

Broadview Infiltration Reduction Pilot Project

September 13, 2011

Seattle
 Public
Utilities

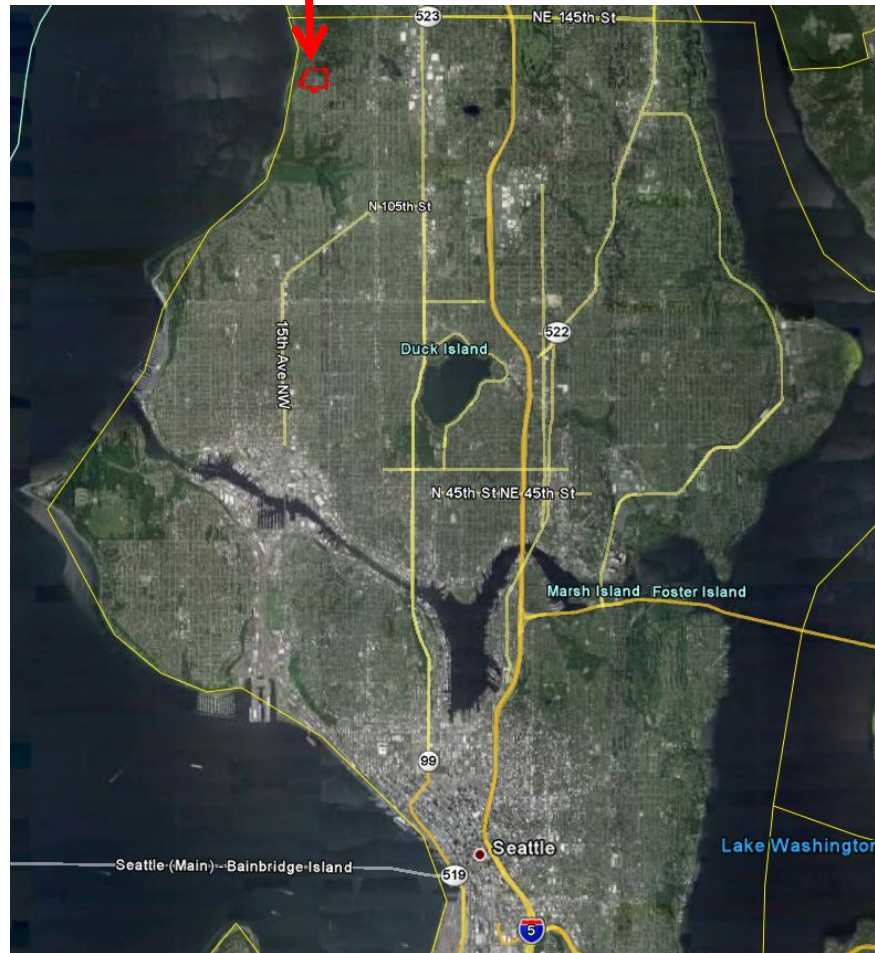
Agenda

- 9:00 - Introductions and Description of the Pilot Project – SMT Room 5072
- 10:00 - Leave for vans
- 10:30 - Arrive at pilot site - Demonstration of process by Bravo
- 12:30 - Leave for Brown and Caldwell offices
- 1:00 - Lunch at B&C; further discussion
- 2:00 - Adjourn

Introductions

- ❑ Martha Burke – SPU, Project Manager
- ❑ Jim Johnson – SPU, Engineering Project Manager
- ❑ Bob Jacobsen – BC, Project Manager
- ❑ Csilla Pall – Sanipor, President

Project Location



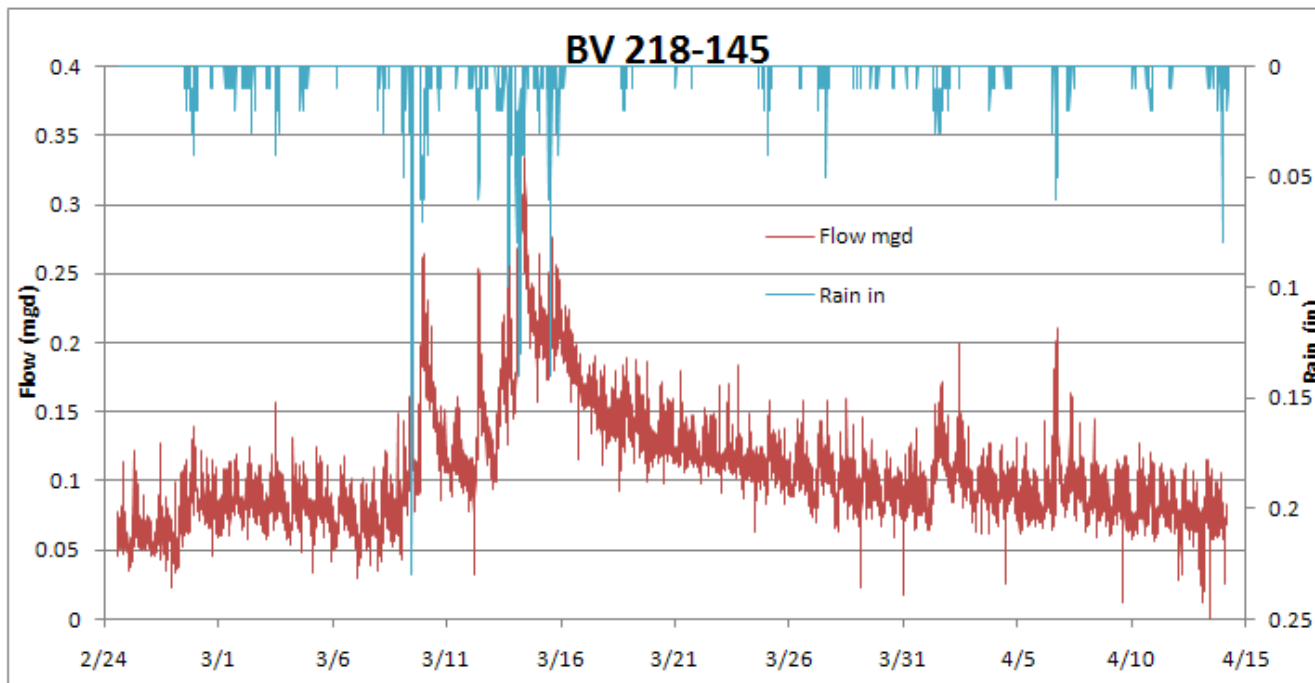
Broadview Neighborhood

- ❑ Residential, with houses built in 50's and 60's
- ❑ History of backups during storm events
- ❑ SPU has a project to improve service in this area and reduce the chance of backups into peoples' homes

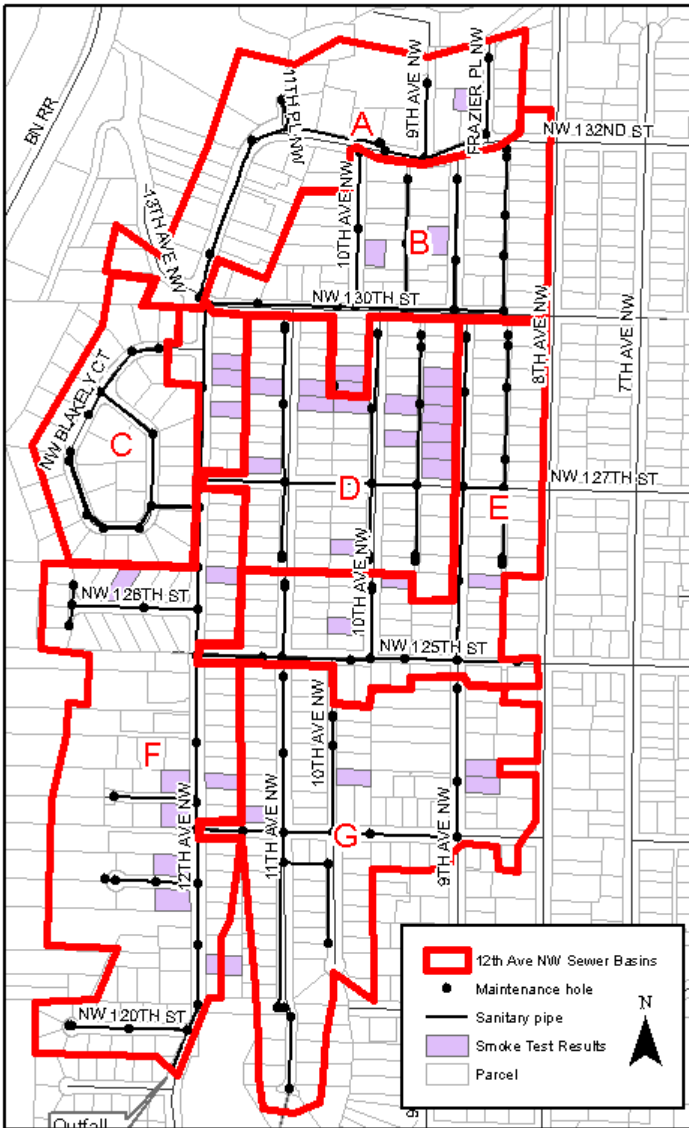


Why Here?

- Repeated wet weather sanitary sewer backups and SSO's.
- Flow metering and modeling indicate infiltration is leading contributor of wet weather flow



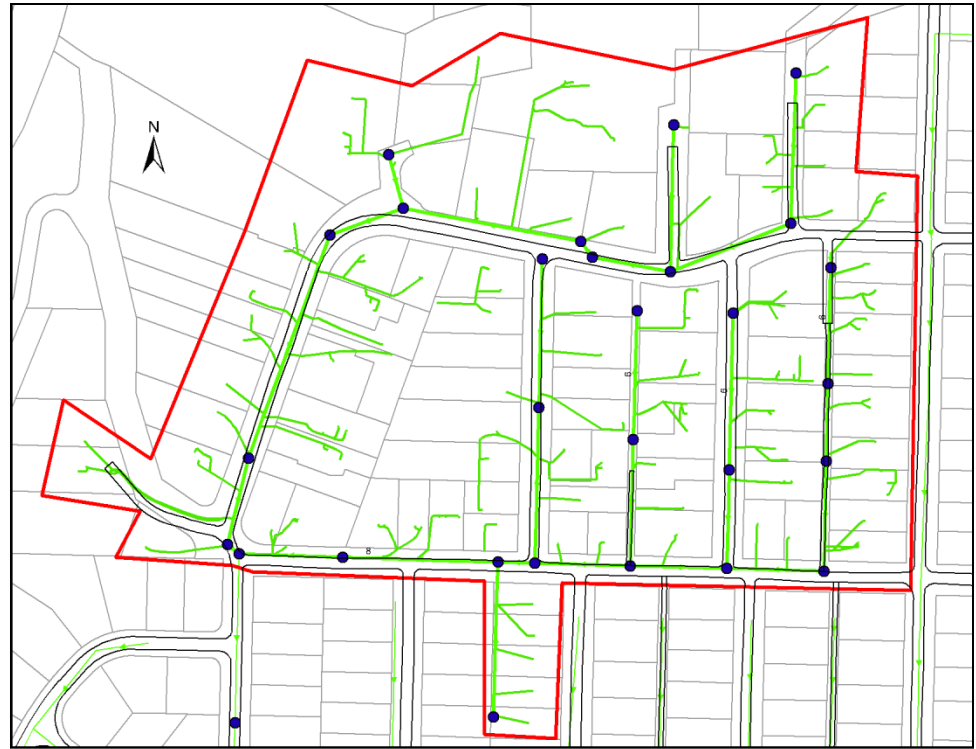
Why Here?



- ❑ Most “upstream” basin (“A” and “B”)
- ❑ Limited known inflow sources
- ❑ Large enough to accurately measure flow
- ❑ Good metering location
- ❑ Business case evaluation

Basin Statistics

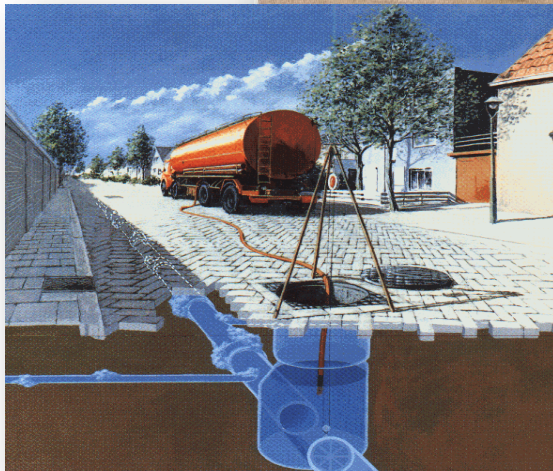
- 27 – MH to MH sections
- 28 MH's – 4 feet to 16 feet deep
- 5,913 ft of 6 – 8" mainline sewers (concrete)
- 9,725 ft of 4 – 8" side sewers (concrete & PVC)
- 88 parcels
- 30 acres





Sanipor Sewer Sealing System

Environment Friendly
with No-dig Technology



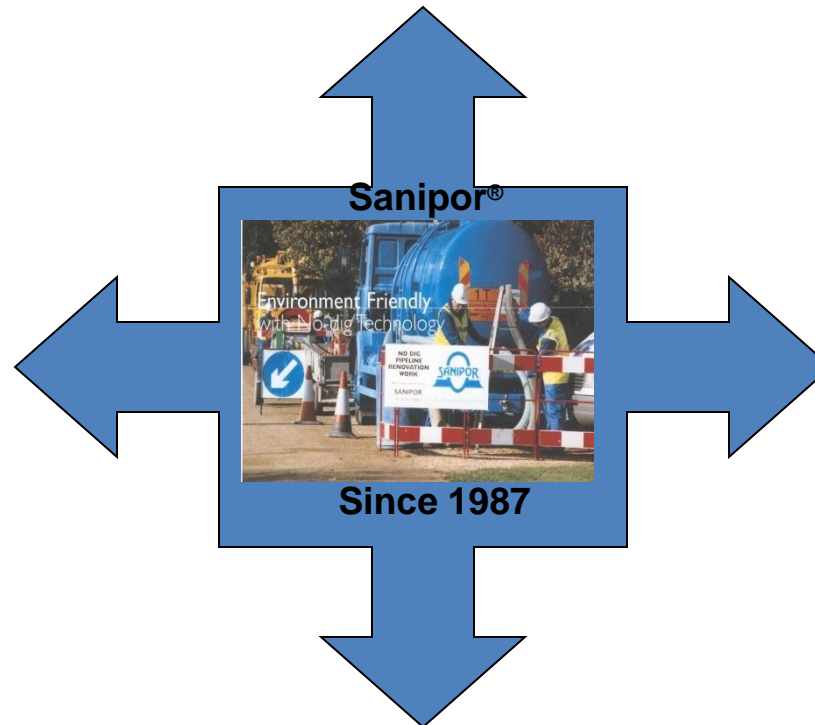
www.sanipor.com



The Sanipor® Process

Silicate based Flood-and-Grout

**Seals all parts of one gravity fed pipe section
between two manholes in a two step operation**



**EPA 832-R-06-004 July
2006 Emerging
Technologies fo
Conveyance Systems**

**New Installations and
Rehabilitation
Methods**

**Methods for Cost-
Effective
Rehabilitation of
Private Lateral Sewers
(02-CTS-5)**

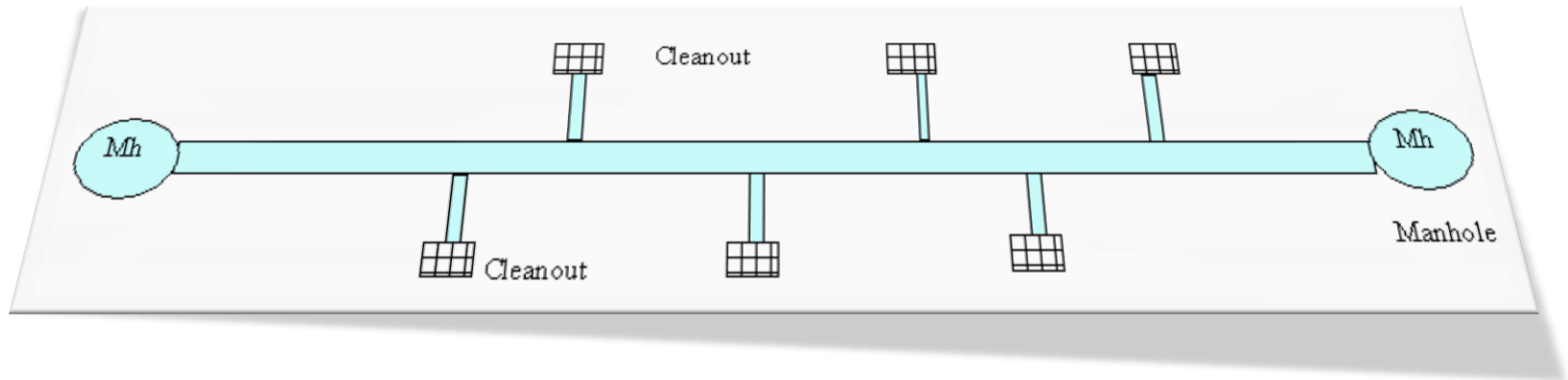
WERF Report

**Eliminates Infiltration from
the whole Conveyance
System to 100 %**



Sanipor's view on the Sewer System

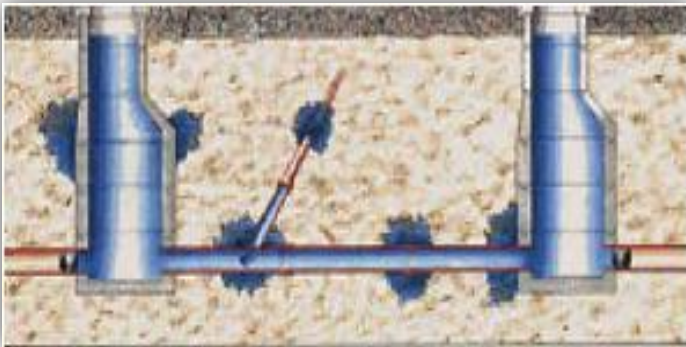
- one work unit -



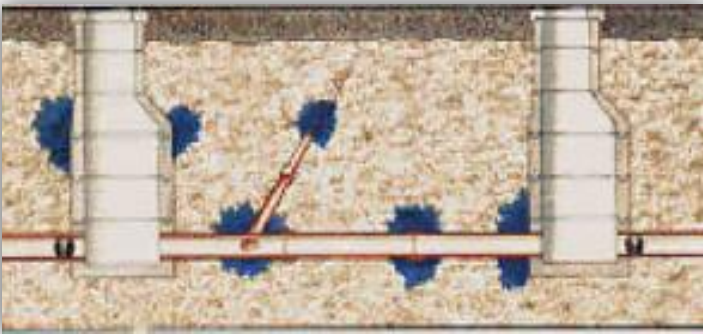
MODEL-SECTION	Average Sizes of a MH to MH Section
Mainline:	8 inch, 280-300 feet long
Manholes (2)	48 inch, 6 feet deep
Laterals (6)	6 inch, 25-30 feet long each (162 feet)
	total: 454-474 feet of all pipes



Sanipor® - The Geotechnical System for Sealing Sewers using Soluble Silicates



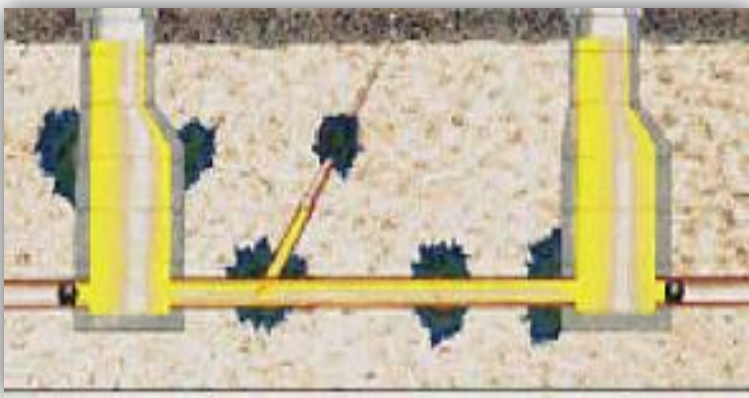
- After CCTV survey and jetting, the section to be treated is first plugged with inflatable plugs. Sewer, laterals and manholes are filled with solution S1 which penetrates through defects into the surrounding ground.



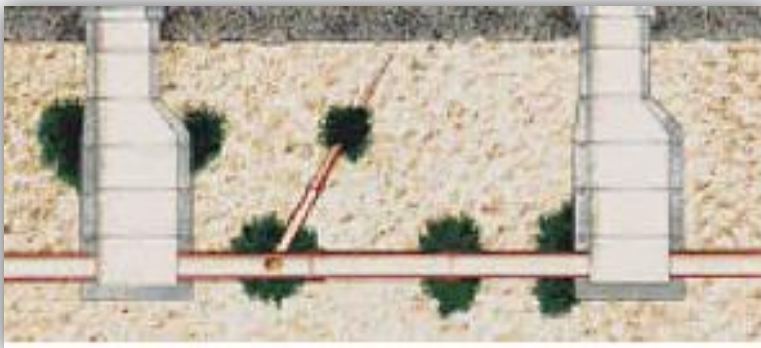
- When optimum penetration has been achieved Solution S1 is rapidly pumped out, leaving defect zones saturated.



Sanipor® - The Silicate Based System for Sealing Sewers



- The section is immediately refilled with solution S2 which reacts with S1 in the ground. This starts to form a concrete-like matrix, binding the soil particles and sealing all leaks with solidified ground around the defects.



- When the reaction is complete and the water-tightness established, Solution S2 is pumped out. After flushing, the sewer is returned to service. The pipe's structure protected from further deterioration.



The sandstone like, watertight layer around the sewer system - demonstration trench



Excavated trench after sealing the pipe



S1 Component – „Waterglass“ (liquid glass) Sanipor is not „Chemical Grout“

Soluble Silicates are made of sand and potassium by melting.
The result is amorphous glass that can be dissolved in water, referred to as „Waterglass“.

Silicate solutions have been applied for centuries in:

- road building,
- anti corrosion coating
- fire resistance coating,

Geotechnical applications:

- soil stabilisation, foundations,,
- water insulation,
- dikes, slurry walls etc.

SANIPOR is more than Waterglass
**S1 + S2 +soil particles/aggregate =
silicate conglomerate**

As Flood Grouting it can :

- Provide a stable environment for the pipes
- Eliminate water movements from and into the conveyance system
- Stop biogenic sulfur corrosion
- Coat concrete pipes
- Reduce root ingress
- Resist oil and organic solvents
- Incapsulate contaminations



Preconditions for a Sanipor® - Project

1. Lateral pipes need to be cleaned and examined – then remove debris, roots, grease, incrustations, deposits etc.



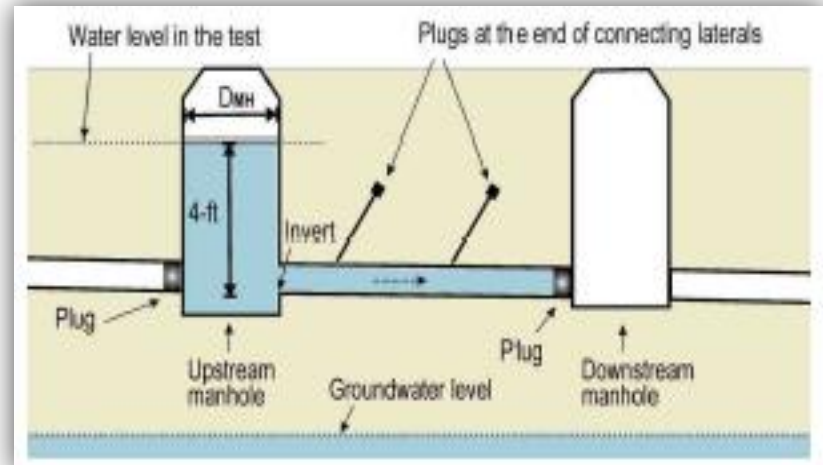
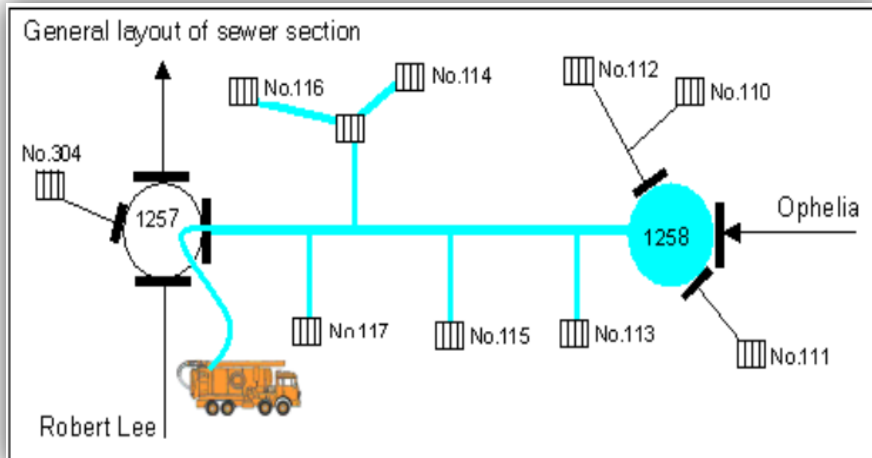
2. Lateral CCTV inspection to locate alignment, side branches, sags, incrustations, broken parts.



3. Installation of missing **cleanouts** in laterals: **Vac-a-T**

4. Initial Water Exfiltration Test (per section)

Waterdrop before: 15.03 gallons / 5 min.
Waterdrop after: 0.325 gallons / 5 min.





Typical pictures of a Sanipor job site



Downstream
Manhole



**Vac- Tank Trucks in the
Street**



Upstream Manhole



Typical pictures of a Sanipor job site



1



2



3



4

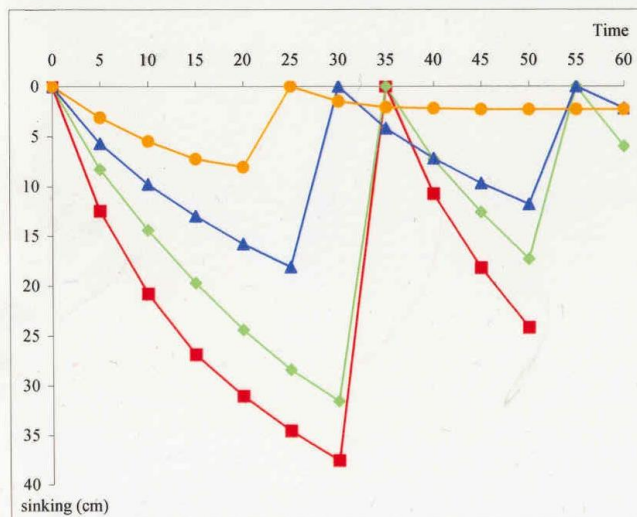
1. Extended Cleanout
2. Insertion of plug
3. Measuring the drop
4. Filling the manhole



Measuring of the drop of S-2 in the manhole

SANIPOR® - Sealing protocol

Start:	09:00	10:10	11:25	12:30
Time (Min)	Drop (cm)	Drop (cm)	Drop (cm)	Drop (cm)
	■ Cycle No.1 S1	◆ Cycle No.1 S2	▲ Cycle No.2 S1	● Cycle No.2 S2
0	0	0	0	0
5	12,5	8,3	5,7	3,1
10	20,8	14,4	9,8	5,5
15	26,9	19,7	13	7,3
20	31,1	24,4	15,8	8,1
25	34,6	28,4	18,1	0
30	37,6	31,6	0	1,5
35	0	0	4,2	2,1
40	10,8	7,3	7,2	2,2
45	18,2	12,6	9,7	2,3
50	24,2	17,3	11,8	2,3
55		0	0	2,3
60		6	2,2	2,3



pipe: 8 - 5.2		
Ø mm	length (m)	volume (m³)
150	54,3	0,96
L 100	3	0,02

manholes:		
Ø cm	depth (m)	volume (m³)
5.2 80	1,34	0,66
8 80	1,1	0,54

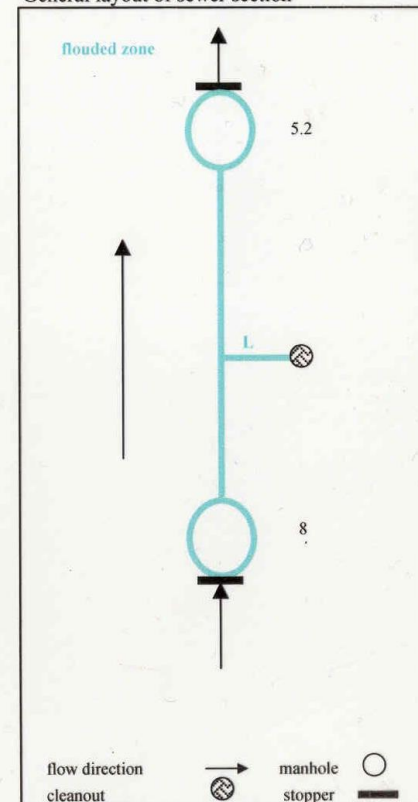
Injection material:

S-1: 1 m³
S-2: 0,5 m³

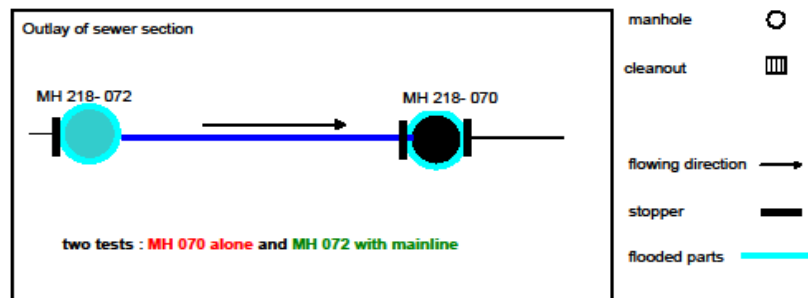
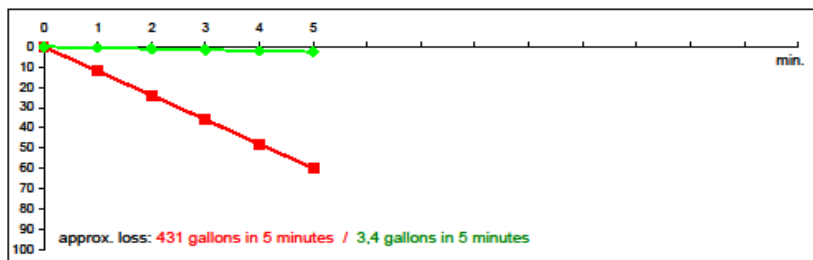
Working time: 5 h



General layout of sewer section



Sanipor - Hydrotest protocol

[illegible]

main pipe		
Ø inch	length(feet)	vol.gall.
8	151	394

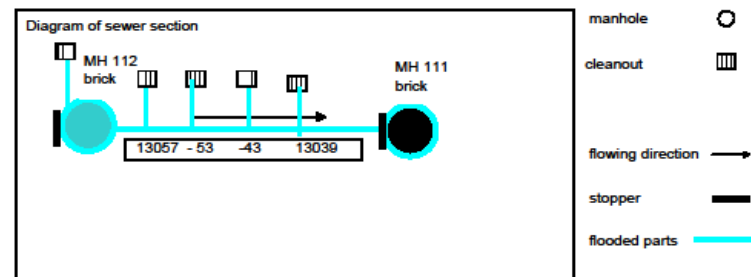
EN 1610
allowances
1,4 gal/ 30 min
3,4gal/30 min

Ø inch	dept (feet)	volume gallons
48	15	1409.00
48	11.8	1108.00

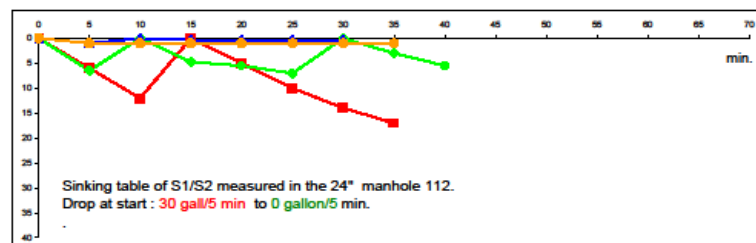
Location: *Seattle, WA, 12 th Ave NW*
Date: *May 20, 2011*

Supervisor: Csilla Pall, Sanjipor
Contractor: Bravo Environmental Inc.

Sanipor - Sealing protocol



Date:	17. August 2011	MH 112	MH and main			
Time	10:16	12:18	13:45	14:45		
minutes	sinking (inch) 1. cycle S1	sinking (inch) 1. cycle S2	sinking (inch) 2. cycle S1	sinking (inch) 2. cycle S2	sinking (inch) 3. cycle S1	sinking (inch) 3. cycle S2
0	0	0	0	0		
5	6	6,5	1	1		
10	12	0	0	1		
15	0	4,75	0,35	1		
20	5	5,5	0,35	1		
25	10	7	0,35	1		
30	14	0	0,35	1		
35	17	3		1		
40		5,5				
45						
50						
55						
60						
65						
70						



main pipe and laterals		
Ø inch	length(feet)	volume
7	253	505,00
06, jan	198	290,00

Location: *Seattle*
Date: *17 August 2011*

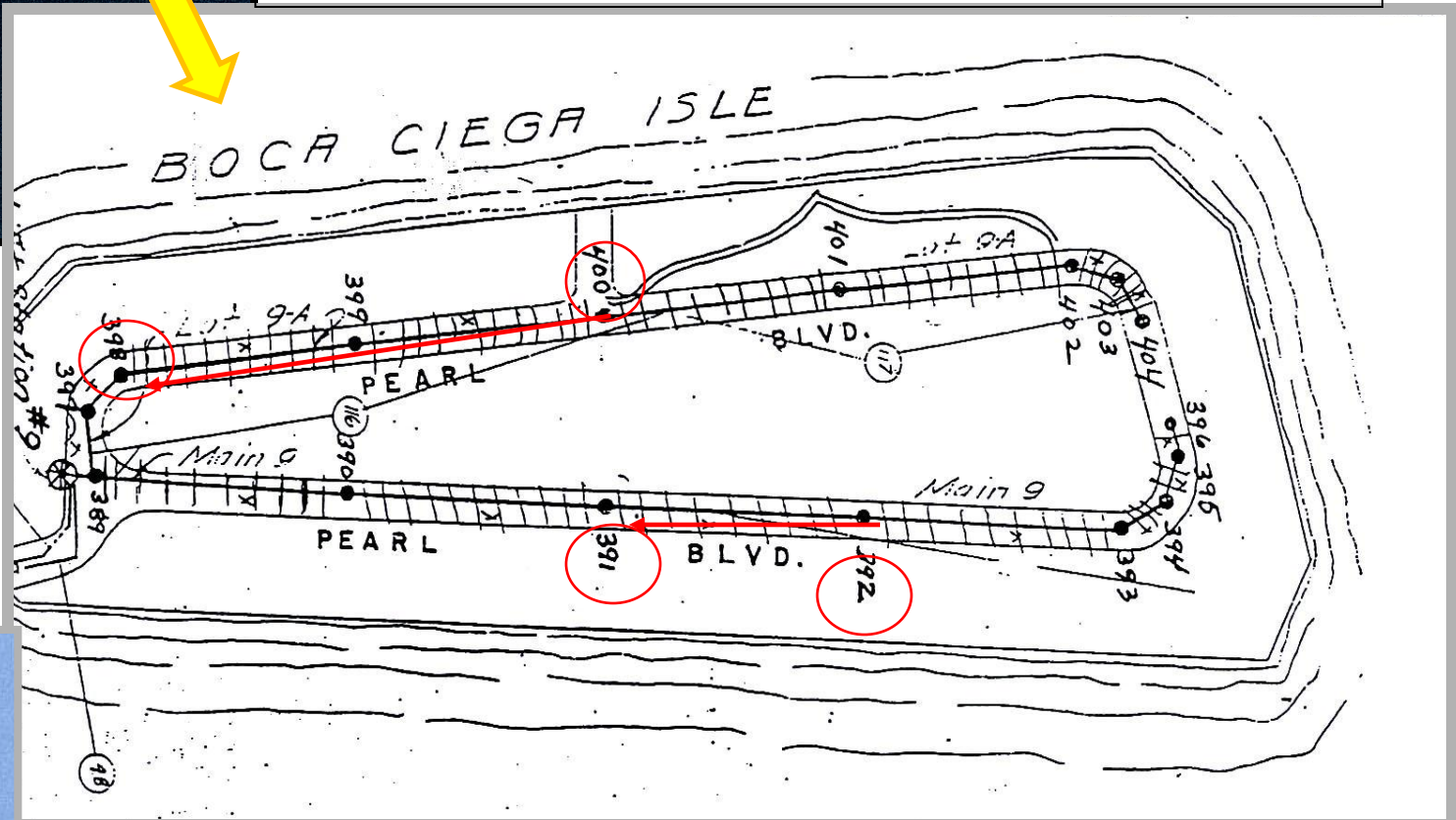
manholes: 218-112 to 218-111		
Ø inch	dept (feet)	volume gallons
24-48	5.5	1466.00
(48)	5.1	970)

Supervisor: Csilla Pall, Ferenc Pall
Contractor: Bravo Environmental Inc.



City of St. Petersburg Beach, FL Sanipor® Infiltration Removal in 1992 CCTV Inspection in 2002

16 brick mhs, 15 mains - DN 6,8", 3286 ft, vcp,
98 laterals orangenburg, 1 lift station,
salt water infiltration, 7-8 pumping hours p.d.





City of St. Petersburg Beach, Florida
Boca Ciega Isle

SANIPOR RENOVATION PROCESS

INFILTRATION REMOVAL

1992

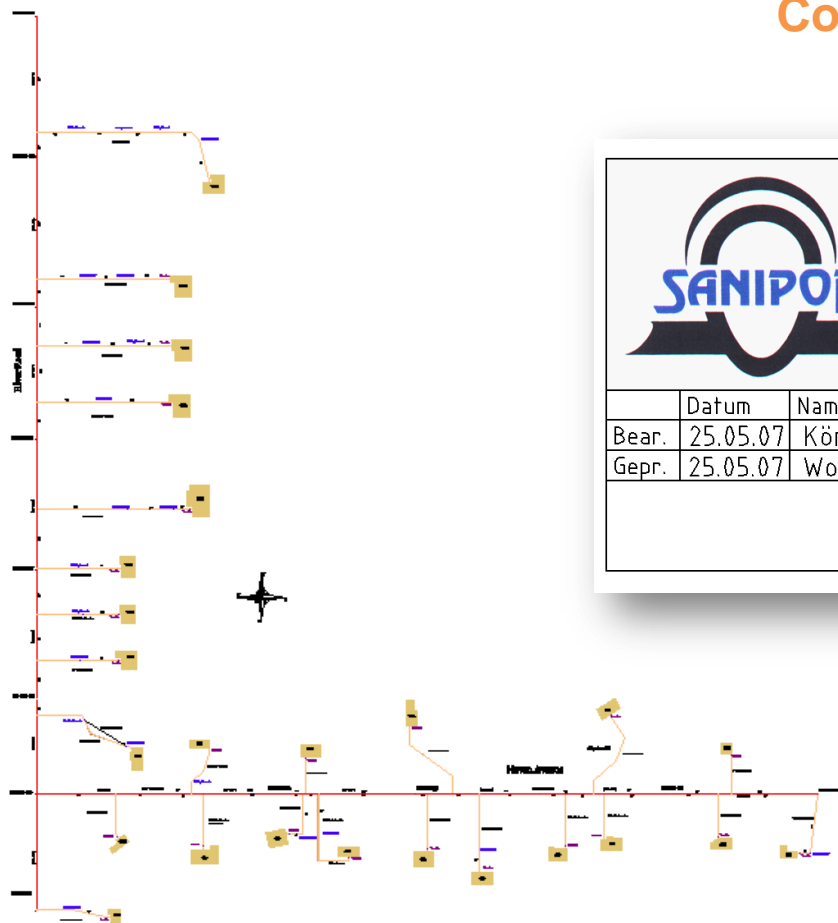
From Manhole	To Manhole	Size Pipe (in)	Length (ft)	In-Line Services	Prior to Rehabilitation		Post Rehab.	Comments
					Infiltration Measured (gpd)	Chlorides Measured (ppm)	Infiltration Measured (gpd)	
404	403	8	74	2	0	0	0	
403	402	8	64	2	0	0	0	
402	401	6	337	8	8640	10000	0	Previously Sliplined
401	400	6	314	8	15480	12000	0	Previously Sliplined
400	399	8	354	10	30600	17500	0	
399	398	8	335	5	48600	20000	0	
398	397	8	75	1	8700	12000	0	
397	389	8	81	2	2880	5000	0	
396	395	8	65	2	1440	5000	0	
395	394	8	74	2	1440	5000	0	
394	393	8	73	2	720	2500	0	
393	392	8	360	10	5760	10400	0	
392	391	8	366	10	16920	16600	0	
391	390	8	355	11	8280	19870	0	
390	389	8	359	9	18000	20000	0	
TOTALS			3286	84	167460		0	

Cost of Sanipor sealing in 1992: US\$ 80,000.00 Payback period: 9-13 months 3 pumping hours p.d.



Sanipor® Pilot Project, City of Mequon, June 2007

Conveyance Plan



Project
City of Mequon, Wisconsin
Haven Avenue / River Road

SANIPOR Pilot Project

	Datum	Name
Bear.	25.05.07	König
Gepr.	25.05.07	Wolff R.



GmbH

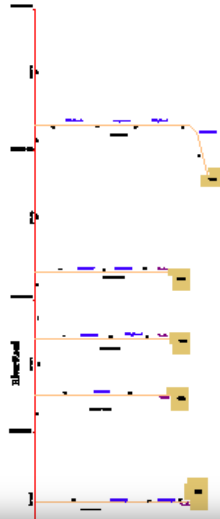
Ingenieurbüro
für Kanaltechnik
und Kanalsanierung
Ludwig-Geiger-Str. 28
D-87474 Buchenberg
Tel. 0049(0)8378/7234
Fax 0049(0)8378/7231



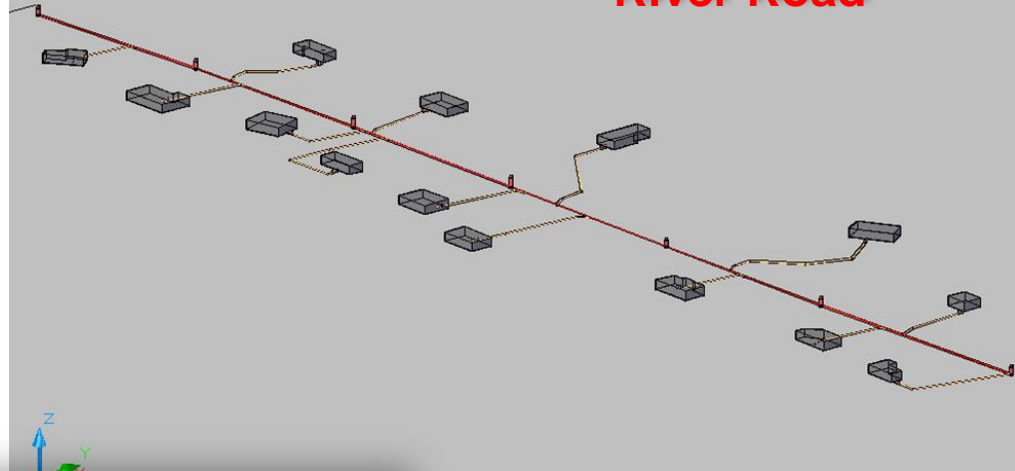


Sanipor® Pilot Project, City of Mequon, June 2007

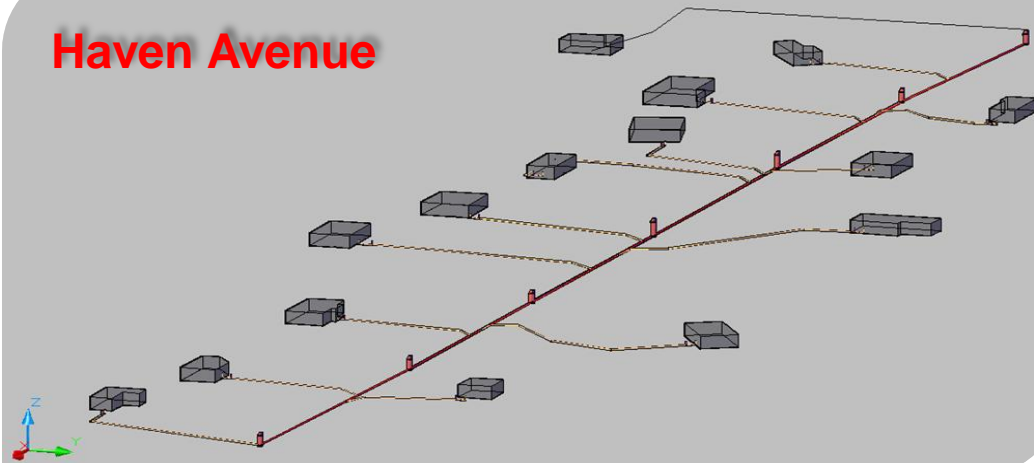
Conveyance Plan



River Road



Haven Avenue



		Project	
		City of Mequon, Wisconsin Haven Avenue / River Road	
		SANIPOR Pilot Project	
Datum	Name		
Bear: 25.05.07	König		
Gepr: 25.05.07	Wolff R.	Ingenieurbüro für Kanaltechnik und Kanalsanierung Ludwig-Geiger-Str. 28 D-87474 Buchenberg Tel. 08491/8378/7234 Fax 08491/8378/7231	



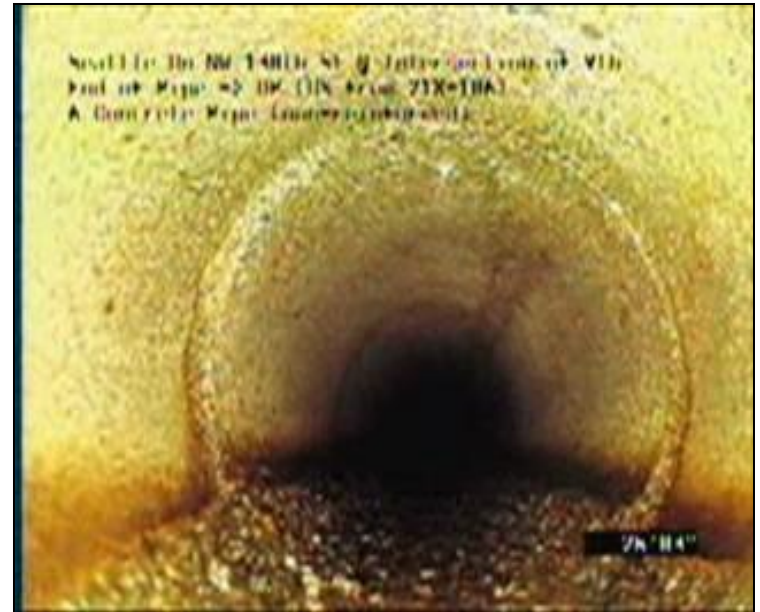
Sanipor® Pilot Project, City of Mequon, June 2007

Results of the Sealing Effect in avg. 99.99%

City of Mequon, Sanipor® Pilot Project, June 2007									
in conjunction with MMSD									
Results:			1	2		3			4
Street	US MH	DS MH	"before" exfiltration H2O gal / 5 minutes	"after" exfiltration S2 gal / 5 minutes	cycles	allowance norm gal / 5 min	"after" vs. "before" % reduction	Remark	inner surface in sqm
River Road	9	8	187	0	2	0,82	100,00		62,09
River Road	8	7	55	3	1	1,32	99,95	interrupted	100,46
River Road	7	6	48	0,53	1	1,52	99,99		115,32
River Road	6	5	198	1	2	1,6	99,99		121,36
River Road	5	4	225	0,8	2	1,35	100,00		102,52
River Road	4	3	157	0,79	1	1,5	99,99		113,07
Haven Ave	40	41	149	0,21	1	1,39	100,00		105,27
Haven Ave	38	39	95,11	0,61	1	1,4	99,99		105,3
Haven Ave	42	43	84,55		2	1,17			89,04
total:			1198,66	6,14			99,99	% in avg	
1: measured exfiltration by flooding with water , prior to Sanipor process									
2: measured exfiltration of S2 for final 5 minutes									
3: Allowance in accordance with the German Approval of Sanipor: 0.3 litres / sqm of wet inner surface of pipes in 30 minutes (equals the water tightness of concrete pipes)									
4: inner surface of main, laterals and manholes together in sqm									

Broadview Sequence of Work

- ❑ Right of entry
 - (no community support = no project)
 - ❑ Community meetings
 - ❑ Mailings
 - ❑ Community task force support
- ❑ CCTV inspection (mainline and side sewer)
- ❑ Repairs if needed



Broadview Sequence of Work

- ❑ Clean out installation
- ❑ Clean water testing
- ❑ Sanipor application



Major Basin Challenge

- Topography
 - 30 ft difference between upstream and downstream MH



Initial Observations

- Incomplete base mapping
 - Missing MH's, pipe size transitions, side sewers in wrong location
- Elevation difference is a challenge, but not a project stopper
- Promising exfiltration rate improvements

