

STORMWATER MAINTENANCE MANUAL

FOR

WEST ORANGE PLAZA

BLOCK 152.01 LOT 1445 AND LOT 1445.05

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY, NEW JERSEY

SUBMITTED TO:

WEST ORANGE ZONING BOARD

PREPARED FOR:

WEST ORANGE PLAZA

P.O. Box 326

PLAINFIELD, NEW JERSEY 07061

PREPARED BY:

PETRY ENGINEERING, LLC

155 PASSAIC AVENUE

FAIRFIELD, NEW JERSEY 07004

973-227-7004



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J. MICHAEL PETRY, PE, PP, AIA
NJ PROFESSIONAL ENGINEER #36662

APRIL 24, 2023



I. INTRODUCTION

This Manual presents specific maintenance information about structural and nonstructural stormwater management measures that shall be used to address stormwater quality and quantity requirements of the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, as applied to the proposed site. One specific structural measure, also known as a Best Management Practices (BMPs), included in this manual is:

1. HDPE Pipe Repair Options

The specific maintenance plans for the structural/non-structural BMPs included in this Manual will be followed by those parties responsible for their operation and maintenance. To assist the operator and maintenance inspector of the on-site stormwater management facilities, copies of tables, sample checklists, and logs from the NJDEP Stormwater Management Facilities Maintenance Manual are included in the Appendix of this Manual.

The responsible party for the subject site operation and maintenance is:

**West Orange Plaza
P.O. Box 326
Plainfield, New Jersey 07061
(973) 763-8454**

General maintenance for all stormwater management measures include:

- a. Inspection of inlets (in parking lot areas) and riprap aprons for clogging and excessive debris and sediment accumulations at least 4 times annually as well as after every storm exceeding 1 inch of rainfall.
- b. Disposal of debris, trash, sediment and other waste material must be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.
- c. Parking lot and lawn areas within the site to be kept free of trash/debris and maintained to the greatest extent possible to prevent clogging of stormwater systems.
- d. All structural components must be inspected for cracking, subsidence, spalling erosion and deterioration at least annual and repaired as required to restore components to original condition.



- e. Inspection of all underground systems shall be in strict accordance with OSHA recommendations for confined space entry and shall be performed during periods of dry weather.
- f. In no instance shall inspection of an underground system be performed less than 72 hours after the end of a rainfall event to allow proper drain time of the systems.

II. MAINTENANCE COST ESTIMATE

Storm Sewers and Inlets.....\$2,000 per year

Maintenance cost estimate includes all maintenance tasks, including inspection, sediment, trash and debris removal. Maintenance cost estimates are based on engineering assumptions, manufacturer's recommendations as well as the relative frequency of maintenance. Actual costs may differ from estimate.

III. APPENDIX

HDPE PIPE REPAIR OPTIONS



APPENDIX

MAINTENANCE EQUIPMENT AND PROCEDURES

TABLE 4-1

N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION STORMWATER MANAGEMENT FACILITY MAINTENANCE MANUAL

SUMMARY OF MAINTENANCE PROCEDURES

A. PREVENTATIVE MAINTENANCE

1. Grass Cutting
2. Grass Maintenance
3. Vegetative Cover
4. Removal and Disposal of Trash and Debris
5. Sediment Removal and Disposal
6. Mechanical Components
7. Elimination of Mosquito Breeding Habitats
8. Pond Maintenance
9. Inspection
10. Reporting

B. CORRECTIVE MAINTENANCE

1. Removal of Debris and Sediment
2. Structural Repairs
3. Dam, Embankment, and Slope Repairs
4. Dewatering
5. Pond Maintenance
6. Extermination of Mosquitoes
7. Erosion Repair
8. Fence Repair
9. Elimination of Trees, Brush, Roots, and Animal Burrows
10. Snow and Ice Removal

C. AESTHETIC MAINTENANCE

1. Graffiti Removal
2. Grass Trimming
3. Control of Weeds
4. Details

MAINTENANCE EQUIPMENT AND PROCEDURES

TABLE 4-2

N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION STORMWATER MANAGEMENT FACILITY MAINTENANCE MANUAL

MAINTENANCE EQUIPMENT AND MATERIALS

This Table lists the equipment and materials which are typically required to maintain a SWMF. It is presented as a general guide to assist owners, maintenance directors, designers, and financial planners in establishing specific facility maintenance programs. The reader should note that actual equipment and materials requirements must be determined on an individual basis for each facility. Additionally, specific manufacturers, brand names, and types of equipment are not included, as availability, personal preference, and specific usage must also be determined for each maintenance program.

A. GRASS MAINTENANCE EQUIPMENT

1. Tractor-Mounted Mowers
2. Riding Mowers
3. Hand Mowers
4. Gas Powered Trimmers
5. Gas Powered Edgers
6. Seed Spreaders
7. Fertilizer Spreaders
8. De-Thatching Equipment
9. Pesticide and Herbicide Application Equipment
10. Grass Clipping and Leaf Collection Equipment

B. VEGETATIVE COVER MAINTENANCE EQUIPMENT

1. Saws
2. Pruning Shears
3. Hedge Trimmers
4. Wood Chippers

C. TRANSPORTATION EQUIPMENT

1. Trucks for Transportation of Materials
2. Trucks for Transportation of Equipment
3. Vehicles for Transportation of Personnel

MAINTENANCE EQUIPMENT AND PROCEDURES

TABLE 4-2 (CONTINUED)

D. DEBRIS, TRASH, AND SEDIMENT REMOVAL EQUIPMENT

1. Loader
2. Backhoe
3. Grader

E. MISCELLANEOUS EQUIPMENT

1. Shovels
2. Rakes
3. Picks
4. Wheel Barrows
5. Fence Repair Tools
6. Painting Equipment
7. Gloves
8. Standard Mechanics Tools
9. Tools for Maintenance of Equipment
10. Office Space
11. Office Equipment
12. Telephones
13. Safety Equipment
14. Tools for Concrete Work (Mixers, Form Materials, etc.)
15. Welding Equipment (for Repair of Trash Racks, etc.)

F. MATERIALS

1. Topsoil
2. Fill
3. Seed
4. Soil Amenities (Fertilizer, Lime, etc.)
5. Chemicals (Pesticides, Herbicides, etc.)
6. Mulch
7. Paint
8. Paint Removers (for Graffiti)
9. Spare Parts for Equipment
10. Oil and Grease for Equipment and SWMF Components
11. Concrete

Maintenance Work Order and Checklist for Stormwater Management Facilities

Name of Facility: _____

Location: _____ Date: _____

Crew: _____

Work Started: date _____ time _____

Equipment: _____

Work Completed: date _____ time _____

Weather: _____

Total Manhours of Work: _____

A. Preventative Maintenance

Work Item	Items Required (✓)	Items Done (✓)	Comments and Special Instructions
1. Grass Cutting			
A. Bottoms			
B. Embankments and Side Slopes			
C. Perimeter Areas			
D. Access Areas and Roads			
E. Other:			
2. Grass Maintenance			
A. Fertilizing			
B. Re-Seeding			
C. De-Thatching			
D. Pest Control			
E. Other:			
3. Vegetative Cover			
A. Fertilizing			
B. Pruning			
C. Pest Control			
D. Other:			
4. Trash and Debris Removal			
A. Bottoms			
B. Embankments and Side Slopes			
C. Perimeter Areas			
D. Access Areas and Roads			
E. Inlets			
F. Outlets and Trash Racks			
G. Other:			
5. Sediment Removal			
A. Inlets			
B. Outlets and Trash Racks			
C. Bottoms			
D. Other:			

SWM Maintenance List

Items
Required
(✓)Items
Done
(✓)

Page 2 of 3

Work Item

Comments and Special Instructions

6. Mechanical Components

A. Valves			
B. Sluice Gates			
C. Pumps			
D. Fence Gates			
E. Locks			
F. Access Hatches			
G. Other:			

7. Elimination of Potential Mosquito Breeding Habitats

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8. Pond Maintenance

A. Aeration Equipment			
B. Debris & Trash Removal			
C. Weed Removal			
D. Other:			

9. Other Preventative Maintenance

A.			
B.			
C.			

B. Corrective Maintenance

Work Item	Items Required (✓)	Items Done (✓)	Location, Comments and Special Instructions
1. Removal of Debris & Sediment			
2. Structural Repairs			
3. Dam, Embankment & Slope Repairs			
4. Dewatering			
5. Pond Maintenance			
6. Control of Mosquitoes			
7. Erosion Repair			
8. Fence Repair			
9. Elimination of Trees, Brush, Roots & Animal Burrows			
10. Snow & Ice Removal			
11. Other			

C. Aesthetic Maintenance

Work Item	Items Required (✓)	Items Done (✓)	Location & Comments
1. Graffiti Removal	☐	☐	
2. Grass Trimming	☐	☐	
3. Weeding	☐	☐	
	☐	☐	

Remarks (Refer to Item No., if Applicable):

Work Order Prepared By: _____

Work Completed By: _____

[illegible]

[illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible]

C. Aesthetic Maintenance**Work Item****1. Graffiti Removal**

--	--	--	--	--	--	--	--	--	--

2. Grass Trimming

--	--	--	--	--	--	--	--	--	--

3. Weeding

--	--	--	--	--	--	--	--	--	--

4. Other:

--	--	--	--	--	--	--	--	--	--

Remarks (Refer to Item No., If Applicable):

Table 4-5

Inspection Checklist for Stormwater Management Facilities

Name of Facility: _____

Location: _____ Date: _____

Weather: _____

Facility Item	O.K. ¹	Routine ²	Urgent ³	Comments ⁴
1. Embankments and Side Slopes				
A. Vegetation				
B. Linings				
C. Erosion				
Settlement				
Sloughing				
F. Trash and Debris				
G. Seepage				
H. Aesthetics				
I. Other:				
2. Bottoms (Detention and Infiltration)				
A. Vegetation				
B. Erosion				
C. Standing Water				
D. Settlement				
E. Trash and Debris				
F. Sediment				
G. Aesthetics				
H. Other:				
3. Low Flow Channels (Detention)				
A. Vegetation				
B. Linings				
C. Erosion				
D. Settlement				
E. Standing Water				
F. Trash and Debris				
G. Sediment				
H. Other:				

Facility Item

O.K.¹ Routine² Urgent³ Comments⁴

4. Ponds (Retention)

A. Vegetation				
B. Shoreline Erosion				
C. Aeration Equipment				
D. Trash & Debris				
E. Sediment				
F. Water Quality				
G. Other:				

5. Inlet Structure

A. Condition of Structure				
B. Erosion				
C. Trash & Debris				
D. Sediment				
E. Aesthetics				
F. Other:				

6. Outlet Structure (Detention & Retention)

A. Condition of Structure				
B. Erosion				
C. Trash & Debris				
D. Sediment				
E. Mechanical Components				
F. Aesthetics				
G. Other:				

7. Emergency Spillway

A. Vegetation				
B. Lining				
C. Erosion				
D. Trash & Debris				
E. Other:				

8. Perimeter

A. Vegetation				
B. Erosion				
C. Trash & Debris				
D. Fences & Gates				
E. Aesthetics				
F. Other:				

9. Access Roads

A. Vegetation				
B. Road Surface				
C. Fence & Gates				
D. Erosion				
E. Aesthetics				
F. Other:				

Facility Item O.K.¹ Routine² Urgent³ Comments⁴

10. Miscellaneous

A. Effectiveness of Exist. Maint. Program				
B. Dam Inspections				
C. Potential Mosquito Habitats				
D. Mosquitoes				
E.				
F.				
G.				

¹ The item checked is in good condition, and the maintenance program is adequate.

² The item checked requires attention, but does not present an immediate threat to the facility function or other facility components.

³ The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.

⁴ Provide explanation and details if columns 2 or 3 are checked.

Remarks (Refer to Item No., If Applicable):

Inspector: _____

Facility Item

4. Ponds (Retention)

A. Vegetation									
B. Shoreline Erosion									
C. Aeration Equipment									
D. Trash & Debris									
E. Sediment									
F. Water Quality									
G. Other:									

5. Inlet Structure

[illegible]

6. Outlet Structure (Detention & Retention)

A. Condition of Structure									
B. Erosion									
C. Trash & Debris									
D. Sediment									
E. Mechanical Components									
F. Aesthetics									
G. Other:									

7. Emergency Spillway

[illegible]

8. Perimeter

A. Vegetation									
B. Erosion									
C. Trash & Debris									
D. Fences & Gates									
E. Aesthetics									
F. Other:									

9. Access Roads

[illegible]

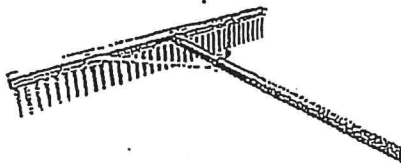
Facility Item

10. Miscellaneous

A. Effectiveness of Exist. Maint. Program										
B. Dam Inspections										
C. Potential Mosquito Habitats										
D. Mosquitoes										
E.										
F.										
G.										

- ¹ The item checked is in good condition, and the maintenance program is adequate.
- ² The item checked requires attention, but does not present an immediate threat to the facility function or other facility components.
- ³ The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.

Remarks (Refer to Item No., If Applicable):



Specialty designed for sifting, grading and screening. The tool of choice when you have to sift or screen stones and debris from sand or fine soil.

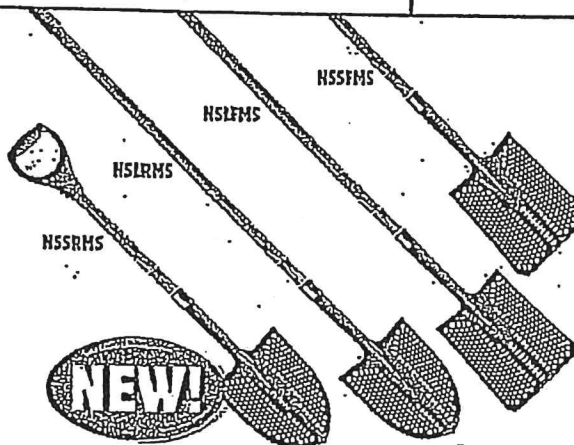
All Rakes have a 66" L handle with 5" L vinyl grip for increased comfort.

No.	Description	Weight	1-2	3+
BJB-60777	24" W Landscape Rake	4.5 lb.	\$40.50	\$36.50
BJB-60778	36" W Landscape Rake	5.3 lb.	49.70	44.90
BJB-60779	48" W Landscape Rake	6.0 lb.	57.80	52.10
BJB-60780	24" W Screening Rake	4.0 lb.	48.90	44.10
BJB-60781	36" W Screening Rake	4.5 lb.	50.20	52.50

SCREENING RAKE BY BEN MEADOWS
(OR APPROVED EQUAL)

50 lb/bag PINELANDS GREEN TURF FESCUE
PLUS MIX (SUN OR SHADE) \$73.00/bag
40% Jubilee tall fescue
40% Morgan tall fescue
14% Saint perennial ryegrass
6% Cache Kentucky bluegrass

GRASS SEED MIXES BY
PINELANDS NURSERY
(OR APPROVED EQUAL)



Mud Slingers

Dig these 4 great new additions to our already outstanding line of shovels and spades.

- Holes in blade allow for superior mud-release.
- The blade is almost 1 pound lighter.
- Fiberglass handle and cushion grip.
- Satisfaction Guaranteed.

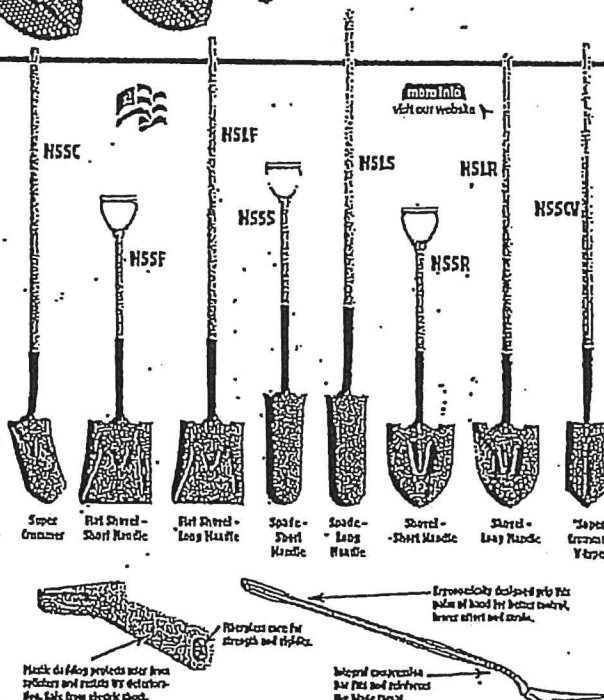
All Mud Slingers\$46.47 ea.

Indestructible Shovels & Spades!

No more broken handles!

- Heavy 14-gauge blades with hollow-back construction.
- Solid fiberglass handles that are guaranteed for a lifetime.
- Forward turned steps for foot comfort and easier penetration.
- Does not absorb moisture, resists industrial chemicals.
- Easily cleaned of concrete, tar, etc.
- Easy to handle in extreme temperatures.
- Ergonomic design for comfort and stress reduction.
- Excellent rigidity reduces wasted effort.

*Super Crummer V-type\$36.19 ea.
All Others\$31.19 ea.
Handles only\$16.70 ea.



MUD SLINGERS, SHOVELS &
SPADES BY AGRI DRAIN
(OR APPROVED EQUAL)

EXHIBIT 1

NOTE:
ITEMS SHALL BE USED FOR REMOVAL OF
SAND AND DEBRIS.

HDPE PIPE REPAIR OPTIONS



TECHNICAL NOTE

HDPE Pipe Repair Options

TN 5.03
January 2010

Introduction

High-density polyethylene (HDPE) pipe is lightweight and very easy to handle. The attributes that make the pipe easy to use can also make it easy to abuse, resulting in damaged pipe or joints. This technical bulletin discusses some of the products available that can be used to repair damaged HDPE pipe or joints in the field.

Repair Options

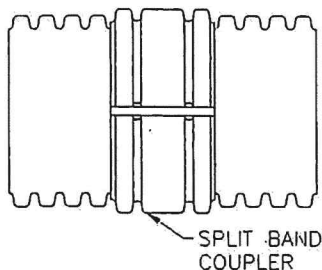
One of the primary considerations in selecting a repair method is the degree of joint performance required. Watertight repairs are generally used on pipe with watertight joints, and soil-tight repairs on pipe with soil-tight joints. This helps keep costs in line and prevents the repair from being the weak area of the pipe system.

The way in which a pipe can be accessed is another primary consideration which influences what type of repair alternative is selected. Pipe that is not yet buried, or can be easily excavated, can be repaired from the exterior. If the pipe is buried and cannot be conveniently excavated, an internal repair may be the best alternative. If the pipe is too small to enter, there are companies with remote controlled equipment that can install the product. Each situation must be considered individually.

The repair options addressed below are divided into external repairs and internal repairs. During any pipe repair, backfill should be placed and compacted per project specifications to provide proper support for the pipe and coupler.

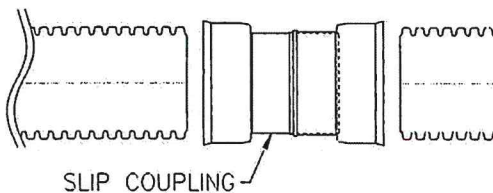
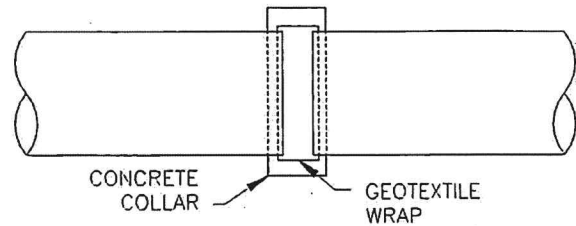
External Mechanical Repairs

Mar Mac Polyseal Pipe Coupler, 4- through 60-inch (100 - 1500 mm), consists of a mastic adhesive base layer, a cross-laminated polyethylene middle layer with a spun-bonded geotextile polypropylene cloth outer layer. The coupler incorporates a self-adhering rubberized bonding mastic and securing bands to insure a positive seal around the pipe. . If the pipe itself is damaged, the damaged area will need to be removed and a new pipe section spliced in before installing a coupler around both ends. Polyseal Pipe Couplers are reasonably priced, especially when considering the quality of the finished repair, and are typically used with soil-tight smooth interior corrugated HDPE pipe products. *Note: Mar-Mac bands shall be installed in accordance with manufacturer's recommendations.*



Snap couplers, 4- through 8-inch (100 – 200 mm), and *split band couplers*, 10- through 30-inch (250 – 750 mm), will provide a soil-tight repair with or without gaskets. This repair method should only be used if the damaged area is in a non-trafficked green area, is cosmetic in nature, confined to a single corrugation, and is not defined as structural damage. The coupler shall be centered around the damaged area of pipe and tightened down with the nylon straps. If the damaged area is large or significant, the damaged area is to be cut out, and replaced with a new section of pipe. The replacement section is to be 'spliced' in place using snap or split band couplers. They are a convenient, low-cost repair alternative, and are typically used to repair soil-tight smooth interior corrugated HDPE pipe products.

Concrete collars also provide a soil-tight repair, dependent on the integrity of the installation. Installing a concrete collar involves building a form around the area to be repaired and encasing it in concrete. A geotextile is usually wrapped around the repair area prior to pouring the collar to keep the concrete from seeping into the pipe. Typically, approximately 6" (0.15m) is excavated beneath the pipe to allow for proper application of the geotextile and concrete encasement. If the pipe itself is damaged, the damaged area shall be removed and a replacement pipe section spliced in prior to pouring the collar. In order to provide a greater level of joint performance, a gasket can be installed on the pipe in the concrete encasement. Concrete collars are typically more costly and time consuming than snap couplers or split band couplers but are reasonable repair options for soil-tight smooth interior corrugated HDPE pipe products. .



Slip Couplings 4- through 24-inch (100 – 600 mm), provides a watertight repair that will meet most pressure testing requirements, when installed correctly. The slip coupling uses PVC bells with gaskets. The gaskets are placed in the valleys on either side of the section to be repaired and slip couplings are then slid over the gaskets. PVC slip couplings are most commonly used with watertight smooth interior corrugated HDPE pipe products. .

Internal Repairs

Internal mechanical repair products generally consist of a flexible cylindrical gasket sleeve, which is expanded to conform to the inner wall of the pipe. The feasibility of this repair method depends on the size of the damaged section or joint and available access into the pipe. Internal mechanical seals slightly restrict the inside diameter of the pipe. This should be considered when assessing the risk of debris obstruction.

NPC Internal Joint Seal, 18- through 60-inch (450 – 1500 mm), consists of an EPDM rubber seal and stainless steel bands. The rubber seal is inserted into the pipe and positioned over the joint. A torque wrench is used to expand the bands against the inner wall of the pipe. The Internal Joint Seal is designed to seal joints – not repair damaged pipe sections. The damaged area of the pipe must be removed and a replacement section spliced in if necessary in order to use the Internal Joint Seal. This system may provide a watertight joint when installed as recommended. The manufacture should be contacted to verify the product meets the specific application requirements including test requirements, if specified. If pressure tests are required, NPC should be contacted to ensure that the product is suitable for the specific test criteria.

Internal mechanical seals will slightly restrict the inside diameter of the pipe. This should be considered when assessing the risk of debris obstruction.

Link Pipe Grouting Sleeve™, 4 through 60 inch (100 – 1500 mm), is a stainless steel grouting sleeve that is installed with an inflatable plug. The sleeve may be used to seal a joint or repair short sections of damaged pipe. The manufacture should be contacted to verify the product meets the specific application requirements including test requirements, if specified.

Internal chemical sealing is another method of internal joint repair using chemically activated gel or grout to minimize joint leakage. The grout is typically applied with specialized remote-controlled equipment. Test/seal



packer is used to remotely seal a joint. The grouting chemicals are forced through the joint out into the surrounding soil where they gel with the soil. The gelled mass forms a waterproof collar around the pipe. The result is significantly reduced leakage. There are several types of chemical grouts available and the manufacturer should be contacted to review the specific situation and any joint tightness or pressure test criteria. Companies such as Avanti International, Strata Tech Inc., and Carylton Corporation manufacture and/or install chemical grout. Stephen's Technologies *New Life Coatings* and *NewLife Liner Systems* as well as Avast Hydro-Lining International, are examples of companies that offer cured in place epoxy lining systems that have been effectively used with HDPE pipe. Most pipe diameters can be chemically grouted provided the grouting contractor has the appropriate equipment.

Manufacturer Contact Information

Contact the Regional Engineer or Application Engineering Department for assistance with other unique conditions or for contact information regarding any companies listed in this technical note.

Note: The HDPE pipe products are solely intended for the conveyance of fluids. Access into this product for maintenance, inspection, repair, or other reason should be done in strict accordance with OSHA recommendations for confined space entry.