and Air Quality. MOBILE6.2 allows the use of site specific and fleet specific parameters in order to develop emission estimates that best represent expected conditions and site location. Fleet vehicles that are less than 10 years old, utilized diesel fuel with 15 ppm sulfur content, and had an average speed of 10 miles per hour were modeled.

Table 11: Emissions Summary

The emissions from each of the tables described above are summarized by area on this table.

Off-Site Disposal and License Termination Alternative (LT)

This alternative involves removing the radioactive materials from the site by railcar, with some materials requiring crushing prior to off-site removal. It also conservatively assumes the placement of clean soil (cover material) over the Storage Yard after the materials have been removed. Under this alternative, active decommissioning measures will occur for eight hours per day, five days per week, five months per year, over a two year period. To analyze emissions generated from this alternative, the following operational areas have been considered:

Area 1 Existing Storage Yard

The majority of the material to be transported off-site is located in the Storage Yard. The material will be removed and brought to the Staging Area.

Area 2 Temporary D111 and D102/D112 Demolition Material Storage Area

The demolition material will be removed and brought to the Staging Area.

Area 3 Staging Area

The Staging Area is used for materials crushing and train loading operations.

Area 4 Roadways

The roadways are comprised of the paved and unpaved roads the construction vehicles associated with the project will utilize.

Emissions were estimated for the project steps that are expected to occur during implementation of this alternative from material relocation through transportation off-site. Multiple spreadsheets were used to estimate emissions, as presented in the attached tables. The following is a summary of the emission estimation methodologies and emission factors presented in each of the tables:

Table 1: Air Emission Details

The operational assumptions that are common to multiple aspects of the various emission estimates are summarized on Table 1. Included in the operational assumptions are operational times and material amounts handled.

Table 2: Material Description

This table presents the area, volume, mass, and physical characteristics of each subpile of material in the Storage Yard as well as the D111 and D102/D112 piles and cover materials. Based on material composition the density, silt content, and moisture content of each material was estimated. Each material was matched with a similar material found in AP-42 Table 13.2.4-1. Table 2 also presents weighted average of the materials' physical characteristics that is used in some of the emission estimation tables.

Table 3: Material Handling – "Drop Emissions"

Fugitive PM_{10} "drop emissions" are created when a truck dumps material onto a pile or when material is loaded from a pile into a truck. The equation to estimate drop emissions is found in AP-42 Chapter 13.2.4, Aggregate Handling and Storage Piles. For this alternative, it is assumed that the drop emissions will occur when cover materials are dumped on-site, when material is loaded onto a tri-axle truck for transfer to the Staging Area, and when the train is loaded with material. One of the variables used in the equation, mean wind speed, is from the table of "Normals, Means, and Extremes for

Philadelphia PA (PHL)" from Local Climatological Data (ISSN 0198-4535) published by the NCDC (Table 3-5).

Table 4: Material Handling – Crushing Emissions

Fugitive PM_{10} emissions are created when mechanical crushing is employed for material size reduction. Only piles with large material will be processed in the crusher. The emission factor is from EPA's Factor Information Retrieval (FIRE) Data System version 6.25. The source classification code (SCC) for the process is 3-05-020-02, which is for stone quarrying – processing, secondary crushing (no emission factors were available for primary crushing). The emission factor is for a crusher that employs wet suppression technology as an emission control. The daily amount of material crushed and the estimated PM_{10} emissions are limited by the amount of material that can be loaded into a rail car. Annual emissions assume that half the material will be crushed in the first year and the other half crushed in the second year.

Table 5: Material Handling – Active/Inactive Pile Emissions

Fugitive PM_{10} emissions are generated once a pile is disturbed and becomes "active", which is when pile material is dumped, loaded, or otherwise handled. Per AP-42 Chapter 13.2.4, once a pile is disturbed, the fines may be disaggregated and released by wind events. There are also fugitive PM_{10} emissions generated when a disturbed pile is inactive due to wind erosion. As the undisturbed pile weathers, the potential for emissions is greatly reduced.

The emissions are estimated by using two emission factors published in the Air Pollution Engineering Manual 1992 (AP-40), Chapter 15, Table 1 (page 779), "Uncontrolled Particulate Emission Factors for Sand and Gravel Processing". One emission factor is for active storage piles during an active day. The active storage pile emission factor includes the following operations: loading (drop emissions), equipment traffic, and wind erosion. The "drop emission" for loading into the Staging Area pile is included in the active pile emission factor. The emission factor assumes that there is 8 to 10 hours of activity per 24 hours. The second emission factor is for a disturbed pile (recently active) that is inactive for the entire day. This emission factor represents wind erosion emissions. Both emission factors are for sand and gravel processing plants; the materials that are stored in Area 1 and Area 2 are similar to the types of materials associated with such operations.

The estimated daily emissions assume that only two subpiles have been disturbed and become active. Since the emission factor is based on the pile size, the daily emissions from the two largest subpiles are estimated. For the purposes of modeling each hour of the day, the wind erosion portion of the active emission factor was extracted. Material handling is assumed to occur for 8 work hours each day and thus material handling emissions are calculated based on 8 hours per day. Wind erosion is assumed to occur 24 hours per day. The emission factor was then adjusted to represent the 8 hour portion of the day that is active and the 16 hour inactive portion of the day when only wind erosion is a source of emissions. Annual emissions assume that half the piles have been disturbed and removed during the first year and the remaining piles are disturbed and removed during the second year

Table 6: Heavy Equipment Operation

The emission factor used to estimate the fugitive PM_{10} emissions due to the operation of heavy equipment is from AP-42 Chapter 11.9 Western Surface Coal Mining. The heavy equipment assumed to be used includes a dozer, loaders and an excavator. A dozer and loader are assumed to be used in Area 1 to remove the existing piles. Only the loader is expected to be used in Area 2 to relocate the two piles. A second loader is expected to be operating at the Staging Area. Dozer emissions are estimated using an equation for estimating emissions associated with the bulldozing of overburden materials. It is assumed that the emission rate for the loader is the same as the dozer.

Table 7: Unpaved Roadways – Access Road

The emission estimates for fugitive PM_{10} from the access road are based on emission factors from AP-42 Chapter 13.2.2 Unpaved Roads. It is assumed that the vehicles using the road will be represented by heavy duty tri-axle trucks. The equation for unpaved surfaces at industrial sites is used for this project. Included in the equation is the number of days with precipitation greater than 0.01 inches. The precipitation data is from "Normals, Means, and Extremes for Philadelphia PA (PHL)" from Local Climatological Data (ISSN 0198-4535) published by NCDC (Table 3-5). The silt loading value is the weighted average of the materials' physical characteristics from Table 2. The calculations assume the unpaved roads will be treated each month with a chemical dust suppressant, which is expected to reduce PM_{10} emissions by 80%, per AP-42 Figure 13.2.2-5. The daily number of vehicles assumes that the material transfer and the cover material deliveries occur on the same days.

Table 8: Paved Roadway Emissions

The emission estimates for fugitive PM_{10} from the paved road are based on AP-42 Chapter 13.2.1 Paved Roads. It is assumed that the vehicles using the road will be represented by heavy duty tri-axle trucks. AP-42 Chapter 13.2.1 Equation 1 is used to estimate emissions from the paved roads and the silt loading is the value for iron and steel production as presented in AP-42 Table 13.2.1-3.

Table 9: Exposed Ground Area Emissions

The emission factor for fugitive PM_{10} from the exposed ground area is presented in AP-42 Chapter 11.9.1, Table 11.9.4. Following EPA guidance, the emission estimates assume that re-vegetation (after the end of material relocation) will end the wind erosion emissions from the exposed ground area. The emission factor is for PM_{30}, but the AP-42 table refers to AP-42 Chapter 13.2.5, which has a particle distribution table that states typically 50% of PM_{30} emissions are PM_{10} when wind speed is a factor.

Table 10: Off-Road Diesel Engine Emissions

The emissions estimated and presented in this table are emissions from off-road vehicle engines. Emissions estimates include exhaust, brake and tire wear. Off-road vehicles have different emission factors than on-road vehicles because the manufacturers are subject to different emission standards for engine designs. The emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Non-Road Engine Modeling – Compression-Ignition, dated February 13, 1998, revised June 15, 1998. It is assumed that the engines were manufactured between 2003 and 2006 and are regulated by Tier 2 emission standards for PM and NO_x. Due to expected USEPA implementation of the Ultra-Low Sulfur Diesel Rule in June 2006, it is assumed that the diesel fuel has a sulfur content of 15 parts per million.

Table 11: Crusher - Engine Emissions

The emissions estimated and presented in this table are combustion point source emissions from the diesel engine that powers the crusher. For the purpose of estimating emissions, it is assumed that the engine has a power rating of 300 HP. The emission factors used to estimate emissions are published in AP-42 Chapter 3.3, Table 3.3-1. Due to expected USEPA implementation of the Ultra-Low Sulfur Diesel Rule in June 2006, it is assumed that the diesel fuel has a sulfur content of 15 parts per million.

Table 12: Locomotive – Diesel Powered

The emissions estimated and presented in this table are combustion emissions from the diesel engine that powers the train. For the purpose of estimating emissions, it is assumed that the locomotive operates under "switch duty-cycle" as defined by USEPA and the engine has a power rating of 1,000 HP. The emission factors used to estimate emissions are published in USEPA's "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines – Locomotives". Emissions are based on the assumption that the engines were manufactured from 2000 to 2004. Due to expected USEPA implementation of the Ultra-Low Sulfur Diesel Rule in June 2006, it is assumed that the diesel fuel has a sulfur content of 15 parts per million.

Table 13: On-Road Engine Emissions

The emissions estimated and presented in this table are combustion emissions from the on-road vehicle engines. Emissions estimates are based on MOBILE6.2, a computerized model that provides emission estimates of present and future emissions from highway motor vehicles and is available through the EPA Office of Transportation and Air Quality. MOBILE6.2 allows the use of site-specific and fleet-specific parameters in order to develop emission estimates that best represent expected conditions and site location. TRC modeled fleet vehicles that are less than 10 years old, utilized diesel fuel with 15 ppm sulfur content, and had an average speed of 10 miles per hour. Emission estimates include brake and tire wear.

Table 14: Emissions Summary

The emissions from each of the tables described above are summarized by area on this table.

License Continuation Alternative (LC)

The LC Alternative involves leaving the existing storage piles in-place. Under this alternative, it is expected that the area would become largely naturally vegetated over the long term. Areas that do not support vegetation, such as large pieces of slag, have been exposed to the wind for some time and wind erodible particles have been removed. USEPA notes that erodible materials are removed from an undisturbed surface in a matter of minutes by wind, and as long as the surface remains undisturbed, it is no longer a source of particle emissions (USEPA, AP-42, Compilation of Air Pollution Emission Factors, Section 13.2.5). Piles containing finer material will tend to form a natural crust, and again the erodible materials from the crusted surface have already been removed. There would be no vehicles or construction equipment used under this scenario.

There will be no emissions of NO_x attributable to this alternative, since there will be no combustion sources or engines employed. Airborne particle emissions under the LC Alternative will be negligible. USEPA does not consider inactive exposed areas and storage piles within industrial facilities to be sources of particle emissions. Under the LC Alternative, the site would have inconsequential impacts on air quality, since there would be virtually no emissions. Under this scenario, the air quality concentrations would be equal to the background concentrations.

Project Visibility Screening Modeling

The worst-case emission scenario (LT Alternative) was modeled using the EPA's visibility screening model, VISCREEN, to determine whether the Project would have any significant visibility impact on the nearest Prevention of Significant Deterioration (PSD) Class I area, the Brigantine National Wildlife Refuge. Modeling was performed in accordance with the Federal Land Manager's Air Quality Related Values Working Group (FLAG) Phase I Report (U.S. Forest Service, December 2000). The output of the VISCREEN model is attached and shows that the screening criteria for the maximum visual impacts are not exceeded either inside or outside the Class I area. Thus, since the other alternatives have lower emission rates, all of the remediation alternatives will comply with the visibility screening criteria.

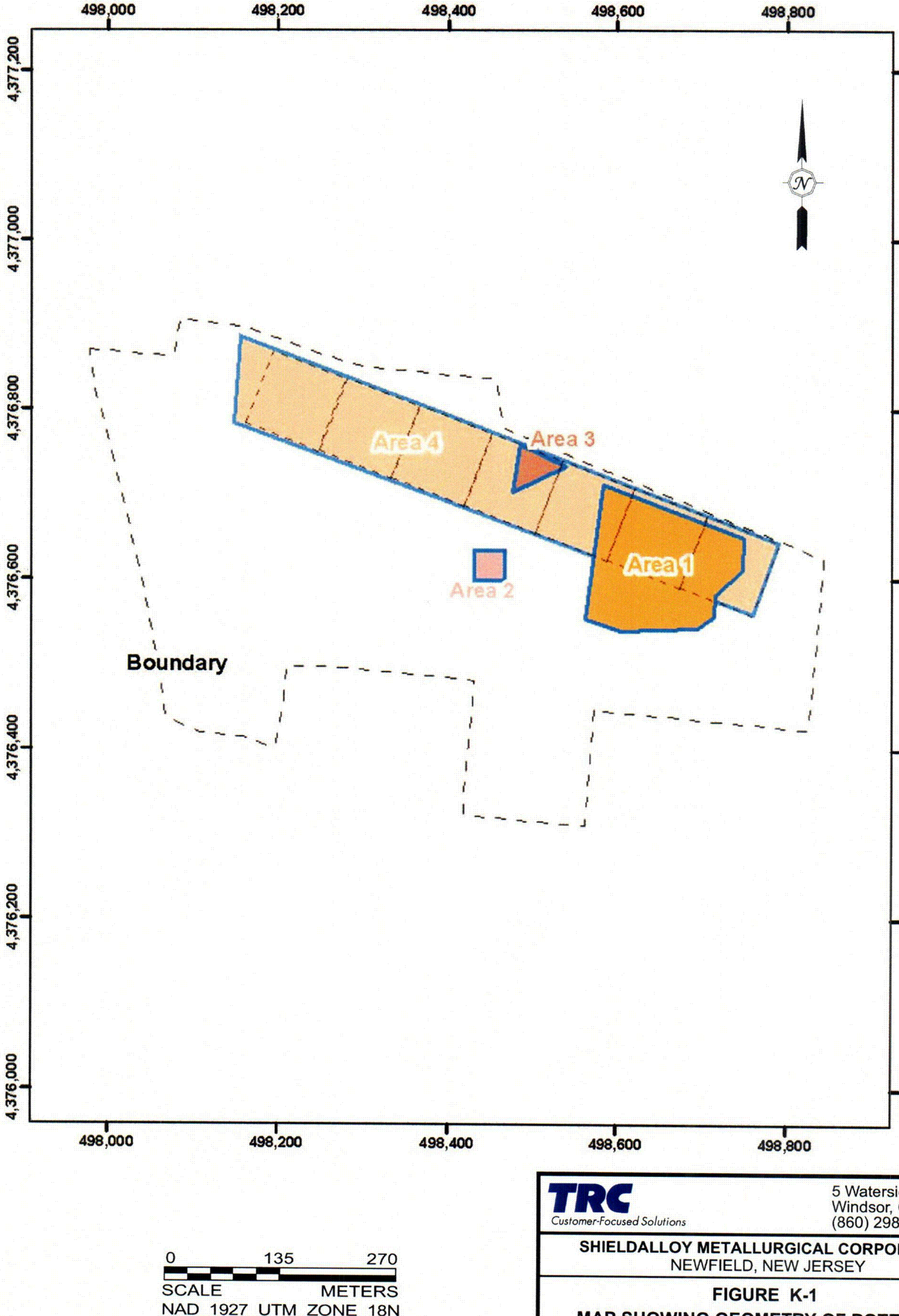

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FIGURE K-1

MAP SHOWING GEOMETRY OF POTENTIAL EMISSION SOURCES FOR THE PROPOSED DECOMMISSIONING ALTERNATIVES

pers/jw/haz/26770 smc/ER Doc.fh10

Date: 09/05 | **Project No.** 26770-0000-00000

C37

SMC

On-Site Stabilization and Long-Term Control

Table 1
Air Emission Details

Engineered Barrier Material			
Amount of Topsoil (cubic yards)		3,667	CAD-based Estimate
Amount of Soil Isolation & Frost Protection (cubic yards)		15,000	CAD-based Estimate
Amount of Sand Cushion (cubic yards)		6,000	CAD-based Estimate
Material Total (cubic yards)		24,667	
Amount of Topsoil (tons)		5,197	Cubic Yards x Pounds per Cubic Yard
Amount of Soil Isolation & Frost Protection (tons)		21,263	Cubic Yards x Pounds per Cubic Yard
Amount of Sand Cushion (tons)		8,910	Cubic Yards x Pounds per Cubic Yard
Material Total (tons)		35,370	
Number of Trucks		1,233	Material Needed / Yards per Load
Yards per Load		20	Given
Cubic Yards of Engineered Barrier Material Delivered		24,667	Number of Trucks x Yards per Load
Pounds per Cubic Foot of Topsoil & Soil Isolation, Density		105	From Table 2
Pounds per Cubic Yard, Density		2,835	Pounds per Cubic Foot x 27
Grams per Cubic Centimeter		1.68	From Table 2
Pounds per Cubic Foot of Sand, Density		110	Given
Pounds per Cubic Yard, Density		2,970	Pounds per Cubic Foot x 27
Grams per Cubic Centimeter		1.76	From Table 2
Soil Material Loaded per Truck (tons)		28	Yards per Load x Pounds per Cubic Yard
Weight per Empty Truck (tons)		15	Given
Weight per Loaded Truck (tons)		43	Load per Truck + Weight of Empty Truck
Average Weight of a Soil Material Truck (tons)		29	Average of Empty Truck and Loaded Truck
Average Number of Wheels per Truck (10 unloaded, 14 loaded)		12	Given
Trucks per Project, Soil Material		1,233	Assumes Cover Operation = 90 Calendar Days (64 work days)
Trucks per Day, Soil Material		19.3	Trucks per Project / Time for Engineered Barrier (64 work days)
Tons Loaded per Day, Soil Material		546	Trucks per Day x Tons Loaded per Truck
Tons Loaded per Project, Soil Material		34,965	Trucks per Project x Tons Loaded per Truck
Soil Material for the Relocated Pile Area			
Engineered Barrier Area Size (square feet)		196,858	CAD-based Estimate
Total Storage Yard Area Size (square feet)		310,687	CAD-based Estimate
Size of Area to be Covered (square feet)		113,829	Total Storage Yard Area - Engineered Barrier Area
Depth of Cover (feet)		1	Given
Number of Yards of Cover Needed (cubic yards)		4,216	Size of Area x Depth of Cover
Number of Trucks		211	Cover Needed / Yards per Load
Yards per Load		20	Given
Trucks per Day		24	Assume 3 Loads per Hour / 8 Hours Day
Yards per Day		480	Yards per Load x Trucks per Day
Pounds per Cubic Foot (same as Topsoil & Soil Insolation above)		105	From Table 2
Ton per Project		5,976	Pounds per Cubic Yard / Yards of Cover
Number of Days Needed		9	Number of Trucks / Yards per Load
Material Relocation by Truck (D111/D112)			
Number of Trucks from Piles to Engineered Barrier Area		100	Cubic Yards / Yards per Load
Yards per Load		20	Given
Material to be Moved (cubic yards)		2,000	From Table 2
Material to be Moved (tons)		3,240	From Table 2
Trucks per Day		24	Assume 3 loads per Hour / 8 Hours Day
Tons Material Loaded per Truck		32	Tons Material Moved / Number of Trucks
Weight per Empty Truck (tons)		15	Given
Weight per Loaded Truck (tons)		47	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck (tons)		31	Average of Empty Truck and Loaded Material Truck
Average Weight of All Trucks (tons)		29	Weighted Average Weight (material trucks and cover trucks)
Operation Duration			
Total Time (MONTHS)		7	Given (see Figure 18.12 Project Schedule)
Time for Creating Consolidated Pile to Engineered Barrier (DAYS)	Calendar	90	Given (see Figure 18.12 Project Schedule)
	Work	64	Assumed
Time for moving two piles (DAYS)	Work	4.2	Number of Trucks Material Relocation / Trucks per Day
Time for Engineered Barrier (DAYS)	Calendar	90	Given (see Figure 18.12 Project Schedule)
	Work	64	Assumed
Placement of Sand and Soil Barrier Layer (DAYS)	Calendar	60	Given (see Figure 18.12 Project Schedule)
	Work	44	Assumed
Placement of Vegetation Layer (DAYS)	Calendar	30	Given (see Figure 18.12 Project Schedule)
	Work	20	Assumed
Vegetation Establishment Period (DAYS)		60	Given (see Figure 18.12 Project Schedule)
Soil Cover for Non-Engineered Barrier Area (DAYS)	Calendar	13	Assumed
	Work	9	Assumed
Days per Week		5	Assumed
Hours per Day		8	Assumed
Length of UNPAVED Roadway (feet) - from Pile to Engineered Barrier		550	D111/D112 Material Piles Moved
Length of UNPAVED Roadway (feet) - to paved roadway		1,200	Cover & Engineered Barrier Material
Length of PAVED Roadway (feet)		1,650	Cover & Engineered Barrier Material
Daily/Annual Operating Rates			
Loader(s) = Maximum Operating Hours per Day		8	Assumed
= Operating Hours per Year		1057	Assumed
Dozer = Maximum Operating Hours per Day		8	Assumed
= Operating Hours per Year		1057	Assumed
Excavator = Maximum Operating Hours per Day		4	Assumed
= Operating Hours per Year		256	Assumed
Dust Control Truck = Maximum Operating Hours per Day		2	Assumed
= Number of Trips per Month		1	Assumed
= Number of Trips for Project		7	Assumed

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On-Site Stabilization and Long-Term Control

Table 2
Material Description

Parcel #	Material Type	Volume (cubic yard)	Pile Size (acre)	Density (lbs/ft^3)	Density (g/cm^3)	Mass (tons)	Silt * (%)	Moisture* (%)	AP-42 Material* Match
1	Excavated Soil Mixed with Slag	15,000	0.9	120	1.9	24,300	9.0	12.0	Cover
2	Excavated Soil from D111	1,000	0.2	105	1.68	1,418	9.0	12.0	Cover
3	Canal Slag (In & Out of Supersacs)	3,000	0.2	165	2.6	6,683	5.3	0.92	Slag
4	Slag	30,000	1.0	140	2.2	56,700	5.3	0.92	Slag
5	Slag & Demolition Concrete	5,000	0.5	140	2.2	9,450	5.3	0.92	Slag
6	Hi-Ratio Slag	2,000	0.3	140	2.2	3,780	5.3	0.92	Slag
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	1,000	0.3	130	2.1	1,755	5.3	0.92	Slag
8	Baghouse Dust	13,000	0.9	100	1.6	17,550	13.0	7.0	Flue Dust
9	Baghouse Dust Mixed with Slag	4,000	0.4	145	2.3	7,830	5.3	0.92	Slag
T12	D111/D112 Concrete	500	0.05	120	1.9	810	3.9	2.10	Limestone Products
E of N-S road; W of Storage Yard	D111/D112 Concrete	1,500	0.1	120	1.9	2,430	3.9	2.10	Limestone Products
CVR1	Cover for moved pile areas	4,216	0.5	105	1.68	5,976	9.0	12.00	Cover
EB1	Topsoil	3,667	0.5	105	1.68	5,197	9.0	12.00	Cover
EB2	Soil Isolation & Frost Protection	15,000	0.5	105	1.68	21,263	9.0	12.00	Cover
EB3	Sand	6,000	0.5	110	1.8	8,910	2.6	7.40	Sand
Weighted Average	(includes engineered barrier material and cover material)			123	2.0		7.44	6.17	
na	Unpaved Roadway						6.0		
na	Total Volume & Mass of Material	104,882				174,051			
	Controlled Materials:	76,000 cubic yards							

* Moisture and Silt percentages are from EPA's AP-42 Chapter 13.2.4, Table 13.2.4-1
** Assumed pile size for D112/D113 concrete similar by ratio of weight to Pile 5.

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On-Site Stabilization and Long-Term Control

Table 3
Material Handling - "Drop Emissions"

The "drop emission" factor accounts for the batch dropping of material while loaded or unloaded. Although batch dropping occurs when material is loaded into piles, the drop emissions associated with each activity are included in the emission factor for those processes.

$$E = k(0.0032) \times (U/5)^{1.3} / (M/2)^{1.4}$$

Emission factor equation from AP-42 5th Edition Section 13.2.4, January 1995

Material Type	Parcel#	Pile & Material Type	Amount of Pile To Be Moved (%)	Material Amounts (tons/project)	Material to be Handled (tons)	Number of Working Days	Material Amounts (tons/day)	Particulate Size	k Particulate Size Multiplier (dimensionless)	M Material Moisture Content (%)	U Mean Wind Speed (mph)	E Calculated Emission Factor (lb/ton)	Calculated Emissions (lb/day)	Calculated Emissions (ton/project)
EB Soil Placement	EB1	Topsoil	100	5,197	5,197	20	260	PM10	0.35	12.00	9.6	2.1E-04	0.06	5.5E-04
EB Soil Placement	EB2	Soil Isolation & Frost Protection	100	21,263	21,263	44	483	PM10	0.35	12.00	9.6	2.1E-04	0.10	2.3E-03
EB Sand Placement	EB3	Sand	100	8,910	8,910	44	203	PM10	0.35	9.7	9.6	2.9E-04	0.06	1.3E-03
Cover Placement	CVR1	Cover for moved pile areas	100	5,976	5,976	9	664	PM10	0.35	9.7	9.6	2.9E-04	0.19	8.6E-04
Loader Unloading	1	Excavated Soil Mixed with Slag	100	24,300	24,300	64	380	PM10	0.35	12	9.6	2.1E-04	0.08	2.6E-03
Loader Unloading	2	Excavated Soil from D111	100	1,418	1,418	64	22	PM10	0.35	12	9.6	2.1E-04	4.7E-03	1.5E-04
Loader Unloading	3	Canal Slag (In & Out of Supersacs)	50	6,683	3,341	64	52	PM10	0.35	0.92	9.6	7.8E-03	0.40	1.3E-02
Loader Unloading	4	Slag	25	56,700	14,175	64	221	PM10	0.35	0.92	9.6	7.8E-03	1.72	5.5E-02
Loader Unloading	5	Slag & Demolition Concrete	0	9,450	0	64	0	PM10	0.35	0.92	9.6	7.8E-03	0.0E+00	0.0E+00
Loader Unloading	6	Hi-Ratio Slag	20	3,780	756	64	12	PM10	0.35	0.92	9.6	7.8E-03	0.09	2.9E-03
Loader Unloading	7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing	0	1,755	0	64	0	PM10	0.35	1	9.6	7.8E-03	0.0E+00	0.0E+00
Loader Unloading	8	Baghouse Dust	20	17,550	3,510	64	55	PM10	0.35	7	9.6	4.5E-04	0.02	7.9E-04
Loader Unloading	9	Baghouse Dust Mixed with Slag	10	7,830	783	64	12	PM10	0.35	1	9.6	7.8E-03	9.5E-02	3.0E-03
Loader Unloading	T12	D111/D112 Concrete	100	810	810	64	13	PM10	0.35	2.10	9.6	2.4E-03	0.03	9.9E-04
Loader Unloading	E of N-S road; W of Storage Yard	D111/D112 Concrete	100	2,430	2,430	64	38	PM10	0.35	2.10	9.6	2.4E-03	0.09	3.0E-03

	Active 8 Hour Day (lbs/day)	Inactive Day (lbs/day)	March to Oct. (lbs/project)	Annual (ton/year)	March - Oct. (ton/project)
Primary Control Area	2.83	0	165	0.082	0.082
Secondary Storage Area	0.124	0	7.91	0.004	0.004

Estimates based on AP-42 Chapter 13.2.4 - Aggregate Handling and Storage Piles. Material moisture content are mean values of similar materials from AP-42 Table 13.2.4-1 and the mean wind speed is from Local Climatological Data (ISSN 0198-4535) Philadelphia, Pennsylvania.
EB = Engineered Barrier

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On-Site Stabilization and Long-Term Control

The emissions factor includes the emissions from loading material (drop emissions) into the pile, equipment traffic in the storage area, and wind erosion.

Table 4
Material Handling - Active/Inactive Pile Emissions

Parcel Number	Material Type	Activity	Estimated Pile Size (tons)	Estimated Pile Size (acre)	Amount of pile to be Moved or Uncovered (%)	Annual* Calendar Days of Operation (days/yr)	Fugitive Particulate Size	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions (lbs/project)	Calculated Emissions (ton/project)
1	Excavated Soil Mixed with Slag	Active	24,300	0.9	100	64	PM10	6.3	5.67	363	0.18
		Inactive	24,300	0.9	100	26	PM10	1.7	1.53	40	0.02
2	Excavated Soil from D111	Active	1,418	0.2	100	64	PM10	6.3	1.01	65	3.2E-02
		Inactive	1,418	0.2	100	26	PM10	1.7	0.27	7	0.004
3	Canal Slag (In & Out of Supersacs)	Active	6,683	0.2	50	32	PM10	6.3	0.60	19	9.6E-03
		Inactive	6,683	0.2	50	58	PM10	1.7	0.16	9	0.005
4	Slag*	Active	56,700	1.0	25	16	PM10	6.3	1.64	26	0.01
		Inactive	56,700	1.0	25	74	PM10	1.7	0.44	33	0.02
5	Slag & Demolition Concrete	Active	9,450	0.5	0	0	PM10	6.3	0.00	0	0.000
		Inactive	9,450	0.5	0	90	PM10	1.7	0.00	0	0.00
6	Hi-Ratio Slag	Active	3,780	0.3	20	13	PM10	6.3	0.40	5	2.6E-03
		Inactive	3,780	0.3	20	77	PM10	1.7	0.11	8	0.00
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	Active	1,755	0.3	0	0	PM10	6.3	0.00	0	0.0E+00
		Inactive	1,755	0.3	0	90	PM10	1.7	0.00	0	0.000
8	Baghouse Dust	Active	17,550	0.9	20	13	PM10	6.3	1.17	15	0.01
		Inactive	17,550	0.9	20	77	PM10	1.7	0.32	24	0.012
9	Baghouse Dust Mixed with Slag	Active	7,830	0.4	10	6	PM10	6.3	0.28	2	0.001
		Inactive	7,830	0.4	10	84	PM10	1.7	0.07	6	0.003
T12	D111/D112 Concrete	Active	810	0.05	100	1	PM10	6.3	0.30	0.31	1.5E-04
		Inactive	810	0.05	100	0	PM10	1.7	0.08	0	0.0E+00
E of N-S road, W of Storage Yard	D111/D112 Concrete	Active	2,430	0.1	100	3	PM10	6.3	0.89	2.8	1.4E-03
		Inactive	2,430	0.1	100	0	PM10	1.7	0.24	0	0.0E+00
EB1	Topsoil	Active	5,197	0.5	100	20	PM10	6.3	3.15	63	3.2E-02
		Inactive	5,197	0.5	100	10	PM10	1.7	0.85	9	0.004
EB2	Soil Isolation & Frost Protection	Active	21,263	0.5	100	44	PM10	6.3	3.15	139	6.9E-02
		Inactive	21,263	0.5	100	16	PM10	1.7	0.85	14	0.007
EB3	Sand	Active	8,910	0.5	100	44	PM10	6.3	3.15	139	6.9E-02
		Inactive	8,910	0.5	100	16	PM10	1.7	0.85	14	0.007
CVR1	Cover for moved pile areas	Active	5,976	0.5	100	9	PM10	6.3	3.15	28	1.4E-02
		Inactive	5,976	0.5	100	4	PM10	1.7	0.85	3	0.002

	March to Oct. (lbs/yr)	Annual (lbs/yr)
Primary Control Area	1,030	1,030
Secondary Control Area	3.08	3.08

Only maximum emission days are modeled, so weekend emissions with no activity will not be maximum emission days.

	Max Active Day Total Day Worst Pile 24 Hr Day (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day (lbs/day)	Max Inactive Day* (weekday) 24 Hr Day (lbs/day)
*Primary Control Area	5.67	1.53	4.65	1.02	0.44
Secondary Control Area	0.888	0.240	0.729	0.160	0.080

Emission factor is from Air Pollution Engineering Manual 1992 (AP-40), Chapter 15, Table 1 (page 779) - Uncontrolled Particulate Emission Factors for Sand and Gravel Processing. Emission factor represents the following steps in the storage cycle:

1) loading of aggregate onto storage piles (batch or continuous drop operations).
2) equipment traffic in storage areas,
3) wind erosion of pile (batch or continuous drop operations). The emission factor assumes that the operation occurs during an 8 to 12 hours per day, the remainder of the day wind erosion of the pile occurs.

EB = Engineered Barrier

** Max Inactive Day represents maximum inactive emissions for the maximum active day that will be used for modeling a "worst case" active weekday. In the Primary Control Area assumes that only 2 piles have been disturbed and that on the maximum inactive day, one is active (the largest emitting pile used as the "Worst Pile") the other is inactive (the 2nd largest emitting pile).

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Table 5

Heavy Equipment Operation

The emission factor estimates emissions from the handling of material and the emissions from movement and traveling on the material. Some of these emissions estimates are double counted when the equipment is working with a pile.

Emission Factor Equations

Loader & Dozer Equation

PM10 lbs/hr $= 0.75 (1.0(s)^{1.5}) / (M)^{1.4}$

Emission factor equations from AP-42 5th Edition Supplement E, Table 11.9.1 July 1998

Heavy Equipment Type	Hours of Operation: Hours per Day (hours)	Hours of Operation: Based on (hours/year)	Vehicle Miles Traveled (miles)	s Site Estimated Material Silt Content (%)	M AP-42 Material Moisture Content (%)	S Average Speed (mph)	Particulate Size	Calculated Emission Factor (lb/hour)	Calculated Emission Factor (lb/VMT)	Calculated Emissions (lb/day)	Calculated Emissions 7 months (lbs/year)	Calculated Emissions 7 months (ton/yr)	Calculated Emissions (ton/project)
Loader	8	1,057		7.44	6.17		PM10	1.19		9.5	1,260	0.63	0.63
Dozer	8	1,057		7.44	6.17		PM10	1.19		9.5	1,260	0.63	0.63
Excavator	4	256		7.44	6.17		PM10	1.19		4.77	305	0.15	0.15

Moving Materials in Storage Area	64	work days
Moving Materials from Secondary Area	4	work days
Handling Engineered Barrier Material	64	work days

	8 Hr Day (lbs/day)	March to Oct. (lbs/year)	Annual (lbs/year)
Primary Controlled Area	23.8	2,745	2,745
Secondary Storage Area	19.1	79.4	79.4
Roadways	0	0	0

Emissions are based on AP-42 Chapter 11.9 - Western Surface Coal Mining.

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On-Site Stabilization and Long-Term Control

This equation is utilized to estimate emissions from the movement of vehicles on unpaved roadways. The particulate emissions estimated do not include particulate emissions from the engines.

Table 6
UnPaved Roadways - Access Road

Predictive Emission Factor Equation 1a from AP-42 5th Edition Section 13.2.2
Industrial Site Unpaved Roads dated December, 2003

$$E = k\,(s/12)^a\,(W/3)^b$$

Adjustment Factor Equation 2

$$Eext = E[(365-p)/365]$$

Given Variables for Estimating PM10 Emissions

1.5	k = base emission factor for pounds of PM-10 particulate per vehicle mile traveled
6.00	s = road surface silt loading (see Table 2)
0.9	a = per Table 13.2.2-2. Constants for Equations 1a and 1b
29.3	W = average weight (tons) of vehicle traveling road
0.45	b = per Table 13.2.2-2. Constants for Equations 1a and 1b
2.24	E = Emission factor, uncontrolled, from Equation 1a
80%	Percent of control, based on Fig. 13.2.2-5, one month re-application, 0.17 gal/yd^2 petroleum resin
0.45	E = Emission factor, controlled, from Equation 1a
119	P = number of days with at least 0.01 inches of precipitation
0.30	Eext = annual size specific emission factor for natural mitigation, lb/vmt

D111/D112 Move to Engineered Barrier Area

550	Estimated feet traveled per vehicle one way, IN
550	Estimated feet traveled per vehicle one way, OUT
1,100	Estimated feet traveled per vehicle trip
24	Maximum number of vehicles per day
100	Maximum number of trucks making the trip per project
5.0	Maximum vehicle miles traveled per day
21	Maximum vehicle miles traveled per project

PM-10 Emissions Actual

2.24	Pounds per day of operation (assuming no rain on worst case day)
6	Pounds per Project
3.15E-03	Tons per Project
3.15E-03	Tons per Year

Engineered Barrier Material & Cover Material Vehicles & Dust Control Vehicle

1,200	Estimated feet traveled per vehicle one way, IN
1,200	Estimated feet traveled per vehicle one way, OUT
2,400	Estimated feet traveled per vehicle trip
43	Maximum number of vehicles per day
1	Dust Control vehicles per month
1,451	Maximum number of trucks making the trip per project
20.1	Maximum vehicle miles traveled per day
660	Maximum vehicle miles traveled per project

PM-10 Emissions Actual

9.03	Maximum pounds per day of operation (assuming no rain on worst case day)
199	Pounds per Project
0.10	Tons per Project
0.10	Tons per Year

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On-Site Stabilization and Long-Term Control

Table 7
Paved Roadway Emissions

This equation is utilized to estimate emissions from the movement of vehicles on paved roadways. The particulate emissions estimated do not include particulate emissions from the engines.

Predictive Emission Factor Equation from AP-42 5th Edition Section 13.2 Paved Roads

$$E = (k(sL/2)^{0.65}) \times (W/3)^{1.5}$$

Given Variables

7.3	k = base emission factor for grams of PM-10 particulate per vehicle mile traveled
9.7	sL = road surface silt loading (grams per square meter for Iron & Steel Production))
29.175	W = average weight (tons) of vehicle traveling road
618	E = emission factor, grams of PM-10 particulate per vehicle mile traveled
1.36	E = emission factor, pounds of PM-10 particulate per vehicle mile traveled

Site variables

1,650	Estimated feet of traveled per vehicle one way, IN
1,650	Estimated feet of traveled per vehicle one way, OUT
0.63	Estimated miles of traveled per vehicle trip
43	Maximum number of vehicles per day
1,444	Number of trucks making the trip per project
27.0	Maximum vehicle miles traveled per day
903	Vehicle miles traveled per project

Estimated Emissions

PM-10 Emissions Actual

36.8	Pounds per day of operation
1,229	Pounds per project
0.61	Tons per project
0.61	Tons per year

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On-Site Stabilization and Long-Term Control

Table 8
Exposed Ground Area Emissions

This table estimates the emissions due to wind erosion to an exposed ground area. Emissions will only occur when the exposed ground is not vegetated.

Material Type	Area	Exposed Ground Area (sq ft)	Exposed Ground Area (acre)	Particulate Size	Emission Factor (ton/acre/year)	Emission Estimate Daily (lbs/day)	Hourly (lbs/hr)	Project (lbs/project)	Annual (lbs/year)
Exposed Ground Areas	Storage Area (EB Area)	196,858	4.52	PM30 (TSP)	0.35	8.67	0.361	1,845	1,845
Exposed Ground Areas	Storage Area (Non-EB Area)	113,829	2.61	PM30 (TSP)	0.35	5.01	0.209	1067	1,067

	Daily (lbs/day)	Hourly (lbs/hr)	March to Oct. (lbs/project)	Annual (lbs/year)
PM10*	6.8	0.285	1,456	1,456
PM30	13.7	0.570	2,912	2,912

Emission factor is from AP-42 Chapter 11.9.1, Table 11.9-4 - Uncontrolled Particulate Emission Factors for Open Dust Sources at Western Surface Coal Mines. Emission rate is an average for a year, typically emission rates decay sharply with time. From the time an area is disturbed until the new vegetation emerges, all disturbed areas are subject to wind erosion. This emission estimate assumes that the area will be become vegetated within 7 months of starting the material relocation/pile construction phase.

*The PM10 emission factor has been adjusted from the PM30 emission factor, Table 11.9-4 refers to Section 13.2.5 which presents a distribution of particle sizes that are comparable for fugitive dust sources where wind speed is a factor.

Physical properties of the material used for development of the emission factor:
 silt range of 5.1 - 21 with a mean of 15
 moisture range of 2.8 - 20 with a mean of 6.9
Physical properties of the sand/gravel:
 silt range of 1.2 - 4.2 with a mean of 2.16 (site specific data)
 sand moisture content, a mean of 7.4 (AP-42 Table 13.2.4-1)

EB = Engineered Barrier

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On-Site Stabilization and Long-Term Control

Table 9
Off-Road Diesel Engine Emissions

These estimates for the operation of heavy equipment only estimate the emissions from the engine of the equipment, which would emitted from the exhaust. A portion of the particulate emissions are double counted due to the testing methods when developing the emissions factors associated with the piles.

Loader
- 145 Estimated HP
- 8 Hours per Day
- 128 Days per Primary Control Area
- 4 Days per Secondary Control Area
- 1057 Hours per Project
- 7.61 *Estimated Fuel Use, gallons per hour (based on 7.05 lbs/gal)*

Dozer
- 132 Estimated HP
- 8 Hours per Day
- 128 Days per Primary Control Area
- 4 Days per Secondary Control Area
- 1057 Hours per Project
- 7.08 Estimated Fuel Use, gallons per hour (based on 7.05 lbs/gal)

Excavator
- 145 Estimated HP
- 4 Hours per Day
- 64 Days per Primary Control Area
- 256 Hours per Project
- 7.61 Estimated Fuel Use, gallons per hour (based on 7.05 lbs/gal)

0.0015 % (15 ppm) Sulfur percentage content in fuel

Pollutant	Emission Factor Units	Loader Emission Factor	Loader pounds/day	Loader pounds/year	Dozer Emission Factor	Dozer pounds/day	Dozer pounds/year	Excavator Emission Factor	Excavator pounds/day	Excavator pounds/year	Totals pounds/day	Totals pounds/year
PM	g/hp-hr	0.100	0.256	34	0.100	0.233	30.8	0.100	0.128	8.2	0.62	73
NOx	g/hp-hr	4 50	11.508	1,521	4.50	10.48	1,385	4.50	5.754	368	27.7	3,274
SOx	lb/1,000 gals	0.213	0.013	1.71	0.213	0.012	1.59	0.213	0.0065	0.41	0.03	3.7

	Primary Control Area 8 Hr Day (lbs/day)	Primary Control Area March to Oct. (lbs/7 months)	Primary Control Area Annual (lbs/year)	Secondary Control Area 8 Hr Day (lbs/day)	Secondary Control Area March to Oct. (lbs/7 months)	Secondary Control Area Annual (lbs/year)	Roadways 8 Hr Day (lbs/day)	Roadways March to Oct. (lbs/7 months)	Roadways Annual (lbs/year)
PM	0.616	71	71	0.489	2.04	2.04	0	0	0
NOx	27.7	3,182	3,182	22.0	91.6	91.6	0	0	0
SOx	0.032	3.62	3 62	0.025	0.104	0.104	0	0	0

Assumptions: The payloader is a L60E Volvo with a 145 HP engine, excavator is a Caterpillar 22B with a 145 HP engine, and the dozer is a Caterpillar D5H 132 HP engine. Emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Nonroad Engine Modeling -- Compression-Ignition, dated February 13, 1998 , revised June 15, 1998. For the emission estimates of NOx and PM it is assumed that the equipment was manufactured between 2003 and 2006 which would be regulated under Tier 2 requirements. The SOx emissions are based on fuel sulfur content.

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On-Site Stabilization and Long-Term Control

EPA Model MOBILE6.2 estimates emission rates for a variety of vehicle classes. The emissions estimates are the engine exhaust emissions. The emissions below are for two classes of heavy duty diesel vehicles.

Table 10
On-Road Engine Emissions
EPA Model MOBILE 6.2

Maximum Miles per Day	
HDDV8A Miles per Day	13.1
HDDV8B Miles per Day	13.1
Miles per Year	
HDDV8A Miles per Year	792
HDDV8B Miles per Year	792
Idling	
Total hours of idling on site per day	1
Total hours of idling on site per year	132

EB Soil Material		D111/D112 Relocation	
Trucks per day	19.3	Trucks per day	24.0
Trucks for project	1,233	Trucks for project	100
Trucks per year	1233	Trucks per year	100
Miles per truck	1.08	Miles per truck	0.21
Cover		Dust Control Truck	
Trucks per day	24	Trucks per day	1
Trucks for project	211	Trucks for project	7
Trucks per year	211	Trucks per year	7
Miles per truck	1.08	Miles per truck	0.66

Pollutant	Operating Condition	HDDV8A (Heavy Duty Diesel Vehicle - >60,000 GVW)				HDDV8B (Heavy Duty Diesel Vehicle - 33,001 - 60,000 GVW)			
		grams/mile	grams/hour	max. pounds/day	pounds/year	grams/mile	grams/hour	max. pounds/day	pounds/year
PM10	10 mph average	0.254	NA	0.0073	0.44	0.25	NA	0.0073	0.44
	Idling	NA	1.0040	0.0022	0.29	NA	1.0040	0.0022	0.29
				0.0095	0.74			0.0095	0.73
SO2	10 mph average	0.0144	NA	4.2E-04	0.03	0.015	NA	4.4E-04	0.03
NOx	10 mph average	12.3	NA	0.354	21.4	13.9	NA	0.402	24.3

	PM10		SO2		NOx	
	max. pounds/day	pounds/year	max. pounds/day	pounds/year	max. pounds/day	pounds/year
Primary Control Area (50%)	0.0095	0.734	4.3E-04	0.0258	0.378	22.9
Secondary Storage Area (0%)	0	0	0	0	0	0
Roadways (50%)	0.0095	0.734	4.3E-04	0.0258	0.378	22.9

Emissions estimates are based on EPA's MOBILE6.2 Mobile Source Emission Factor Model. The emission factors include 6.65 starts per day. All particulate matter is 10 micrometers or less.
EB = Engineered Barrier

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On-Site Stabilization and Long-Term Control

Table 11
Emissions Summary

Source	Area 1 - Primary Controlled Area PM-10 Emissions Active Day			Area 1 12 month	Area 2 - Secondary Storage Area PM-10 Emissions Active Day			Area 2 12 month	Area 4 - Roadways PM-10 Emissions Active Day	Area 4 12 month
	Active Piles	Active Piles (inactive portion)	Inactive Piles		Active Piles	Active Piles (inactive portion)	Inactive Piles			
	lbs/day 8 hours	lbs/day 16 hours	lbs/day 24 hours	lbs/year	lbs/day 8 hours	lbs/day 16 hours	lbs/day 24 hours	lbs/year	lbs/day 8 hours	lbs/year
Material Handling (Table 3)	2.83			165	0.124			7.91		
Active/Inactive Piles (Table 4)	4.65	1.02	0.44	1,030	0.729	0.160	0.080	3 08		
Heavy Equipment (Table 5)	23 8			2,745	19.1			79.4		
Unpaved Roadways (Table 6)									11.3	206
Paved Roadways (Table 7)									36.8	1,229
Exposed Ground Area (Table 8)	2.28		6.8	1,456						
Off-Road Engines (Table 9)	0.616			70.7	0.489			2.04	0	0
On-Road Engines (Table 10)	0.0095			0.734					0.0095	0.734
TOTAL	34.2		7.3	5467.5	20.4		0.1	92.5	48.1	1435 9

Source	Area 1 - Primary Controlled Area SOx Emissions Active Day lbs/day 8 hours	Area 1 12 month lbs/year	Area 2 - Secondary Storage Area SOx Emissions Active Day lbs/day 8 hours	Area 2 12 month lbs/year	Area 4 - Roadways SOx Emissions Active Day lbs/day 8 hours	Area 4 12 month lbs/year
Off-Road Engines (Table 9)	0.032	3.62	0.025	0.104	0	0
On-Road Engines (Table 10)	4.3E-04	0.0258	0	0	4.3E-04	0.0258

Source	Area 1 - Primary Controlled Area NOx Emissions Active Day lbs/day 8 hours	Area 1 12 month lbs/year	Area 2 - Secondary Storage Area NOx Emissions Active Day lbs/day 8 hours	Area 2 12 month lbs/year	Area 4 - Roadways NOx Emissions Active Day lbs/day 8 hours	Area 4 12 month lbs/year
Off-Road Engines (Table 9)	27.7	3,182	22.0	91.6	0	0
On-Road Engines (Table 10)	0.378	22.9	0	0	0.378	22.9

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Off-Site Disposal and License Termination

Table 1
Air Emission Details

Truck Operations

Soil Cover After Removal of Piles

Depth of Cover (feet)	1 Given
Area to be Covered (square feet)	310,687 Cad-Based Estimate
Area to be Covered (acres)	7.1 Square Feet / 43,560
Material Needed for Cover (cubic yards)	11,507 Depth x Area of Cover / 27
Yards per Load	20 Given
Number of Truck Trips	575 Material Needed / Yards per Load
Cubic Yards of Cover Delivered	11,507 Number of Truck Trips x Yards per Load
Pounds per Cubic Foot of Cover, Density	105 From Table 2
Pounds per Cubic Yard, Density	2,835 Pounds per Cubic Foot x 27
Tons Cover Loaded per Truck	28 Yards per Load x Pounds per Cubic Yard
Weight per Empty Truck (tons)	15 Given
Weight per Loaded Truck (tons)	43 Load per Truck + Weight of Empty Truck
Average Weight of a Cover Truck (tons)	29 Average of Empty and Loaded Truck
Average Number of Wheels per Truck (10 unloaded, 14 loaded)	12
Trucks per Year (last year of project, 5 months)	575 Assumes Cover Operation Duration = 5 Months
Trucks per Day	5.31 Trucks per Year / (5/12 Months * 52 Weeks * 5 Days)
Tons Loaded per Day	151 Trucks per Day x Tons of Cover per Truck
Tons Loaded per Project	16,311 Trucks per Year x Tons of Cover per Truck

Material to Be Removed

Number of Truck Trips to Staging Area	3,800 Cubic Yards / Yards per Load
Yards per Load	20 Given
Cubic Yards of Material to be Removed	76,000 From Table 2
Trucks per Day	18 Assumes Material Removal Operation = 2 Years @ 21 Weeks per 5 Days
Weight of Material Loaded per Truck (tons)	35 Number of Truck Trips / Total Tons Material Removed
Weight per Empty Truck (tons)	15 Given
Weight per Loaded Truck (tons)	50 Tons Material Loaded per Truck + Tons per Empty Truck
Average Weight of a Material Truck (tons)	32 Average of an Empty Truck and a Loaded Material Truck
Average Weight of All Trucks (tons)	32 Weighted Average Weight (material trucks and cover trucks)
Number of Train Cars	1,475 Tons of Material Removed / Capacity per Train Car
Capacity per Train Car (tons)	90 given
Total Tons of Material Removed	132,705 Tons from Table 2
Train Cars per Year	737 Number of Train Cars / 2 (which represents the two 5 month periods)
Train Cars per Day (also Trucks to Staging Area)	7.0 Trains per Year / (Weeks per Year x Days per Week)
Tons Loaded per Day	632 Capacity per Train Car x Train Cars per Day
Tons Removed from D111/112 Area	3240 Tons from Table 2
Days to Remove Material from D111/D112	5 Tons Removed from D111/D112 Area / Tons Loaded per Day

Project Duration

Total Time (MONTHS)	10 Given
Time for Removal (MONTHS/year)	5 Given (for 2 years)
Time for Cover (MONTHS)	5 Assumed
Days per Week	5 Assumed
Weeks per Year	21 Assumed
Hours per Day	8 Assumed
Length of UNPAVED Roadway (feet) - storage area to staging area	1,100 Trip Length for Material Removed
Length of UNPAVED Roadway (feet) - to paved roadway	1,200 Trip Length for Cover Delivered
Length of PAVED Roadway (feet)	1,650 Trip Length for Cover Delivered
Material Removed, TONS	132,705 Number of Train Cars x Capacity per Train Car

Operating Daily/Hourly Operating Rates

Loader(s)	= Maximum Operating Hours per Day	16 Assumed
	= Operating Hours per Year	1680 Assumed
	= Yards moved each day (train load + truck load)	724 Assumed
Dozer	= Maximum Operating Hours per Day	2 Assumed
	= Operating Hours per Year	210 Assumed
Train	= Maximum Operating Hours per Day	2 Assumed
	= Operating Hours per Year	210 Assumed
Crusher	= Maximum Operating Hours per Day	3 Assumed
	= Operating Hours per Year	315 Assumed
Dust Control Vehicle	= Maximum Operating Hours per Day	1 Assumed
	= Number of Tips per Day	1 Assumed
	= Number of Trips per Month	1 Assumed

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Off-Site Disposal and License Termination

Table 2
Material Description

Parcel #	Material Type	Volume* (cubic yard)	Pile Size (acre)	Bulk Density** (lbs/ft³)	Bulk Density** (g/cm³)	Mass (tons)	Silt *** (%)	Moisture*** (%)	AP-42 Material*** Match
1	Excavated Soil Mixed with Slag	15,000	0.9	120	1.92	24,300	9.0	12.0	Cover
2	Excavated Soil from D111	1,000	0.2	105	1.68	1,418	9.0	12.0	Cover
3	Canal Slag (In & Out of Supersacs)	3,000	0.2	165	2.64	6,683	5.3	0.92	Slag
4	Slag	30,000	1.0	140	2.24	56,700	5.3	0.92	Slag
5	Slag & Demolition Concrete	5,000	0.5	140	2.24	9,450	5.3	0.92	Slag
6	Hi-Ratio Slag	2,000	0.3	140	2.24	3,780	5.3	0.92	Slag
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	1,000	0.3	130	2.08	1,755	5.3	0.92	Slag
8	Baghouse Dust	13,000	0.9	100	1.60	17,550	13.0	7.0	Flue Dust
9	Baghouse Dust Mixed with Slag	4,000	0.4	145	2.32	7,830	5.3	0.92	Slag
10	Cover (final amount of cover for the Off-Site Disposal Alternative)	11,500	7.1	105	1.68	16,301	9.0	12.0	Cover
T12	D111/D112 Concrete	500	0.05	120	1.92	810	3.9	2.10	Limestone Products
E of N-S road; W of Storage Yard	D111/D112 Concrete	1,500	0.1	120	1.92	2,430	3.9	2.10	Limestone Products
11	Staging Area Day Pile (weighted average of non-cover material)	1,000	0.1	129	2.07	1,746	7.4	4.3	Weighted Average
na	Unpaved Roadway						6.0		
na	Weighted average (includes cover)			126	2.0		7.6	5.3	Weighted Average
na	Total Volume & Mass of Material (excluding cover and staging area pile)	76,000				132,705			

Total Volume (non-cover) 76,000 cubic yards

* Assumed pile size for D111/D112 similar by ratio of weight to Pile 5.
** Densities stated are bulk densities not material densities.
*** Moisture and Silt percentages are from EPA's AP-42 Chapter 13.2.4, Table 13.2.4-1

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Off-Site Disposal and License Termination

Table 3
Material Handling - "Drop Emissions"

The "drop emission" factor accounts for the batch dropping of material while loaded or unloaded. Although batch dropping occurs when material is loaded into piles and into/out of the crusher, the drop emissions associated with each activity are included in the emission factor for those processes.

$$E = k(0.0032) \times (U/5)^{1.3} / (M/2)^{1.4}$$

Emission factor equation from AP-42 5th Edition Section 13 2 4, January 1995

Material Type	Parcel#	Pile & Material Type	Material Amounts (tons/day)	Material Amounts (tons/project)	Particulate Size	k Particulate Size Multiplier (dimensionless)	M Material Moisture Content (%)	U Mean Wind Speed (mph)	E Calculated Emission Factor (lb/ton)	Calculated Emissions (lb/day)	Calculated Emissions (ton/year)	Calculated Emissions (ton/project)
Truck Unloading	10	Cover (final amount of cover for the Off-Site Disposal Alternative)	151	16,301	PM10	0.35	12	9.6	2.1E-04	0.03	1.7E-03	0.0017
Truck Loading	1	Excavated Soil Mixed with Slag	632	24,300	PM10	0.35	12	9.6	2.1E-04	0.13	0.001	0.0026
Train Loading			632	24,300	PM10	0.35	12	9.6	2.1E-04	0.13	0.001	0.0026
Truck Loading	2	Excavated Soil from D111	632	1,418	PM10	0 35	12	9.6	2.1E-04	0.13	7.5E-05	0.0002
Train Loading			632	1,418	PM10	0.35	12	9 6	2.1E-04	0.13	7.5E-05	0.0002
Truck Loading	3	Canal Slag (In & Out of Supersacs)	632	6,683	PM10	0.35	0.92	9.6	7.8E-03	4.90	0.013	0.0259
Train Loading			632	6,683	PM10	0.35	0.92	9.6	7.8E-03	4.90	0.013	0.0259
Truck Loading	4	Slag	632	56,700	PM10	0.35	0.92	9 6	7.8E-03	4.90	0.110	0.2199
Train Loading			632	56,700	PM10	0.35	0.92	9.6	7.8E-03	4.90	0.110	0.2199
Truck Loading	5	Slag & Demolition Concrete	632	9,450	PM10	0.35	0.92	9.6	7.8E-03	4.90	0.018	0.0366
Train Loading			632	9,450	PM10	0.35	0.92	9.6	7.8E-03	4.90	0.018	0.0366
Truck Loading	6	Hi-Ratio Slag	632	3,780	PM10	0.35	0.92	9.6	7.8E-03	4.90	0.007	0.0147
Train Loading			632	3,780	PM10	0.35	0.92	9.6	7.8E-03	4.90	0.007	0.0147
Truck Loading	7	Hi-Ratio Slag & D111 Flex Kleen	632	1,755	PM10	0.35	1	9.6	7.8E-03	4.90	3.4E-03	0.0068
Train Loading		Bags & D116 Polishing Compound	632	1,755	PM10	0.35	0.92	9.6	7.8E-03	4.90	3.4E-03	0.0068
Truck Loading	8	Baghouse Dust	632	17,550	PM10	0.35	7	9.6	4.5E-04	0.29	2.0E-03	0.0040
Train Loading			632	17,550	PM10	0.35	7	9.6	4.5E-04	0.29	2.0E-03	0.0040
Truck Loading	9	Baghouse Dust Mixed with Slag	632	7,830	PM10	0.35	1	9.6	7.8E-03	4.90	1.5E-02	0.0304
Train Loading			632	7,830	PM10	0.35	0.92	9 6	7.8E-03	4.90	1.5E-02	0 0304
Truck Loading	T12	D111/D112 Concrete	632	810	PM10	0.35	2.10	9 6	2.4E-03	1.54	9.9E-04	0.0010
Train Loading			632	810	PM10	0.35	2.10	9.6	2.4E-03	1.54	9.9E-04	0.0010
Truck Loading	E of N-S road; W of Storage Yard	D111/D112 Concrete	632	2,430	PM10	0.35	2.10	9.6	2.4E-03	1.54	3.0E-03	0.0030
Train Loading			632	2,430	PM10	0.35	2.10	9 6	2.4E-03	1.54	3.0E-03	0 0030

Total (except for cover amounts)		PM10	4.90	0.349	0 690
Total (includes cover amounts)		PM10	4.93	0.351	0.692
Truck Unloading (cover material)	Prl. Control Area	PM10	0.032	1.7E-03	1.7E-03
Truck Loading	Prl. Control Area	PM10	4.90	0.174	0.345
Train Loading	Staging Area	PM10	4.90	0.174	0.345
Truck Loading	Secd. Storage Area	PM10	1.54	4 0E-03	4.0E-03

Estimates based on AP-42 Chapter 13.2.4 - Aggregate Handling and Storage Piles. Material moisture content are mean values of similar materials from AP-42 Table 13 2.4-1 and the mean wind speed is from Local Climatological Data (ISSN 0198-4535) Philadelphia, Pennsylvania.
The annual emisison total assumes that all the activity in the Secondary Storage Area occurs in one year.

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Off-Site Disposal and License Termination

Table 4
Material Handling - Crushing Emissions

Emission factor used to estimate emissions is for secondary crushing/screening (no factors for primary crushing are available). The emission estimate assumes wet suppression technology utilized to control emissions. It also assumes that half of each pile is crushed in the first year of operations and the other half in the next year.

Parcel Number	Material Type	Material Amounts (tons/hour)	Material Amounts (tons/day)	Material Amounts (tons)	Particulate Size	Uncontrolled Particulate Size Multiplier (lb/ton)	Controlled Particulate Size Multiplier (lb/ton)	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions Maximum (tons/year)	Controlled Emissions Maximum (tons/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
4	Slag	158	632	56,700	PM10	8.70E-03	7.40E-04	5.50	0.468	0.123	0.010	0.247	0.021
5	Slag & Demolition Concrete	158	632	9,450	PM10	8.70E-03	7.40E-04	5.50	0.468	0.021	0.002	0.041	3.5E-03
6	Hi-Ratio Slag	158	632	3,780	PM10	8.70E-03	7.40E-04	5.50	0.468	8.2E-03	7.0E-04	0.016	1.4E-03
9	Baghouse Dust Mixed with Slag	158	632	7,830	PM10	8.70E-03	7.40E-04	5.50	0.468	0.017	1.4E-03	0.034	2.9E-03
T12	D111/D112 Concrete	158	632	810	PM10	8.70E-03	7.40E-04	5.50	0.468	0.002	1.5E-04	0.004	3.0E-04
E of N-S road; W of Storage Yard	D111/D112 Concrete	158	632	2,430	PM10	8.70E-03	7.40E-04	5.50	0.468	0.005	4.5E-04	0.011	9.0E-04
				Total Material 81,000	PM10			5.498	0.468	0.176	0.015	0.352	0.030

Emission factors are from EPA's Factor Information Retrieval (FIRE) Data System 6.25. SCC for the crushing process is 3-05-020-02.

On-Site Disposal and License Termination

Table 5
Material Handling - Active/Inactive Pile Emissions

The emissions factor includes the emissions from loading material (drop emissions) into the pile, equipment travel associated with the pile, and wind erosion.

Parcel Number	Material Type	Activity	Estimated Pile Size (tons)	Estimated Pile Size (acre)	Annual Days of Operation (days/yr)	Fugitive Particulate Size	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions (lbs/project)	Calculated Emissions (ton/project)
1	Excavated Soil Mixed with Slag	Active	24,300	0.9	38	PM10	6.3	5.67	218	0.11
		Inactive	24,300	0.9		PM10	1.7	1.53		
2	Excavated Soil from D111	Active	1,418	0.2	2	PM10	6.3	1.01	2.3	1.1E-03
		Inactive	1,418	0.2		PM10	1.7	0.27		
3	Canal Slag (In & Out of Supersacs)	Active	6,683	0.2	11	PM10	6.3	1.20	13	6.3E-03
		Inactive	6,683	0.2		PM10	1.7	0.32		
4	Slag	Active	56,700	1.0	90	PM10	6.3	6.55	588	0.29
		Inactive	56,700	1.0		PM10	1.7	1.77		
5	Slag & Demolition Concrete	Active	9,450	0.5	15	PM10	6.3	2.96	44	0.022
		Inactive	9,450	0.5		PM10	1.7	0.80		
6	Hi-Ratio Slag	Active	3,780	0.3	6	PM10	6.3	2.02	12	6.0E-03
		Inactive	3,780	0.3		PM10	1.7	0.54		
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	Active	1,755	0.3	3	PM10	6.3	1.70	4.7	2.4E-03
		Inactive	1,755	0.3		PM10	1.7	0.46		
8	Baghouse Dust	Active	17,550	0.9	28	PM10	6.3	5.86	163	0.08
		Inactive	17,550	0.9		PM10	1.7	1.58		
9	Baghouse Dust Mixed with Slag	Active	7,830	0.4	12	PM10	6.3	2.77	34	0.017
		Inactive	7,830	0.4		PM10	1.7	0.75		
11	Staging Area Day Pile (weighted average of non-cover material)	Active	1,746	0.1	105	PM10	6.3	0.63	66.2	3.3E-02
		Inactive	1,746	0.1	42	PM10	1.7	0.17	7.1	3.6E-03
T12	D111/D112 Concrete	Active	810	0.05	1	PM10	6.3	0.30	0.38	1.9E-04
		Inactive	810	0.05		PM10	1.7	0.08		
-S road, W of Storage Yard	D111/D112 Concrete	Active	2,430	0.1	4	PM10	6.3	0.89	3.4	1.7E-03
		Inactive	2,430	0.1		PM10	1.7	0.24		

Annual emissions assume that for the first 5 months, half the pile area will be active and removed, while the other half is inactive. Once a pile is removed there are no inactive pile emissions, only exposed ground area emission. The "Annual Emission" for "Total Area of Piles" includes 42 weekend days and an assumption that during an active day an average pile size will be inactive during the 5 month. The sub-total of the Primary & Secondary Control Area is based on a ratio of the acres.

	Acres	Active Days 10 Months	One Year: Active Days	One Year: Inactive Weekend Days During 5 Months	One Year: Inactive Days During 3.5 Months	Annual Emissions (tons)
Total Area of Piles (no Staging Area)	4.9	210	105	42	109	1.15
Primary Control Area	4.7	205				1.10
Secondary Control Area	0.2	5				0.04
Staging Area	0.1	210	105	42	0	3.7E-02
						1.18

Only maximum emission days are modeled, so weekend emissions with no activity will not be maximum emission days

	Max Active Day Total Day Worst Pile 24 Hr Day (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day (lbs/day)	Max Inactive Day** (weekday) 24 Hr Day (lbs/day)
**Primary Control Area	6.55	1.77	5.37	1.18	1.58
Secondary Control Area	0.89	0.24	0.73	0.16	0.080
Staging Area	0.63	0.17	0.52	0.11	0.17

Emission factor is from Air Pollution Engineering Manual 1992 (AP-40), Chapter 15, Table 1 (page 779) - Uncontrolled Particulate Emission Factors for Sand and Gravel Processing. Emission factor represents the following steps in the storage cycle
1) loading of aggregate onto storage piles (batch or continuous drop operations),
2) equipment traffic in storage areas,
3) wind erosion of pile (batch or continuous drop operations). The emission factor assumes that the operation occurs during an 8 to 12 hours per day

** *Max Inactive Day represents maximum inactive emissions for the maximum active day that will be used for modeling a "worst case" active weekday. In the Primary Control Area assumes that only 2 piles have been disturbed and that on the maximum inactive day, one is active (the largest emitting pile used as the "Worst Pile") the other is inactive (the 2nd largest emitting pile).*

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Off-Site Disposal and License Termination

Table 6
Heavy Equipment Operation

The emission factor estimates emissions from the handling of material and the emissions from movement and traveling on the material. Some of these emissions estimated are double counted when the equipment is working with a pile or bringing material to the crusher or material from the crusher.

Loader & Dozer Equation

PM10 lbs/hr $= 0.75\ (1.0 \times (s)^{1.5}) / (M)^{1.4}$

Emission factor equations from AP-42 5th Edition Supplement E, Table 11.9.1 July 1998

Heavy Equipment Type	Hours of Operation: Hours per Day (hours)	Hours of Operation: Based on (hours/year)	Vehicle Miles Traveled (miles)	s Site Estimated Material Silt Content (%)	M AP-42 Material Moisture Content (%)	S Average Speed (mph)	Particulate Size	Calculated Emission Factor (lb/hour)	Calculated Emission Factor (lb/VMT)	Calculated Emissions (lb/day)	Calculated Emissions 5 months (lbs/year)	Calculated Emissions 5 months (ton/yr)	Calculated Emissions (ton/project)
Loader(s)	16	1680		7.57	5.33		PM10	1.50		24.0	2,522	1.26	2.52
Dozer	2	210		7.57	5.33		PM10	1.50		3.00	315	0.16	0.32
Totals													
For All Equipment							PM10			27.0	2,837	1.42	2.84
For One Payloader							PM10			12.0	1,261	0.630	1.26
For One Dozer							PM10			3.0	315	0.16	0.32

	Calculated Emissions (lb/day)	Calculated Emissions 5 months (lbs/year)	Calculated Emissions 5 months (ton/yr)	Calculated Emissions (ton/project)
Primary Control Area	15.0	1,515	0.76	1.51
Secondary Storage Area	12.0	61.6	0.031	0.031
Staging Area	12.0	1,261	0.63	1.26

Emissions are based on AP-42 Chapter 11.9 - Western Surface Coal Mining.
The 5 month emission total assumes that the activity in the Secondary Storage Area happens in one year.

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Off-Site Disposal and License Termination

Table 7
UnPaved Roadways - Access Road

This equation is utilized to estimate emissions from the movement of vehicles on unpaved roadways. The particulate emissions estimated do not include particulate emissions from the engines.

Predictive Emission Factor Equation 1a from AP-42 5th Edition Section 13.2.2
Industrial Site Unpaved Roads dated December, 2003

$$E = k\,(s/12)^a\,(W/3)^b$$

Adjustment Factor Equation 2

$$Eext = E[(365-p)/365]$$

Given Variables for Estimating PM10 Emissions

1.5	k = base emission factor for pounds of PM-10 particulate per vehicle mile traveled
6.00	s = road surface silt loading (AP-42 Table 13.2.2-1 for Iron & Steel Production)
0.9	a = per Table 13.2.2-2. Constants for Equations 1a and 1b
32.0	W = average weight (tons) of vehicle traveling road
0.45	b = per Table 13.2.2-2. Constants for Equations 1a and 1b
2.33	E = Emission factor from Equation 1a
80%	Percent of control, based on Fig. 13.2.2-5, one month re-application, 0.17 gal/yd² petroleum resin
0.47	E = Emission factor, controlled, from Equation 1a
119	P = number of days with at least 0.01 inches of precipitation data from Comparative Climatic Data (NOAA) - Philadelphia, Pennsylvania.
0.31	Eext = annual size specific emission factor for natural mitigation, lb/vmt

Cover Vehicle

1,200	Estimated feet of traveled per vehicle one way, IN
1,200	Estimated feet of traveled per vehicle one way, OUT
2,400	Estimated feet of traveled per vehicle trip
5	Maximum number of vehicles per day
575	Maximum number of trucks making the trip per project
2.4	Maximum vehicle miles traveled per day
262	Maximum vehicle miles traveled per project

PM-10 Emissions Actual

0.8	Pounds per day of operation
82	Pounds per Project
0.04	Tons per Project
0.04	Tons per Year (5 months, 2nd year)

Material Transfer Vehicle & Dust Control Vehicle

1,100	Estimated feet of traveled per vehicle one way, IN
1,100	Estimated feet of traveled per vehicle one way, OUT
2,200	Estimated feet of traveled per vehicle trip
18	Maximum number of vehicles per day
1	Dust control vehicles per day (once per month)
3,810	Maximum number of trucks making the trip per project
8.0	Maximum vehicle miles traveled per day
1,588	Maximum vehicle miles traveled per project

PM-10 Emissions Actual

2.5	Pounds per day of operation
499	Pounds per Project
0.25	Tons per Project
0.12	Tons per Year (5 months)

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Off-Site Disposal and License Termination

Table 8
Paved Roadway Emissions

This equation is utilized to estimate emissions from the movement of vehicles on paved roadways. The particulate emissions estimated do not include particulate emissions from the engines.

Predictive Emission Factor Equation from AP-42 5th Edition Section 13.2 Paved Roads

$$E = (k(sL/2)^{0.65}) \times (W/3)^{1.5}$$

Given Variables

7.3	k = base emission factor for grams of PM-10 particulate per vehicle mile traveled
9.7	sL = road surface silt loading (grams per square meter for Iron & Steel Production))
29.175	W = average weight (tons) of vehicle traveling road
618	E = emission factor, grams of PM-10 particulate per vehicle mile traveled
1.36	E = emission factor, pounds of PM-10 particulate per vehicle mile traveled

Site variables

1,650	Estimated feet of traveled per vehicle one way, IN
1,650	Estimated feet of traveled per vehicle one way, OUT
0.63	Estimated miles of traveled per vehicle trip
5	Number of vehicles per day
575	Number of trucks making the trip per project
3.3	Vehicle miles traveled per day
360	Vehicle miles traveled per project

Estimated Emissions

PM-10 Emissions Actual

4.5	Pounds per day of operation
490	Pounds per Project
0.24	Tons per Project
0.24	Tons per Year (5 months, 2nd year)

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Off-Site Disposal and License Termination

Table 9
Exposed Ground Area Emissions

This table estimates the emissions due to wind erosion to an exposed ground area. Emissions will only occur when the exposed ground is not vegetated.

Material Type	Area	Exposed Ground Area (acre)	Particulate Size	Emission Factor* (ton/acre/year)	Calculated Emissions (ton/yr)	Calculated Emissions (lb/day)	Year 1 May - Dec (ton/yr)	Year 2 Jan - Sept (ton/yr)
Exposed Ground Areas	Storage Area	3.57	PM10	0.175	0.62	3.42	0.364	
			PM30 (TSP)	0.350	1.25	6.84	0.728	
Exposed Ground Areas	Storage Area	7.13	PM10	0.175	1.25	6.8		0.94
			PM30 (TSP)	0.350	2.50	13.7		1.87
Exposed Ground Areas	Staging Area	0.10	PM10	0.175	0.02	0.10	0.01	0.01
			PM30 (TSP)	0.350	0.04	0.19	0.02	0.03
Total Acres of Exposed Storage Yard Area		7.13						
			PM10*				0.374	0.949
			PM30 (TSP)				0.749	1.90

Emission factor is from AP-42 Chapter 11.9.1, Table 11.9-4 - Uncontrolled Particulate Emission Factors for Open Dust Sources at Western Surface Coal Mines. Emission rate is an average for a year, typically emission rates decay sharply with time. From the time an area is disturbed until the new vegetation emerges, all disturbed areas are subject to wind erosion.

*The PM10 emission factor has been adjusted from the PM30 emission factor, Table 11.9-4 refers to Section 13.2.5 which presents a distribution of particle sizes that are comprable for fugitive dust sources where wind speed is a factor.

Physical properties of the material used for development of the emission factor:
- silt range of 5.1 - 21 with a mean of 15
- moisture range of 2.8 - 20 with a mean of 6.9

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Off-Site Disposal and License Termination

Table 10
Off-Road Diesel Engine Emissions

These estimates for the operation of heavy equipment only estimate the emissions from the engine of the equipment, which would emitted from the exhaust. This estimate is different to other diesel engines to due regulatory requirements. A portion of the particulate emissions are double counted due to the testing methods when developing the emissions factors associated with the crusher and the piles.

Loaders
145 Estimated HP
16 Hours per Day
1680 Hours per Project
7.61 Estimated Fuel Use, gallons per hour (based on 7.05 lbs/gal)

Dozer
132 Estimated HP
2 Hours per Day
210 Hours per Project
7.08 Estimated Fuel Use, gallons per hour (based on 7.05 lbs/gal)

0.0015 % (15 ppm) Sulfur percentage content in fuel

Pollutant	Emission Factor Units	Loaders			Dozer			Totals	
		Emission Factor	pounds/day	pounds/year	Emission Factor	pounds/day	pounds/year	pounds/day	pounds/year
PM	g/hp-hr	0.100	0.511	54	0.100	0.058	6.1	0.57	60
NOx	g/hp-hr	4.50	23.016	2,417	4.50	2.62	275	25.6	2,692
SOx	b/1,000 gals	0.213	0.026	2.72	0.213	0.003	0.32	0.029	3.04

	PM		NOx		SOx	
	pounds/day	pounds/year	pounds/day	pounds/year	pounds/day	pounds/year
Primary Control Area	0.31	31.7	14.1	1,424	1.6E-02	1.61
Secondary Storage Area	0.26	1.31	11.5	59.0	1.3E-02	6.6E-02
Staging Area	0.26	26.9	11.5	1,208	1.3E-02	1.36

Assumptions: The payloader is a L60E Volvo with a 145 HP engine, and the dozer is a Caterpillar D5H 132 HP engine. Emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Nonroad Engine Modeling -- Compression-Ignition, dated February 13, 1998 and revised June 15, 1998. For the emission estimates of NOx and PM it is assumed that the equipment was manufactured between 2003 and 2006 which would be regulated under Tier 2 requirements. The SOx emissions are based on fuel sulfur content.

One loader will be used at the Staging Area and the other will be used at the Primary Control Area and the Secondary Storage Area.

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Off-Site Disposal and License Termination

Table 11
Crusher - Engine Emissions
Internal Combustion Engine, <600 HP

These emission factors estimate particulate emissions from the engine. Particulate emissions from the crushing of material are not included; those emissions are addressed in Table 4.

Potential Operating Hours (or permitted hours)	8,760
Type Fuel	Diesel
Fuel Higher Heating Value, (Btu/gal)	137,000
Gallons per Hour	15.3 estimated
Fuel Input in MMBtu per Hour	2.100 estimated
BHP Rating	300
Operating Hours	
Per Day	4
Per Year (5 months)	315
Actual Fuel Usage (gals/year)	4,828
Sulfur percentage content in fuel	0.0015 %, (15ppm)

Pollutant	CAS#	Emission Factor Source	Emission Factor (lbs/MMBtu)	Actual Emissions (lb/hr)	Actual Emissions (lb/day)	Actual Emissions (lb/yr)	Actual Emissions 5 months (ton/yr)	Potential Emissions (lb/hr)	Potential Emissions 5 months (ton/yr)
PM	na	1	0.31	0.651	2.60	205	0.103	0.651	2.85
PM10	na	1	0.31	0.651	2.60	205	0.103	0.651	2.85
SOx	na	1	1.52E-03	3.18E-03	1.27E-02	1.00	5.01E-04	3.18E-03	1.39E-02
NOx	na	1	4.41	9.261	37.04	2,917	1.46	9.261	40.6

Footnotes:
1 Emission factors are from EPA's AP-42 Table 3.3-1 dated November, 1996. The SCCs for this source are 2-02-001-01 for industrial size equipment and 2-03-001-01 for commercial/institutional size equipment. SOx emission factor is based on sulfur content.

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Off-Site Disposal and License Termination

Table 12
Locomotive - Diesel Powered

Assumes that the locomotive operates only under "switch duty-cycle" as defined by the EPA.

Type Fuel	Diesel
Fuel Higher Heating Value, (Btu/gal)	137,000
Fuel Input in MMBtu per Hour	7.000 estimated
Maximum hourly fuel use (gal/hr)	51 estimated
BHP Rating	1000
Operating Hours	
Day	2
Year (5 months)	210
Sulfur percentage content in fuel	0.0015 %, (15ppm)

Pollutant	CAS#	Emission Factor Source	Emission Factors		Actual Emissions (lb/day)	(lb/yr)	5 months (ton/yr)
PM	na	1	0.54	g/bhp-hr	2.38	250	0.125
PM10	na	1	0.54	g/bhp-hr	2.38	250	0.125
SOx	na	2	1.52E-03	lbs/MMBtu	0.02	2.23	1.1E-03
NOx	na	1	11.00	g/bhp-hr	48.50	5,093	2.55

Footnote

Emission factors are based on Tier I EPA emission limits for engines that were manufactured from 2000 to 2004. This assumes that if the engine was older than 2000 it would have been rebuilt and is required to comply with modern emission standards. The emission limits were published in the EPA's "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines - Locomotives. Emissions include idling time and assumes that PM=PM10.

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Off-Site Disposal and License Termination

Table 13
On-Road Engine Emissions
EPA Model MOBILE 6.2

EPA Model MOBILE6.2 estimates emission rates for a variety of vehicle classes of on-road vehicles. On-road engines are required to comply with different standards than non-road engines. The emissions estimates are the engine exhaust emissions and emissions form brake and tire wear. The emissions below are for two classes of heavy duty diesel vehicles.

Miles per Day	
HDDV8A Miles per Day (loaded)	6.9
HDDV8B Miles per Day (unloaded)	6.9
Miles per Year	
HDDV8A Miles per Year	708
HDDV8B Miles per Year	708
Idling	
Total hours of idling on site per day	1
Total hours of idling on site per year	105

Cover	
Trucks per day	5.3
Trucks for project	575
Trucks per year	575
Miles per truck	1.08
Material	
Trucks per day	18
Trucks for project	3,600
Trucks per year	1900
Miles per truck	0.42

Dust Control Vehicle	
Trucks per day	1
Trucks for project	10
Trucks per year	5
Miles per truck	0.45

Pollutant	Operating Condition	HDDV8A (Heavy Duty Diesel Vehicle - >60,000 GVW)				HDDV8B (Heavy Duty Diesel Vehicle - 33,001 - 60,000 GVW)			
		grams/mile	grams/hour	pounds/day	pounds/year (5 months)	grams/mile	grams/hour	pounds/day	pounds/year (5 months)
PM10	10 mph average	0.254	NA	0.0038	0.40	0.25	NA	0.0038	0.39
	Idling	NA	1.0040	0.0022	0.23	NA	1.0040	0.0022	0.23
				0.0060	0.63			0.0060	0.63
SO2	10 mph average	0.0144	NA	2.2E-04	0.02	0.015	NA	2.3E-04	0.02
NOx	10 mph average	12.3	NA	0.186	19.1	13.9	NA	0.211	21.7

Area	Distributed Emissions	PM10 max pounds/day	PM10 pounds/year	SO2 max pounds/day	SO2 pounds/year	NOx max pounds/day	NOx pounds/year
Primary Control Area	34%	4.1E-03	0.43	1.5E-04	1.6E-02	1.3E-01	13.9
Secondary Storage Area	2%	2.4E-04	0.025	8.9E-06	9.2E-04	7.9E-03	0.82
Staging Area	34%	4.1E-03	0.43	1.5E-04	1.6E-02	1.3E-01	13.9
Roadways	30%	3.6E-03	0.38	1.3E-04	1.4E-02	1.2E-01	12.3

Emissions estimates are based on EPA's MOBILE6.2 Mobile Source Emission Factor Model, input and output files are included in this report. The emission factors include 6.65 starts per day. All particulate matter is 10 micrometers or less.

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Off-Site Disposal and License Termination

Table 14
Modeling Summary
PM-10 Emissions Summary

	Area 1 - Primary Controlled Area				Area 2 - Secondary Storage Area				Area 3 - Staging Area				Area 4 - Roadways		
	PM-10 Emissions				PM-10 Emissions				PM-10 Emissions				PM-10 Emissions		
	Active Day			12 month	Active Day			12 month	Active Day			12 month	Active Day	Inactive Day	12 month
	Active Piles	Active Piles (inactive portion)	Inactive Piles		Active Piles	Active Piles (inactive portion)	Inactive Piles		Active Piles	Active Piles (inactive portion)	Inactive Piles				
Source	lbs/day 8 hours	lbs/day 16 hours	lbs/day 24 hours	lbs/year	lbs/day 8 hours	lbs/day 16 hours	lbs/day 24 hours	lbs/year	lbs/day 8 hours	lbs/day 16 hours	lbs/day 24 hours	lbs/year	lbs/day 8 hours	lbs/day	lbs/year
Material Handing = Cover	0.032			3.47											
= Material Removed	4.90			341	1.54			7.91	4.90			349			
Crushing - Controlled (Table 4)									0.468			30.0			
Active/Inactive Piles (Table 5)	5.37	1.18	1.58	2,203	0.73	0.16	0.080	88	0.52	0.11	0.17	73.3			
Heavy Equipment (Table 6)	15.0			1,515	12.0			61.6	12.0			1,261	0		0
Unpaved Road (Table 7)													3.3		332
Paved Road (Table 8)													4.52		490
Area Erosion (Table 9)			6.8	1872							0.10	26			
Off-Road Diesel Engine (Table 10)	0.31			31.7	0.26			1.31	0.26			26.9	0		0
Crusher Engine Emissions (Table 11)									2.60			205			
Train Engine Emissions (Table 12)									2.38			250			
On-Road Engine Emissions (Table 13)	4.1E-03			0.43	2.4E-04			0.025	4.1E-03			0.43	3.6E-03		0.38
Total	25.6		8.4	5,967	14.5		8.0E-02	159	23.1		2.7E-01	2,222	7.8		822
	SOx Emissions				SOx Emissions				SOx Emissions				SOx Emissions		
Off-Road Diesel Engine (Table 10)	1.6E-02			1.61	1.3E-02			6.6E-02	1.3E-02			1.36	0		0
Crusher Engine Emissions (Table 11)									0.013			1.00			
Train Engine Emissions (Table 12)									0.021			2.23			
On-Road Engine Emissions (Table 13)	1.5E-04			1.6E-02	8.9E-06			9.2E-04	1.5E-04			1.6E-02	1.3E-04		1.4E-02
Total	1.6E-02			1.63	1.3E-02			6.7E-02	0.05			4.6	1.3E-04		1.4E-02
	NOx Emissions				NOx Emissions				NOx Emissions				NOx Emissions		
Off-Road Diesel Engine (Table 10)	14.1			1,424	11.5			59.0	11.5			1,208	0		0
Crusher Engine Emissions (Table 11)									37.04			2,917			
Train Engine Emissions (Table 12)									48.50			5,093			
On-Road Engine Emissions (Table 13)	1.3E-01			13.9	7.9E-03			0.82	1.3E-01			13.9	1.2E-01		12.26
Total	14.3			1,438	11.5			59.8	97.2			9,232	0.119		12.3

Assumptions

One payloader at the staging area at all times, the other payloader is at the primary and secondary storage areas. The D111/D112 piles will be removed in 5 days. On-road engine emission emissions are assumed to be split as follows: 30% while on the roadways, 34% in the Primary Control Area, 34% in the Staging Area, and 2% in the Secondary Storage Area.

Visual Effects Screening Analysis for
Source: SMC
Class I Area: Brigantine

*** Level-1 Screening ***

Input Emissions for

Particulates	4.59	TON/YR
NOx (as NO2)	5.37	TON/YR
Primary NO2	.00	TON/YR
Soot	.00	TON/YR
Primary SO4	.00	TON/YR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	186.30 km
Source-Observer Distance:	49.00 km
Min. Source-Class I Distance:	49.00 km
Max. Source-Class I Distance:	66.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	141.	66.0	28.	2.00	.067	.05	.001
SKY	140.	141.	66.0	28.	2.00	.017	.05	-.001
TERRAIN	10.	84.	49.0	84.	2.00	.147	.05	.001
TERRAIN	140.	84.	49.0	84.	2.00	.009	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	169.	2.17	1.009	.05	.015
SKY	140.	0.	1.0	169.	2.00	.195	.05	-.007
TERRAIN	10.	0.	1.0	169.	2.00	1.354	.05	.013
TERRAIN	140.	0.	1.0	169.	2.00	.232	.05	.006

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