Rehabilitation of Sewer Service Laterals

Crucial to program success!

PRESENTED BY

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** A significant portion of this work was conducted by CTE-AECOM as part of the Nashville Overflow Abatement Program 1991-2005*

Summary

- Why renew laterals ?
- Sparse project information
- Methods
- Example pilot project
- Verify effectiveness

Why Is Sewer Lateral Renewal Needed?

- Serviceability of lateral for customer
- Structural integrity
- I/I reduction

Private Sector I/I

- 1983 RJN report to EPA
- Study of 19 municipalities – Illinois
- 63% “inflow” from private sector (weighted average)
- May be based on source estimates
- Probably includes downspouts & foundation drains etc.

I/I Removal with Various Lateral Treatment

LOCATION	METHOD	mgd	%Red.	Footage	MG/1000-ft
Pembroke Pines, FL	cip & ff 3 gr lt	0.33	21	8,770	13.7
Dania, FL	cip & ff 122 gr lt	0.97	60	48,100	7.4
Miramar, FL	cip & ff 31 gr lt	0.81	39	22,780	13
Hollywood, FL	cip & ff 158 gr lt	3.53	33	98,710	13.1
Colonial Heights, VA	Cip- lateral cut	0.2	-	5,500	13.3
El Paso, TX	Cip- lateral cut	0.071	51	10,000	2.6
Lynn, MA-35%	Cip- lateral cut-214, MH-20	2.8	-	~26,000	39.3

Lateral Rehabilitation Methods

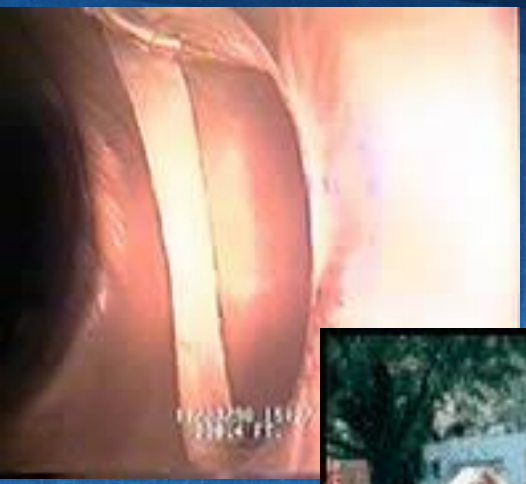
- Replacement and point repairs
- Fusion weld
- Lining – (cured-in-place)
- Grouting
- Bursting
- Robotics
- Vacuum Excavation – Clean-out installation

Dig and Replace

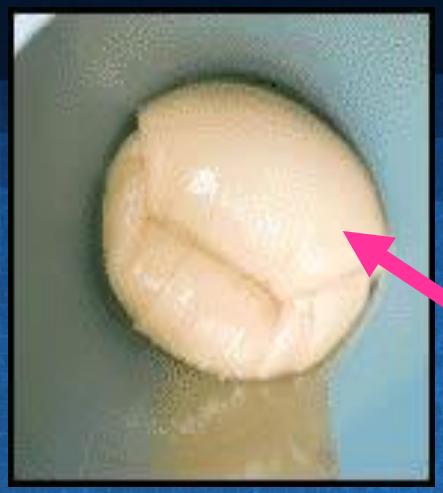
Dig and Replace

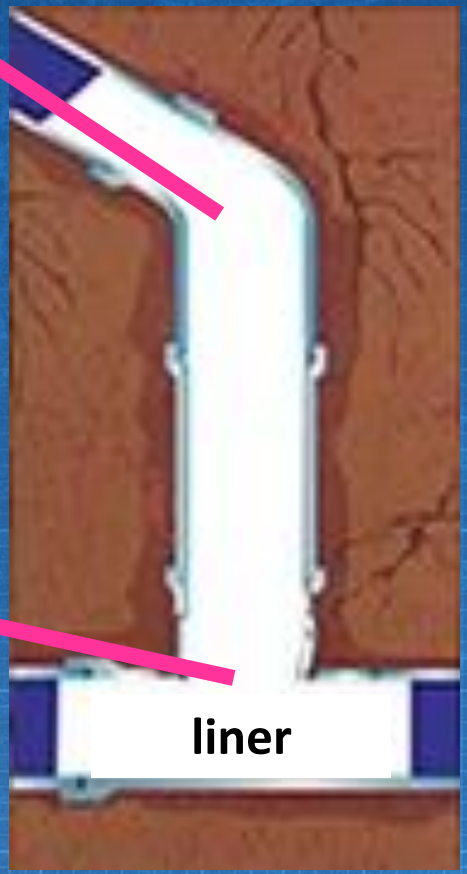
New connections must be tight!

CIP (Cured-in-Place process)

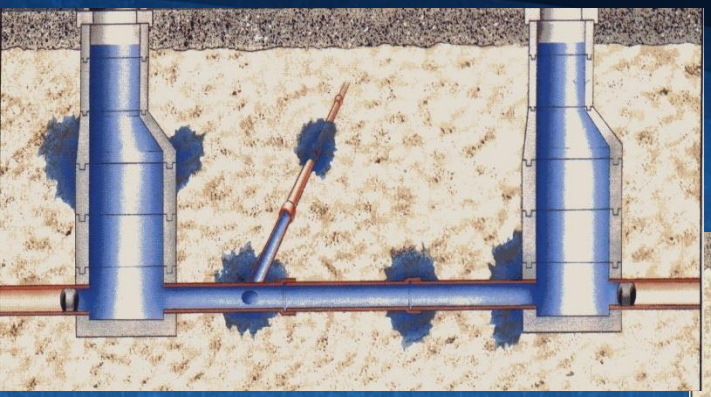


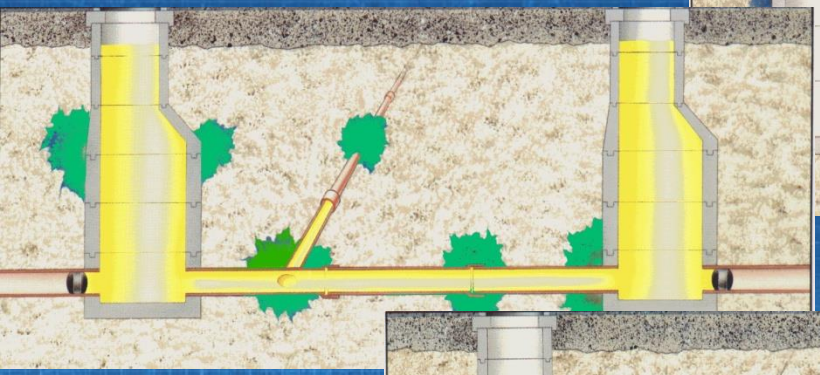
Insert from public sewer

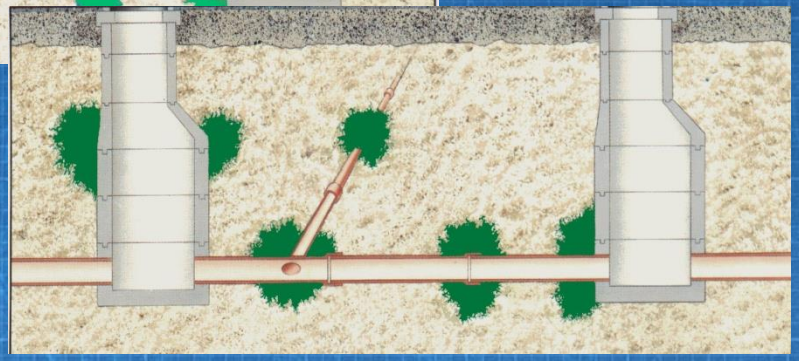




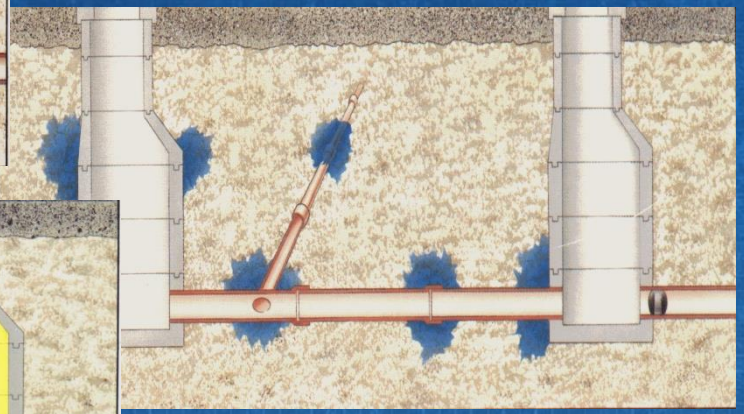
Grouting



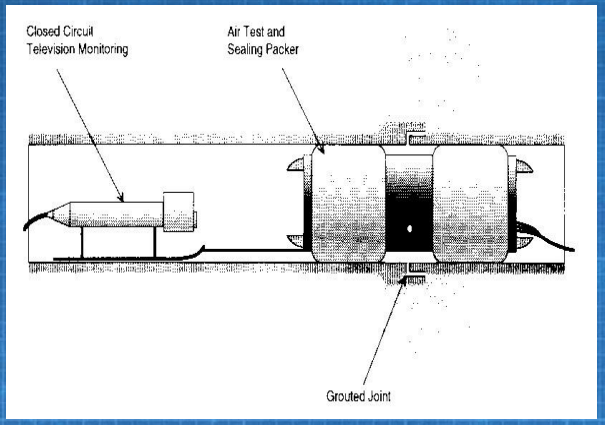




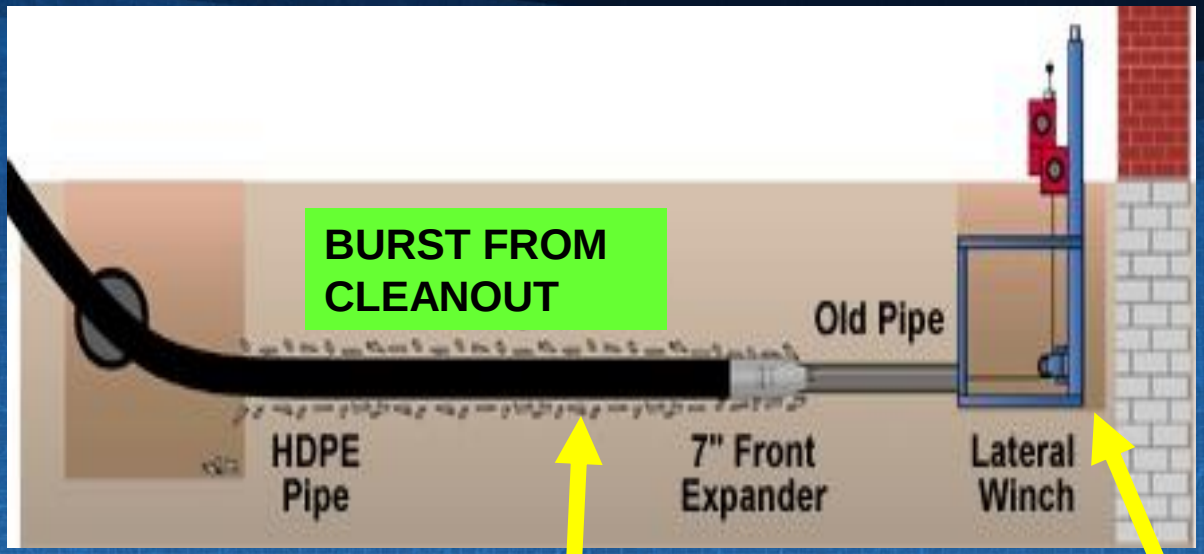
“2-Stage liquid” – includes lateral sealing



“Grout packer”



Lateral Pipe-bursting



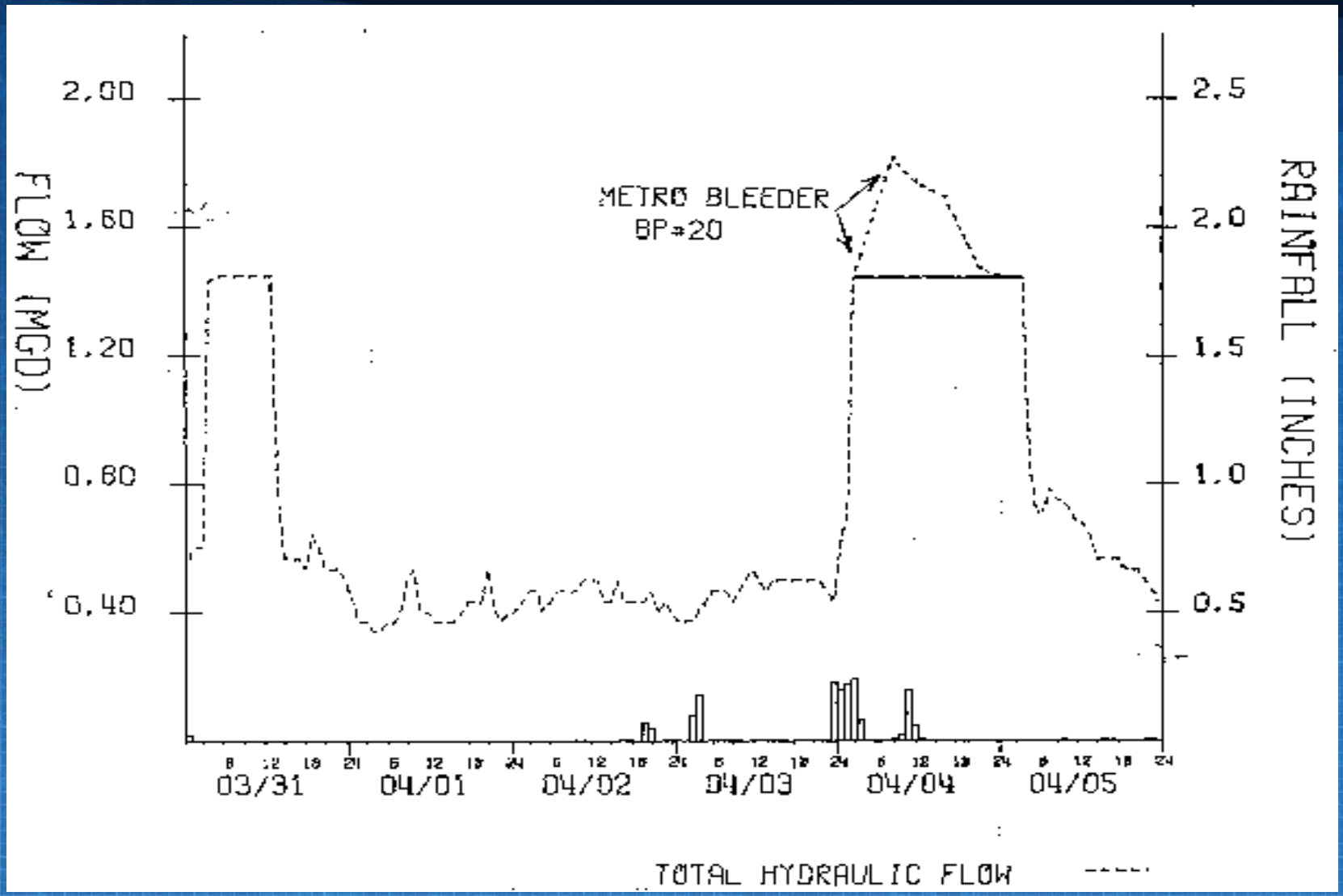
Vacuum-Excavation with minimum disruption

Vacuum-Excavation Clean-Outs

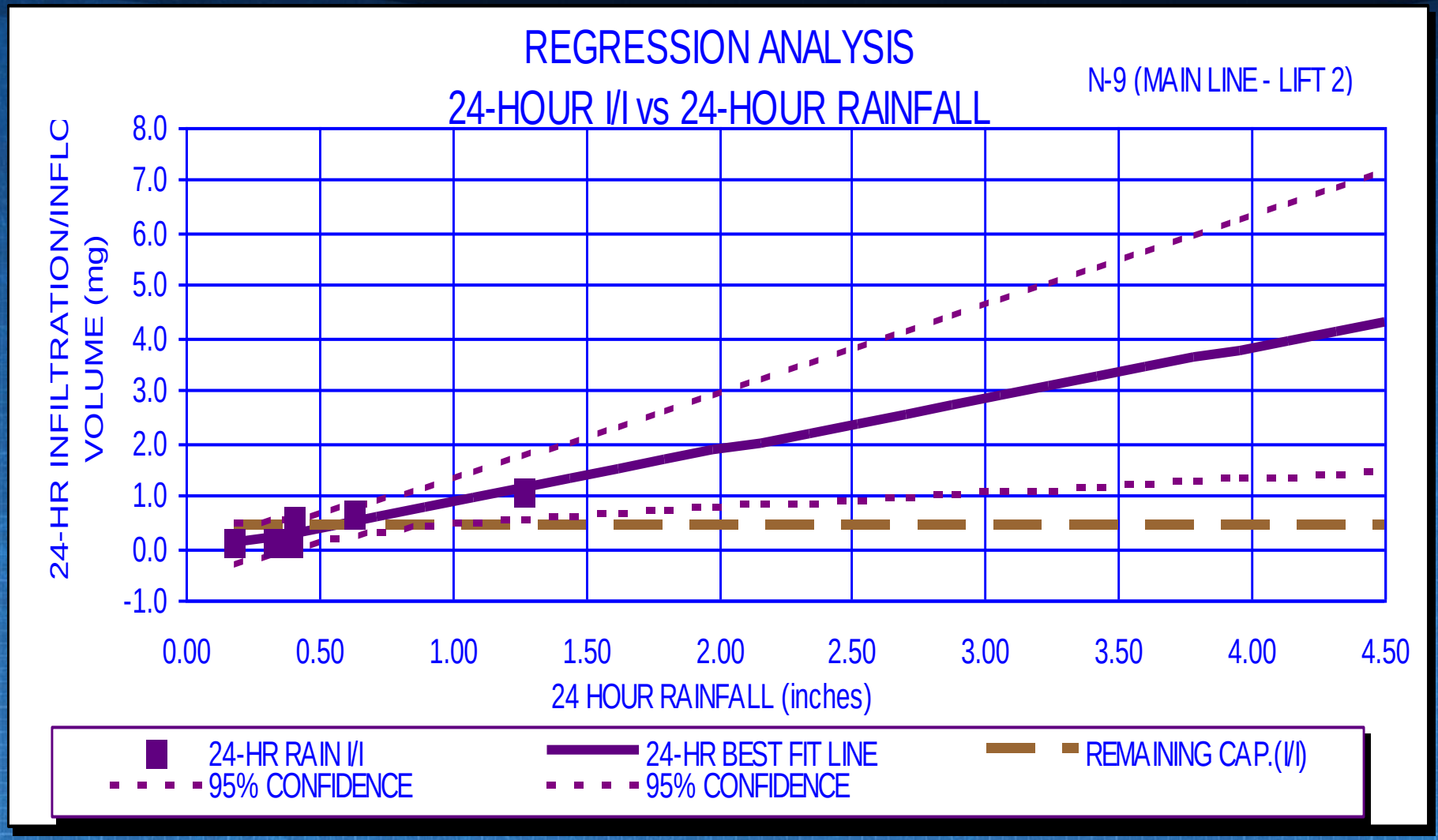
Lateral Pilot Project (Oak valley – Nashville)

- Multiple Phases
- Initial Flow Monitoring – quantify I/I, TV for design – segment selection
- Main Line Rehabilitation only
- Flow Monitoring to quantify results
- Service Lateral Rehabilitation – CIP liner
- Flow Monitoring to measure additional removal

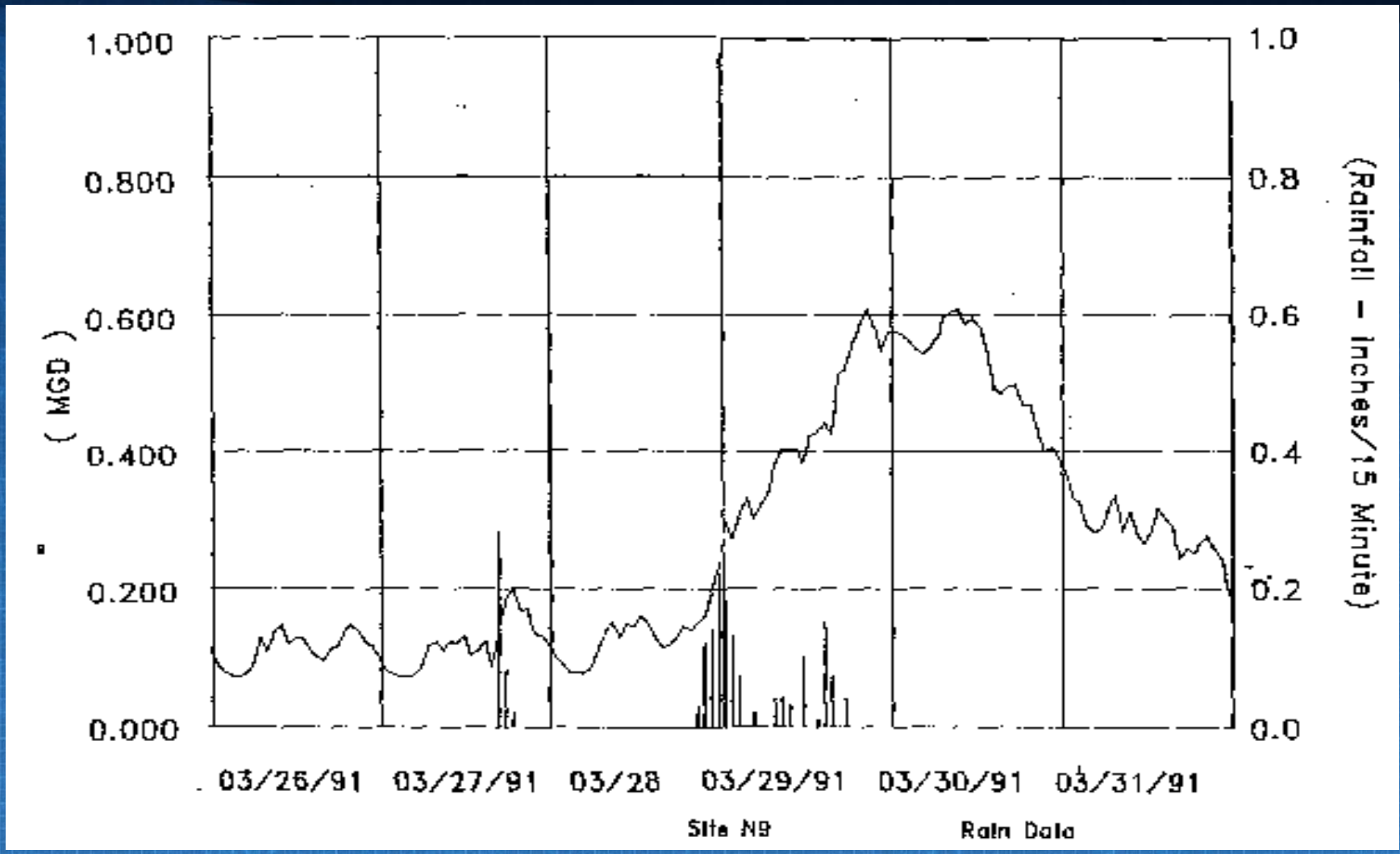
1.67” Rainfall – Before Renewal



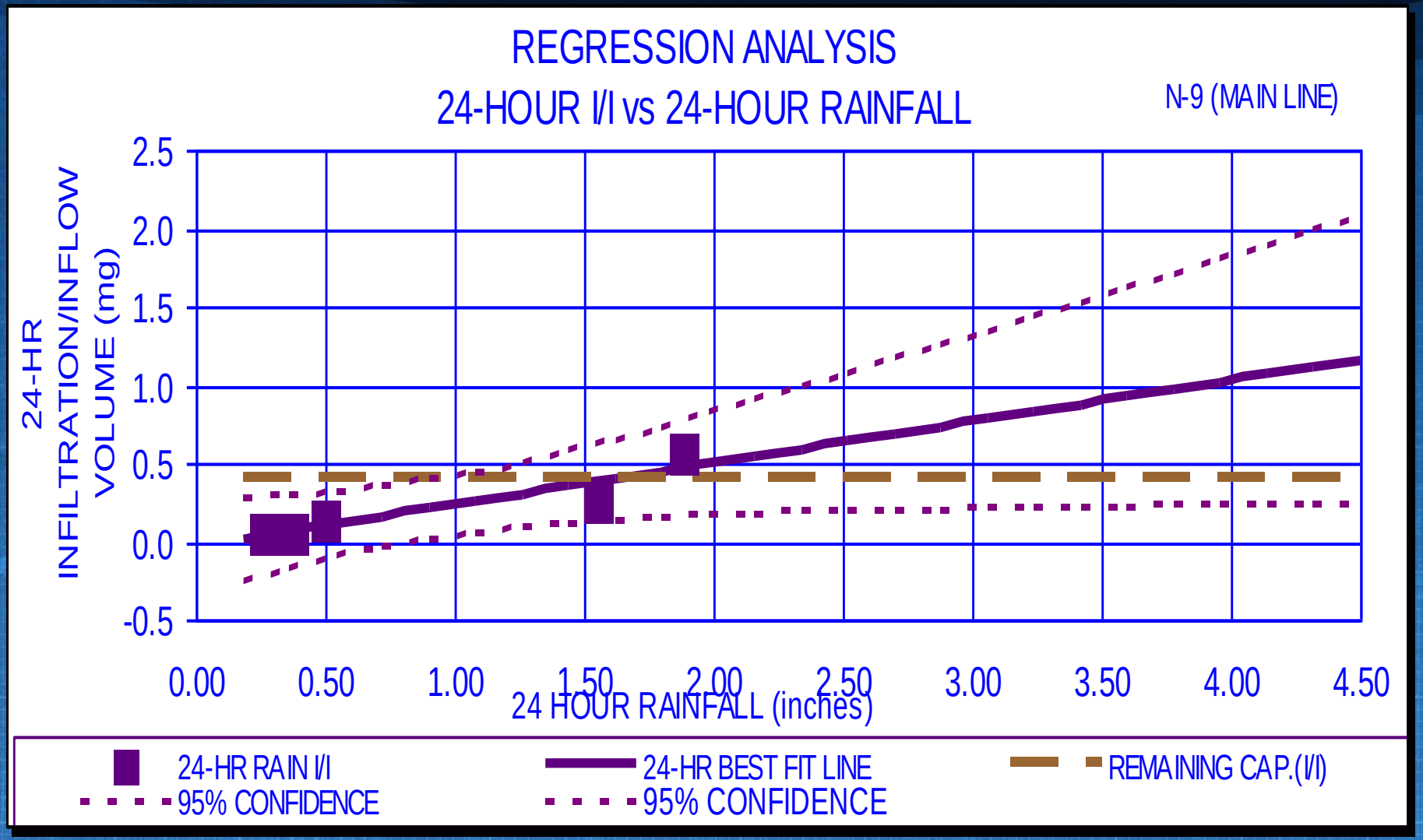
Projected I/I Before Renewal (30 days)



1.58” Rainfall After Pipe Lining



Projected I/I After Main Line Renewal (90 days)



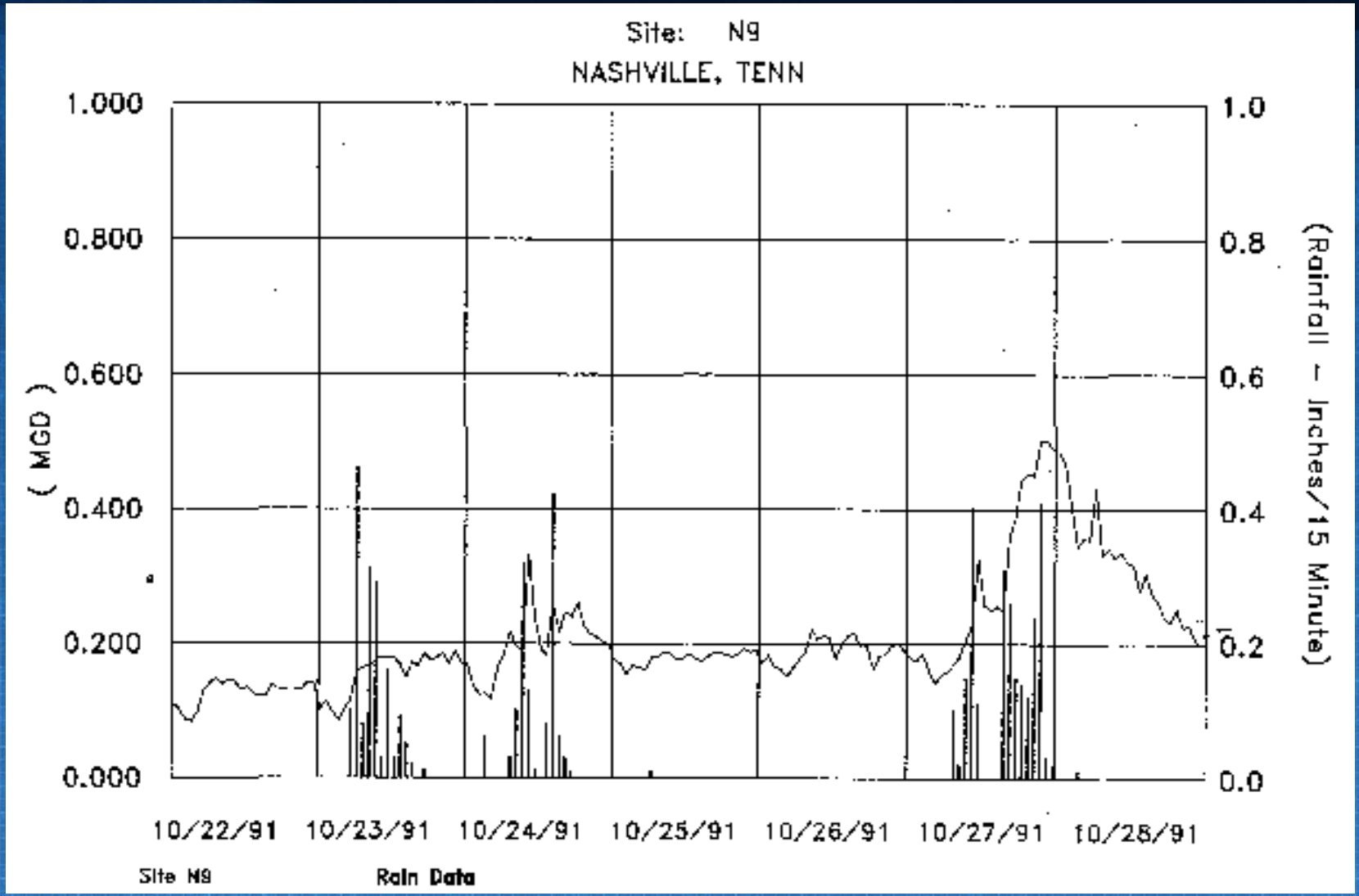
Insert CIP Liner from Cleanout

Observe Insertion to Mainline

Cure the Liner with Hot Water

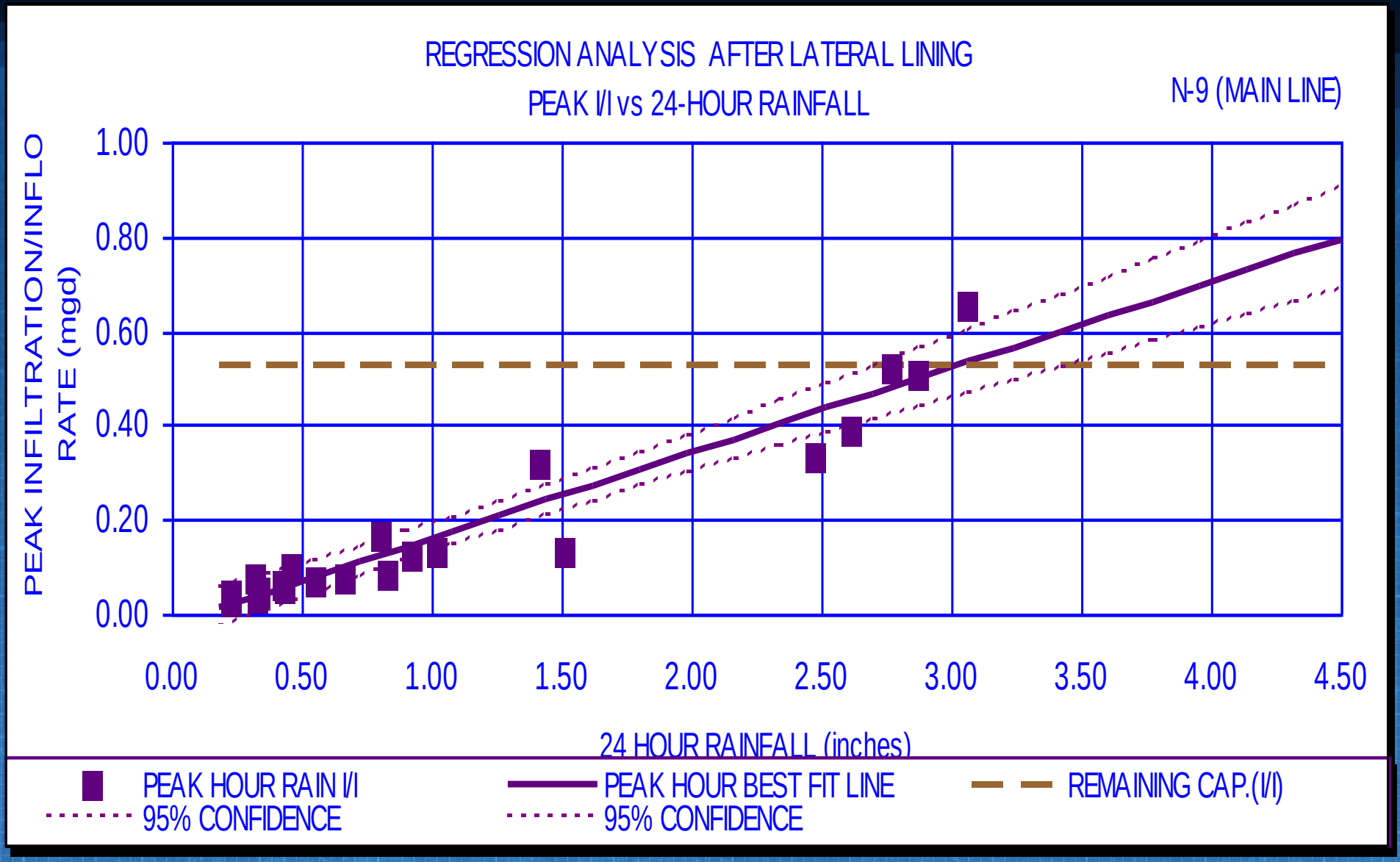
Verify Liner “Locked” to Public Sewer Liner

2.46” Rainfall After Lateral Lining

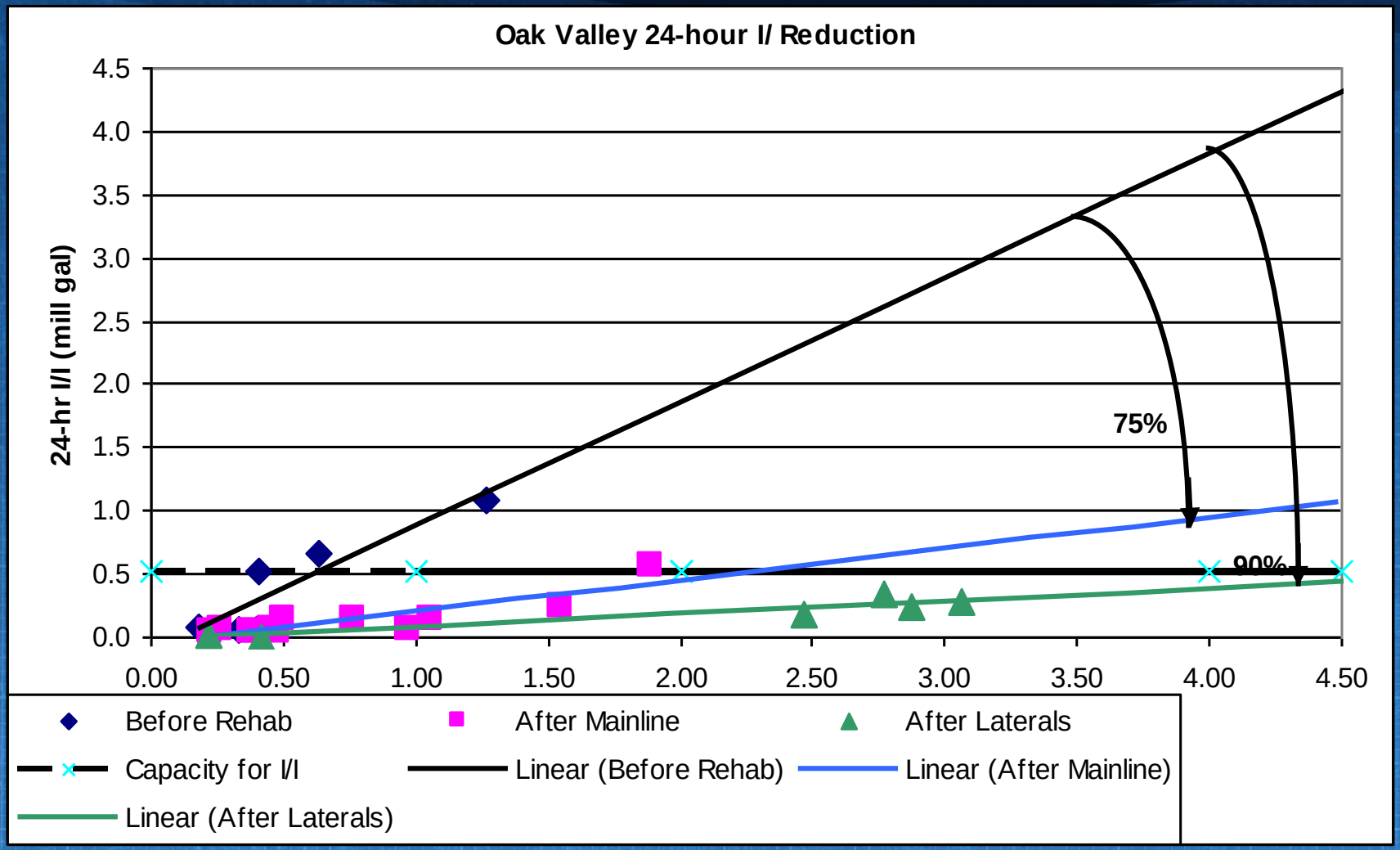


Oak Valley Lateral Renewal

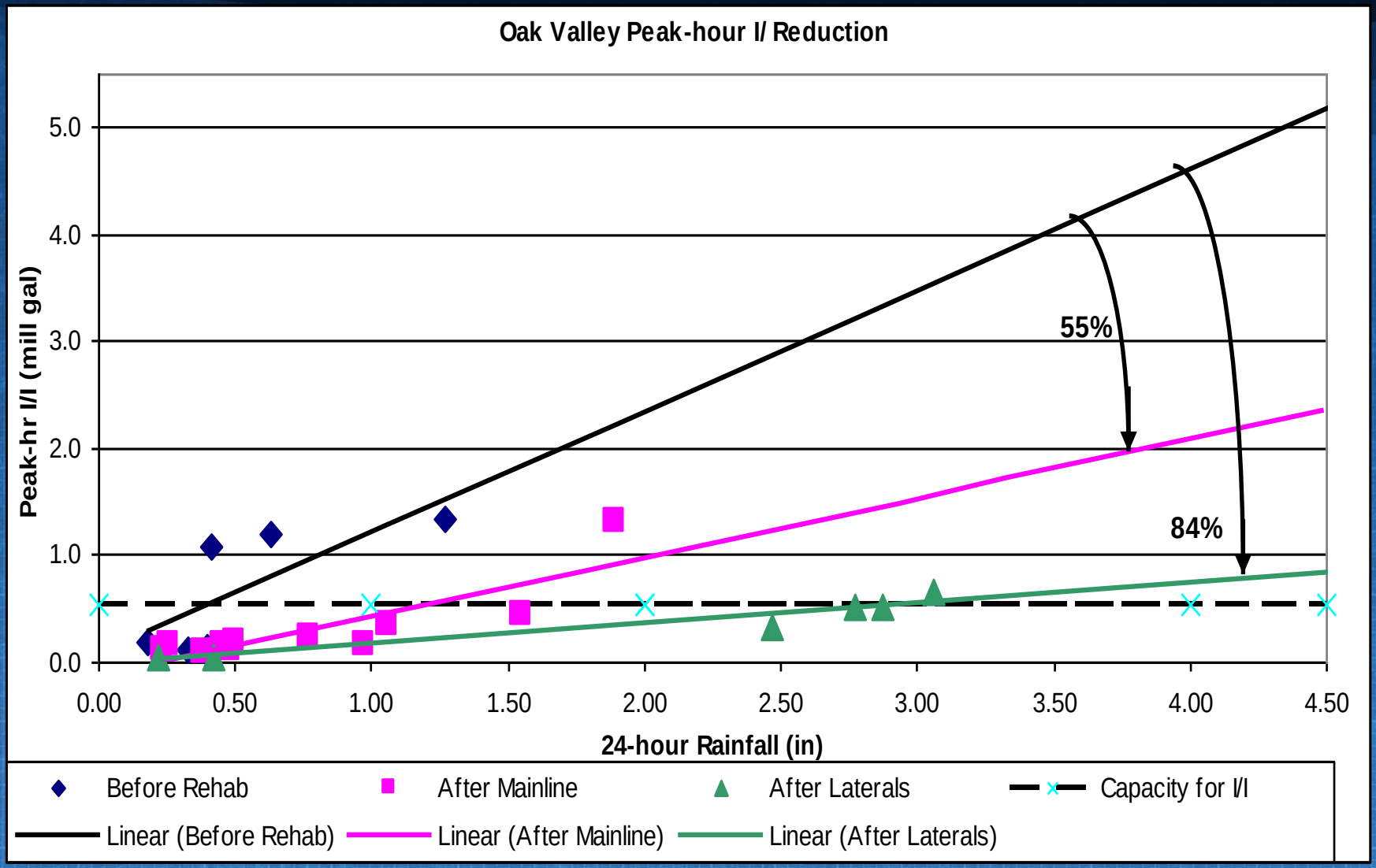
	Before	After M.L.	After Lat.
Peak Q (mgd)	1.8	0.6	0.5
ADF (mgd)	0.2	0.13	0.13
SSO (mgd)	0.16	0	0
24 hr rain (in)	1.67	1.58	2.46
Prev. 48 hr.(in)	0.4	0.38	0
Prev. 21 days (in)	2.11	2.32	3.53


REGRESSION ANALYSIS AFTER LATERAL LINING
PEAK I/I vs 24-HOUR RAINFALL
N-9 (MAIN LINE)
PEAK INFILTRATION/INFLO RATE (mgd)
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
24 HOUR RAINFALL (inches)
PEAK HOUR RAIN I/I
95% CONFIDENCE
PEAK HOUR BEST FIT LINE
95% CONFIDENCE
REMAINING CAP.(I/I)

Cumulative I/I Reduction



Peak Hour I/I Reduction



Bang for the Buck

Result:

- ~ 20% additional I/I removal for ~ 10% contract cost

Pilot Project Results

Nashville rehabilitation policy *

- All laterals connected to pipes being rehabilitated or replaced shall be rehabilitated or replaced to the property line or easement line.

OVER 10,000 SERVICE LATERALS HAVE BEEN REHABILITATED OR REPLACED !

**** Nashville OAP program 1990-2005***

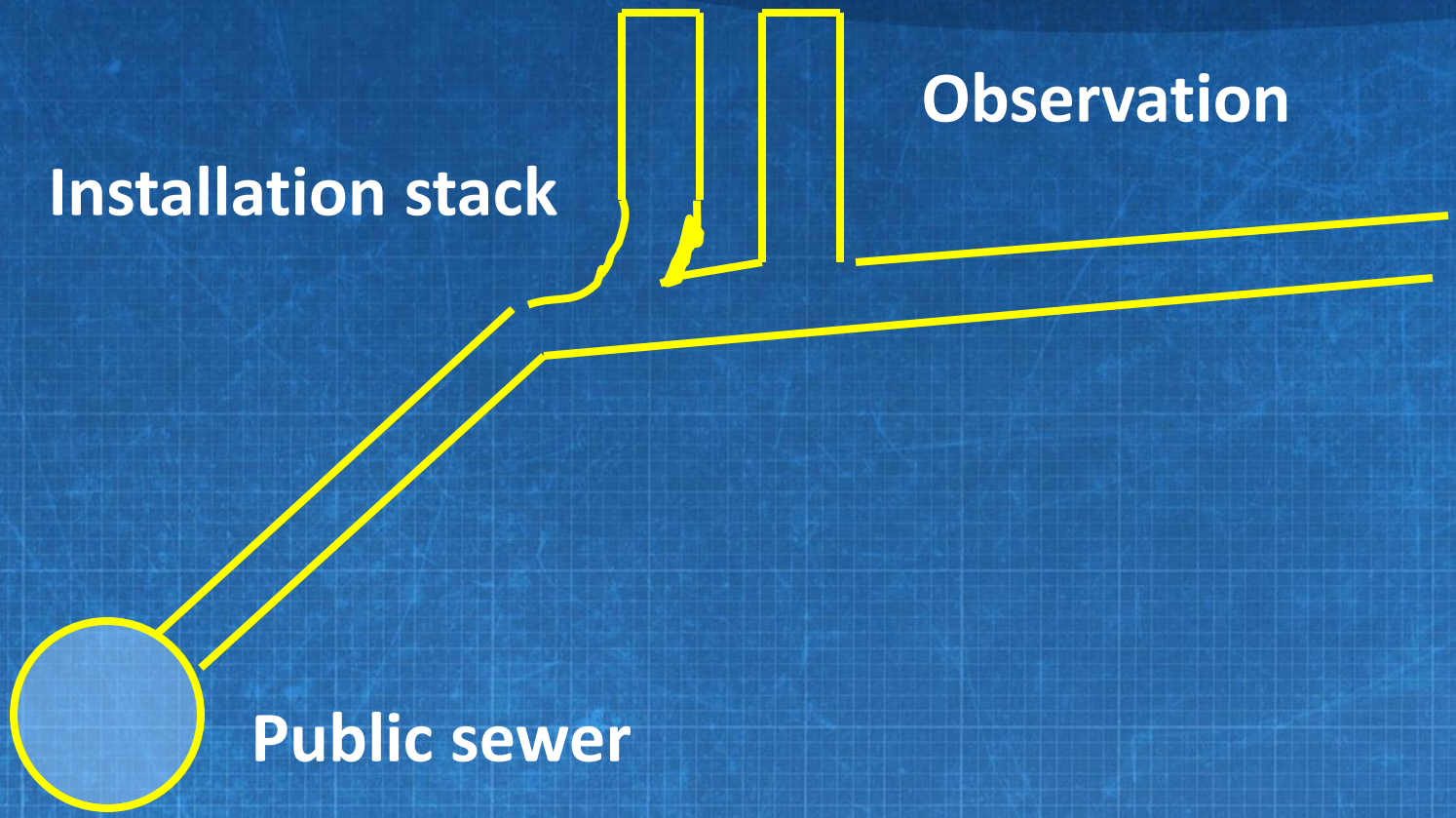
Application – Design Considerations

- Integration with overall sewer system rehabilitation (think: system strategy!)
- Cleaning – root removal
- Problems (Resin slugs, etc.)
- Lateral configuration (bends, transitions, defects, size, etc.)
- Inspection – verification (air test)

Follow-up Monitoring

- Flow metering – verify effectiveness
- Direct observation during wet weather – double stack clean-out

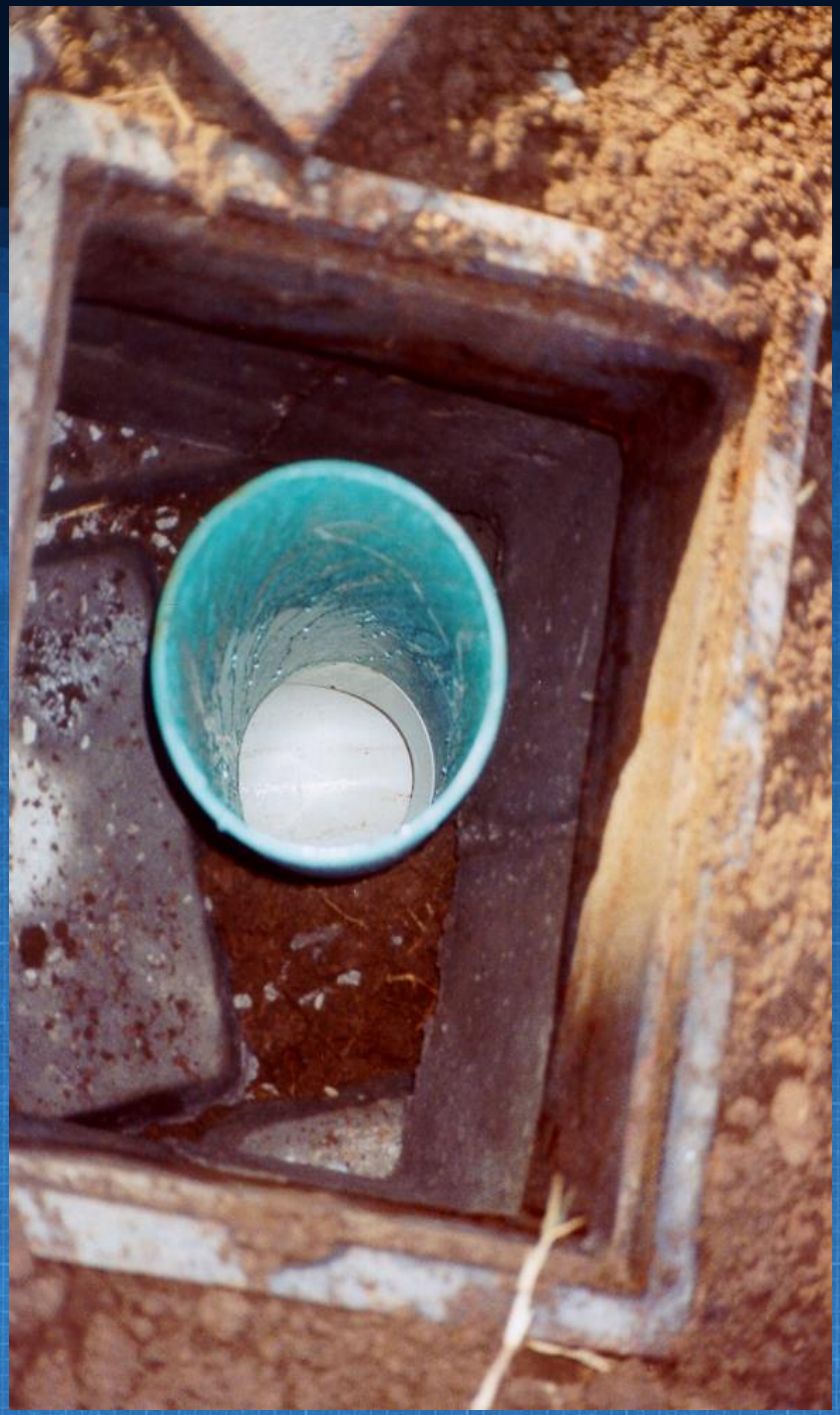
Double Stack Clean-out



Lateral Air Testing

Test after lateral opening cut !

- Test full length line (manhole to manhole and plugs in laterals)
- Test each individual lateral - plug lateral and 2 plugs in pipe



Air Testing the Repaired Lateral Connections

Questions ?

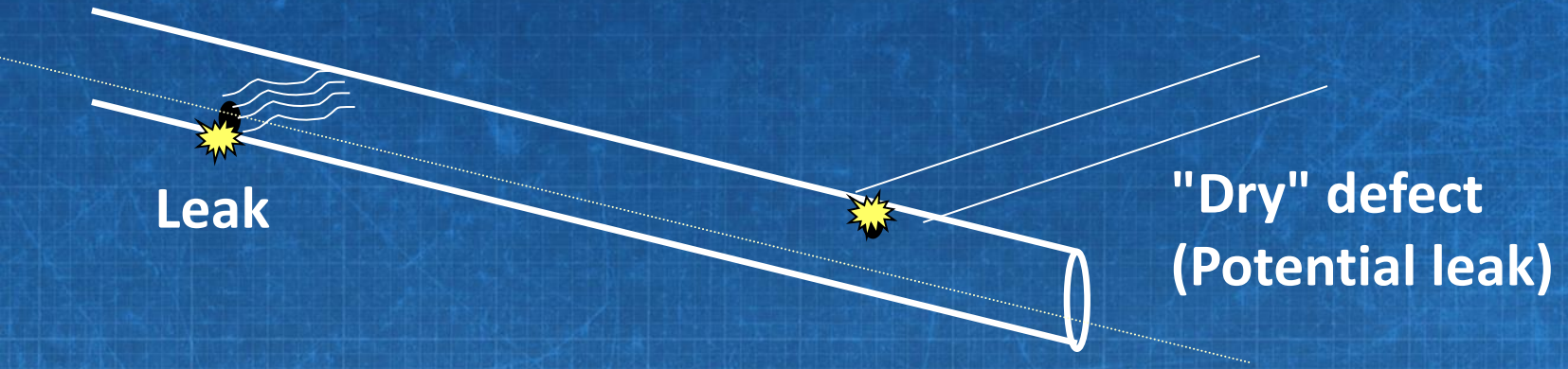

12-519 To 12-518

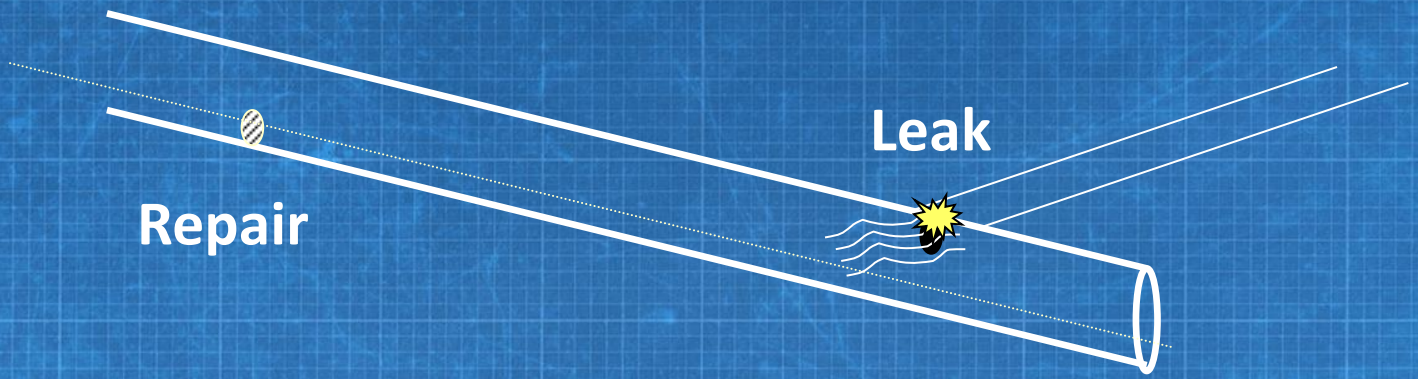

LATERAL AT 9 O'CLOCK
93FT FROM UPSTREAM
SERVICE: SS_28_90
LAT FEET: 0011.0


12-519 To 12-518

Groundwater Migration

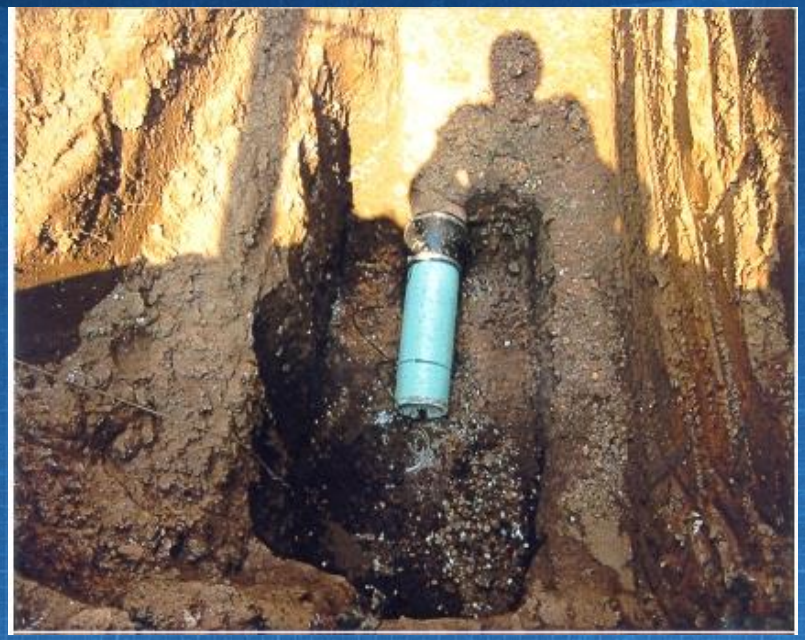
“New” leak may appear at service connection after lining





Traditional Point Repairs

May be disruptive and not prevent flow migration to other defects



– but may be needed for structural repair before lining.