

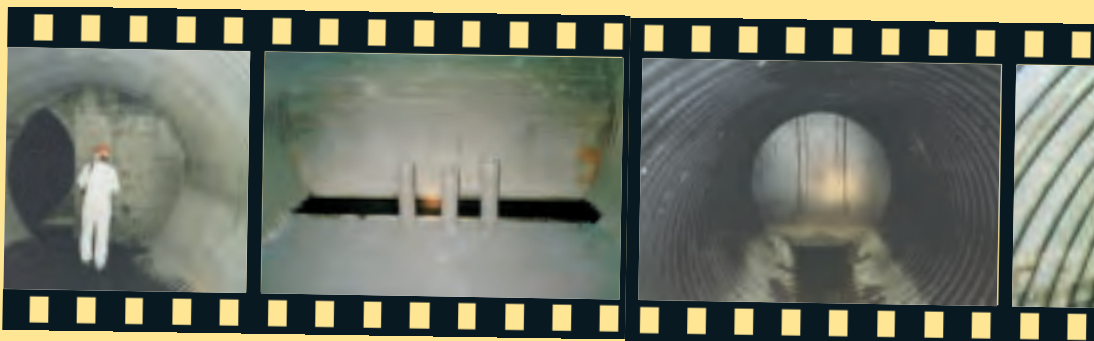


National
Corrugated Steel Pipe
Association

Condition Survey of Corrugated Steel Pipe Detention Systems

An Interim Report
March, 1999

. DETENTION . SYSTEMS .





National Corrugated Steel Pipe Association (NCSPA), in cooperation with the **American Iron and Steel Institute** (AIS), undertook this study to evaluate the condition of CSP stormwater management detention structures in the Washington, D.C. metro area. All inspections were performed by **Parsons Brinkerhoff** located in Baltimore, Maryland.

CSP detention structures have been in use in this area since as far back as the early 1970's. The objective was to perform a qualitative condition survey to assess the overall performance of these systems. This Interim Report contains the findings from the initial inspections. A Final Report will be issued when additional inspections have been completed.

SITE SELECTION

All sites identified and inspected in Montgomery County, Maryland; Fairfax City, Virginia; and Alexandria, Virginia, were determined and located by the government official. In most cases, this was an Inspector, which eliminated any potential bias in site selection. The Inspector was told to supply the oldest structures in place and also to include various coatings (Galvanized, Aluminized, and Bituminous Coated).

Of the twenty-one sites inspected, eleven were galvanized coated; three were aluminized coated type 2; three were fully bituminous coated; and three were aluminum. One of the galvanized sites had saw cuts in the invert to promote infiltration of the runoff into the ground in a similar manner as perforated CSP. Three sites contained sand filters for water quality purposes.

PROCEDURES

The inspection procedures consisted of a qualitative survey of pipe conditions. This included identifying the coating type, corrugation profile, general dimensions of the system, type of release structure, lockseam condition, joint condition, coating condition for the top, sides, and invert, land use, and any other items of interest.

The firm of Parsons Brinkerhoff was contracted to perform the inspections using a Professional Engineer, Dan O'Leary. In addition, a safety consultant was employed to oversee all confined space issues

The coating condition was evaluated on a visual rating scale shown below in Table 1. This same criteria was used in a condition survey of CSP performed by Corrpro Companies in 1986. Environmental conditions (pH, resistivity) were outside the scope of this study.

Table 1: Visual Rating Scale

Rating	Description
100 – 95	
90	Galvanizing Intact
80 – 85	
75	Galvanizing Partly Gone, Some Rust
60 – 55	
50	Galvanizing Gone, Significant Metal Loss
45 – 40	
35 – 30	
25	Deep Pits, Heavy Metal Loss, Perforation
20 – 15	
10 – 5	
0	Major Metal Loss

FINDINGS

The condition survey findings are illustrated in the tables at right, and in the detailed site conditions that follow. Overall, the systems were found to be performing extremely well. From a durability standpoint, most systems still had all zinc intact after up to twenty five years. Only one site showed any signs of metal loss.

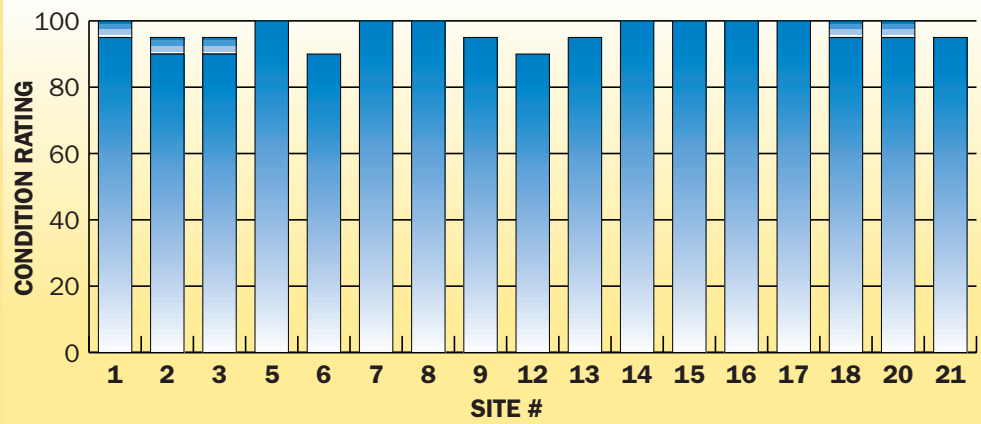
There were no signs of visible deflection in the pipes with the exception of mechanical damage during installation at one location. This damage was not significant enough to require any maintenance activity. Most joints were believed to be soil tight with one exception.

PRELIMINARY CONCLUSIONS

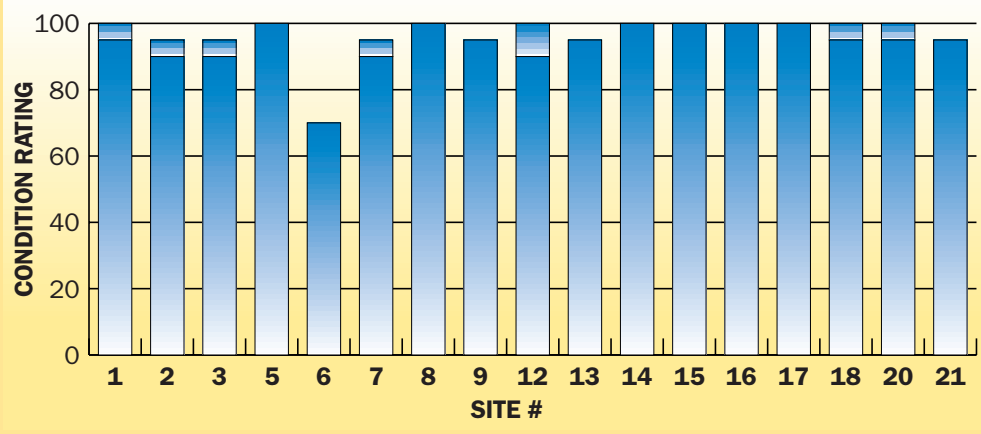
The results of the condition survey indicate that CSP systems provide a reliable and durable solution for stormwater detention. Based on the observations on the older systems (25 years), it would be reasonable to expect these systems to continue service for two to four times (or longer) without any repair being necessary. In addition, a study performed by Corrpro Companies in 1986 found that, "93.2% of plain galvanized CSP installations have a soil-side service life in excess of 75 years, while 81.5% have a soil-side service life in excess of 100 years." The Corrpro finding is consistent with this investigation.

. CONDITION . RATINGS -- ALL . SITES .

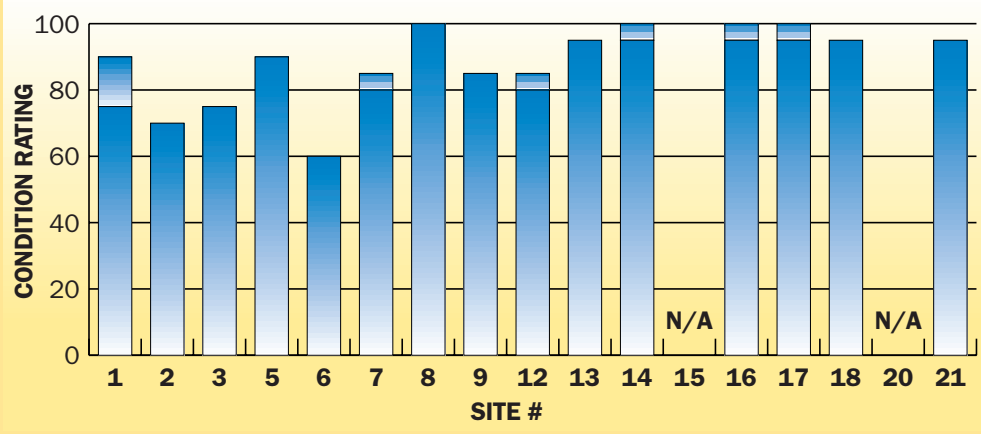
Top



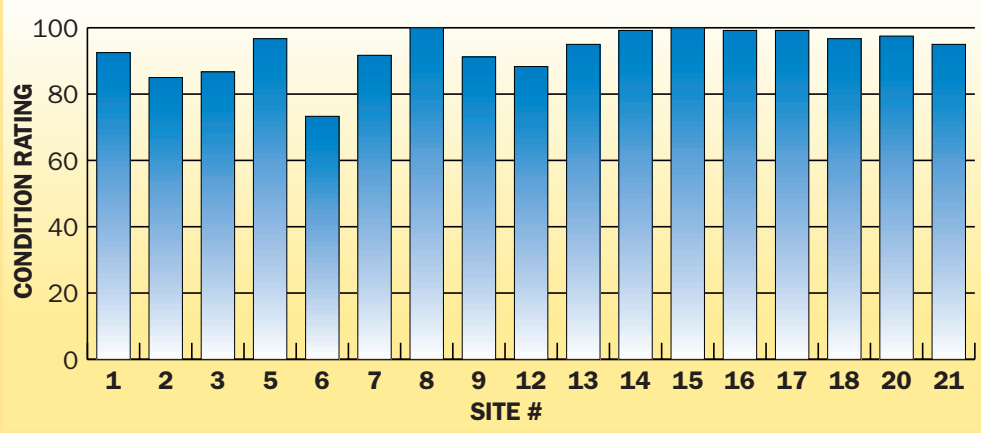
Sides



Invert



Average Rating

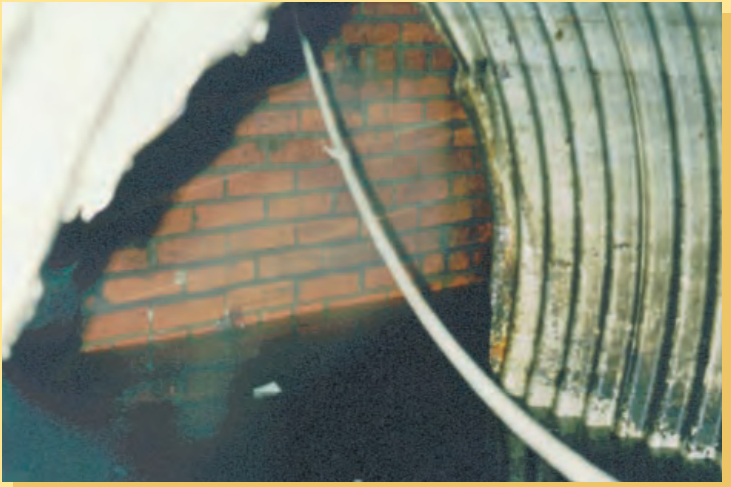




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Sites 4, 10, 11, and 19 were aluminum structures which were not intended for study and were not evaluated.



<p>Condition Rating</p> <p>Top95/100</p> <p>Sides95/100</p> <p>Invert.....75/90*</p> <p>Avg. Rating.....92.5</p>	<p>Age: 25 years</p> <p>Coating Type: Galvanized</p> <p>Diameter: 60"</p> <p>Corrugation: 1x3" Helical</p> <p>Land Use: Industrial</p> <p>Location: Montgomery County, Maryland</p>	<p>Comments:</p> <p>*18" standing water;</p> <p>could not see invert;</p> <p>rating based on probing.</p> <hr/> <hr/> <hr/>
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Detention System

. SITE . 2 .



Condition Rating:

Top90/95
 Sides90/95
 Invert.....70*
Avg. Rating85

Age: 25 years

Coating Type: Galvanized

Diameter: 48"

Corrugation: 1x5" Helical

Land Use: Industrial

Location: Montgomery County,
 Maryland

Comments:

*Isolated pitting invert.



Condition Rating:

Top90/95
 Sides90/95
 Invert75
Avg. Rating.....86.7

Age: 25 years
Coating Type: Galvanized
Diameter: 48"
Corrugation: 1x5" Helical
Land Use: Industrial
Location: Montgomery County, Maryland

Comments:
 36" saw-cuts in every
 corrugation to promote
 infiltration;
 stone backfill.



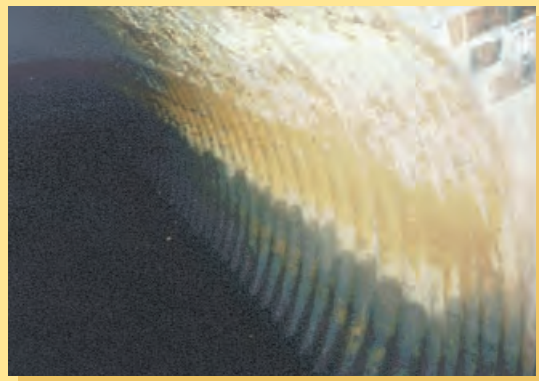
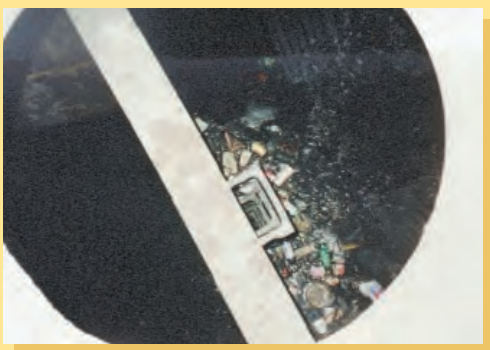
Condition Rating:

Top100
 Sides100
 Invert90
Avg. Rating.....96.7

Age: 20 years
Coating Type: Galvanized
Diameter: 60"
Corrugation: 1x5" Helical
Land Use: Industrial
Location: Montgomery County, Maryland

Comments:

Oil grit separator at
entrance.



Condition Rating:

Top	90
Sides	70
Invert	60
Avg. Rating.....	73.3

Age: 20 years
Coating Type: Galvanized
Diameter: 96"
Corrugation: 1x5" Helical
Land Use: Commercial
Location: Montgomery County, Maryland

Comments:
 6" low orifice clogged;
 24" standing water.
 Red rust on sides with
 coating loss.



Condition Rating

Top100
Sides90/95
Invert80/85
Avg. Rating.....91.7

Age: 20 years
Coating Type: Galvanized
Diameter: 96"
Corrugation: 1x5" Helical
Land Use: Commercial
Location: Montgomery County,
Maryland

Comments:

Limited staining in
invert.



Condition Rating

Top	100
Sides	100
Invert	100
Avg. Rating	100

Age: 20 years
Coating Type: Fully Bituminous Coated
Diameter: 72"
Corrugation: 1x5" Helical
Land Use: Commercial
Location: Montgomery County, Maryland

Comments:
Bituminous coating
intact; no rust on exposed
galvanized surface.



Condition Rating

Top	95
Sides	95
Invert	85
Avg. Rating.....	91.2

Age: 20 years

Coating Type: Galvanized

Diameter: 108"

Corrugation: 1x5" Helical

Land Use: Commercial

Location: Montgomery County, Maryland

Comments:

Oil grit separator at
entrance;
minor soil trough joints;
no sign of gaskets with
joints.



Condition Rating

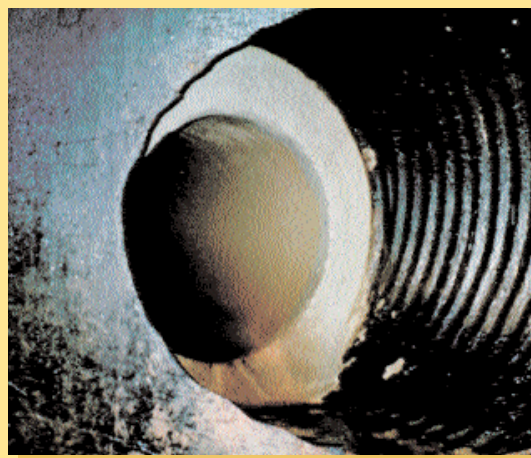
Top90
 Sides90/100
 Invert80/85
Avg. Rating.....88.3

Age: 14 years
Coating Type: Aluminum Coated Type 2
Diameter: 48"
Corrugation: 1/2" x 2 2/3" Helical
Land Use: Commercial
Location: Montgomery County, Maryland

Comments:



<p>Condition Rating</p>	<p>Age: 10 years Coating Type: Aluminum Coated Type 2 Diameter: 108" Corrugation: 1x5" Helical Land Use: Commercial Location: Montgomery County, Maryland</p>	<p>Comments: <u>Oil grit separator at entrance.</u> <hr/> <hr/> <hr/> <hr/></p>
<p>Top95 Sides95 Invert95 Avg. Rating95</p>		

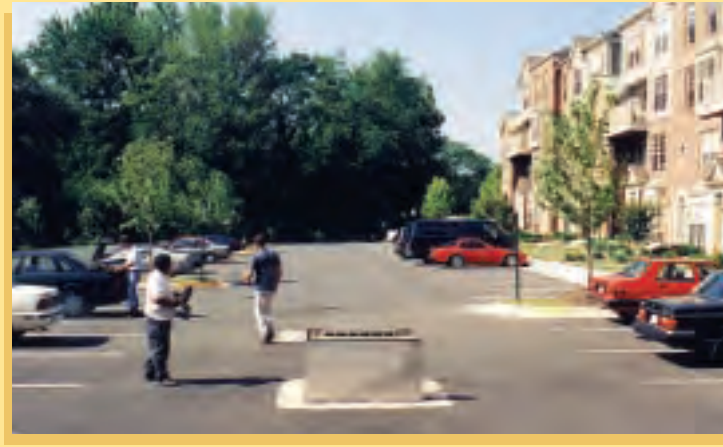


Condition Rating

Top100
 Sides100
 Invert95/100
Avg. Rating.....99.2

Age: 5 years
Coating Type: Fully Bituminous Coated
Diameter: 67"x104"
Corrugation: 1x5" Helical
Land Use: Residential
Location: Fairfax City, Virginia

Comments:
Asphalt coating removed
in sections of invert.
No signs of rust on
exposed galvanizing.



Condition Rating

Top	100
Sides	100
Invert	N/A
Avg. Rating	100

Age: Less than 3 years
Coating Type: Galvanized with Painted Coating
Diameter: 120"
Corrugation: 1x5" Helical
Land Use: Residential
Location: Fairfax City, Virginia

Comments:

Well drained;
 no signs of sediment
 clogging.

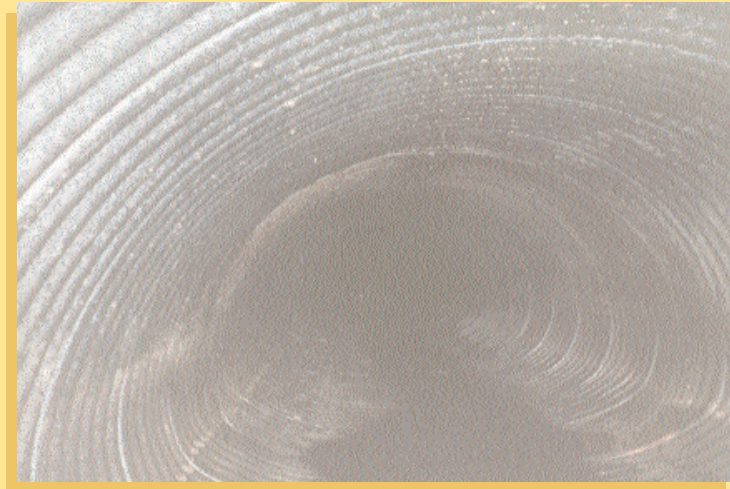


Condition Rating

Top	100
Sides	100
Invert	95/100
Avg. Rating.....	99.2

Age: Minimum 10 years
Coating Type: Aluminum Coated Type 2
Diameter: 80"
Corrugation: 1x5" Helical
Land Use: Residential (SFH)
Location: Fairfax City, Virginia

Comments:
Light staining in invert.



Condition Rating

Top	100
Sides	100
Invert	95/100
Avg. Rating.....	99.2

Age: 5 years

Coating Type: Fully Bituminous Coated

Diameter: 65"x107"

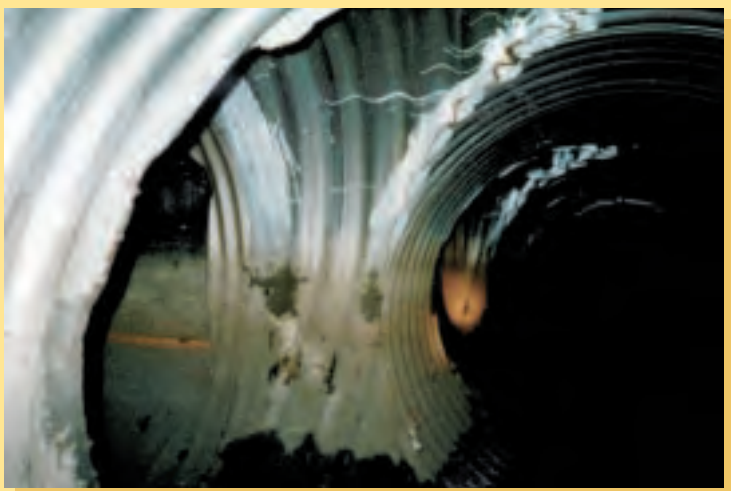
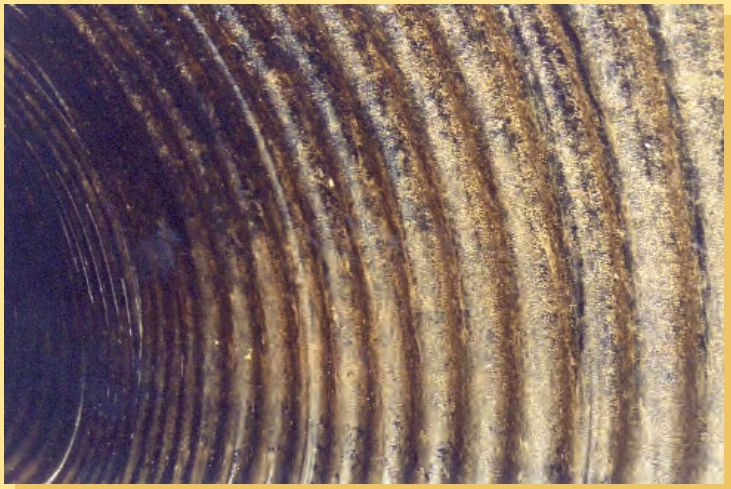
Corrugation: 1x5" Helical

Land Use: Residential

Location: Fairfax City, Virginia

Comments:

Asphalt removed in
some areas; no rust on
exposed galvanized
surface.

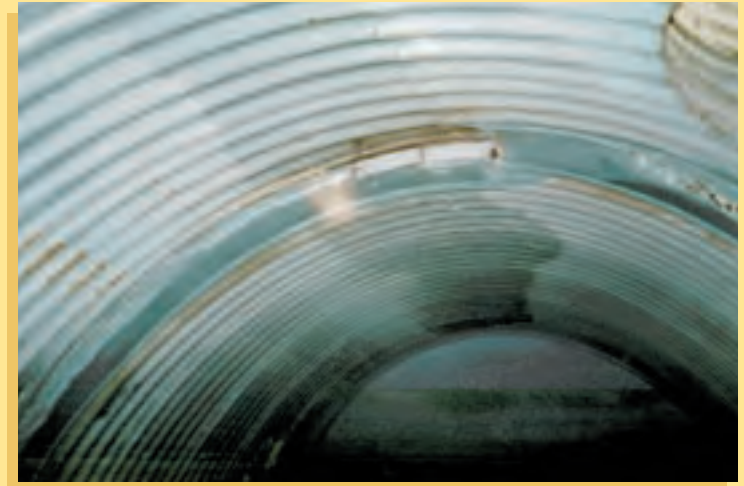
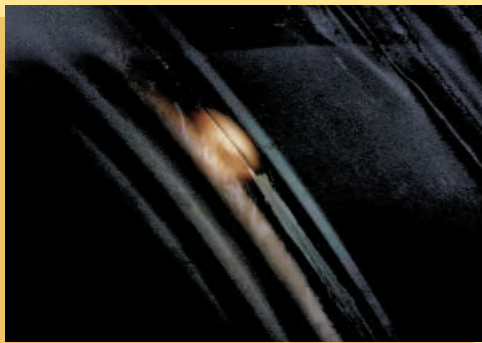


Condition Rating

Top95/100
 Sides95/100
 Invert95
Avg. Rating.....96.7

Age: 10 years
Coating Type: Galvanized
Diameter: 60"
Corrugation: 1x5" Helical
Land Use: Commercial
Location: Alexandria, Virginia

Comments:
Oil grit separator at
entrance.
Non-woven geotextile
inside pipe to minimize
clogging of backfill stone.



Condition Rating

Top95/100
 Sides95/100
 InvertN/A
Avg. Rating.....97.5

Age: 5 years

Coating Type: Galvanized

Diameter: 120"

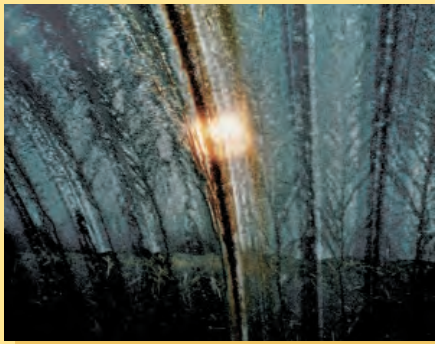
Corrugation: 1x5" Helical

Land Use: Residential

Location: Alexandria, Virginia

Comments:

Little to no debris;
no signs of clogging;
return valve open.



<p>Condition Rating</p>	<p>Age: 5 years Coating Type: Galvanized Diameter: 144" Corrugation: 1x5" Helical Land Use: Residential Location: Alexandria, Virginia</p>	<p>Comments: <u>Detention system with</u> <u>sand filter.</u> <hr/> <hr/> <hr/></p>
<p>Top95 Sides95 Invert95 Avg. Rating95</p>		



The NCSPA would like to thank the following people for their assistance in this study:

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