

ID-6

MEMORANDUM



TO: Doug Halley, Director of Health, Acton
FROM: Jack Troidl, P.E. *JTB*
DATE: July 14, 2009
RE: I/I Investigation Results

Beginning in March 2008 Acton began an Infiltration/Inflow investigation for the tributary areas of Pump Station #3 and Pump Station #6. The 2008 efforts included two nights of TV inspection during wet weather (results included in Table 1). The purpose of this memo is to detail the results of the June 16, 2009 sewer smoke testing for the I/I investigation program. The sewer system infrastructure was evaluated to identify illegal connections and infiltration into the sewer. The areas inspected were the collection system to the Prospect Street Pumping Station, PS #3, consisting of Prospect Street, Hennessey Drive and St. James Circle, and the collection system to the Maple Street Pumping Station, PS #6, consisting of Maple Street, a section of Martin Street, and Railroad Street.

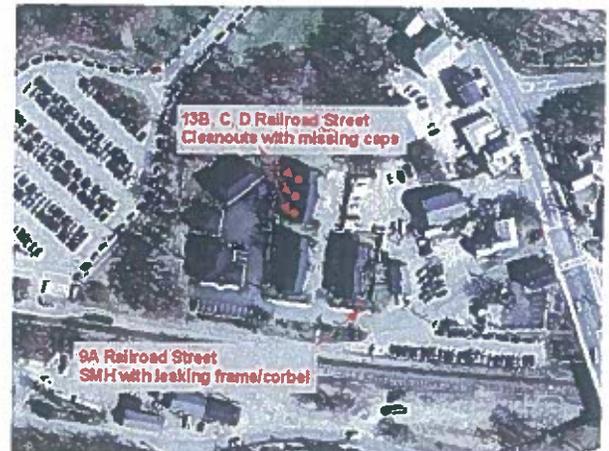
In general, the PVC sewers were observed to be in excellent shape and no smoke indicating illegal connections or inflow sources was observed at the majority of services. Several residences that either appear to have been vacant for an extended period of time, or have a bathroom that is unused were observed having smoke intrusion due to the traps being dry. These residences include 154 Prospect Street (vacant house, recently sold), the Teriyaki Station at Railroad Street and Main Street (which had an unused bathroom), and 9A Railroad Street (vacant apartment). The smoke testing report is attached to this memorandum.

Table 1 highlights the specific problem areas identified in last year's TV inspection and this year's smoke testing investigation. An estimated flow range is included which was used to prioritize the problem areas. A description of each area is discussed in further detail in conjunction with the status of remedying the I/I related issue.

81 Prospect Street: Smoke was continuously flowing from a 4-inch PVC cleanout in the front yard with a missing cap. This cleanout was in a low-lying area of the yard, and with an approximate drainage area of 240 square feet.

9A Railroad Street Sewer Manhole: The area around this sewer manhole, which is on private property and is not shown on the as-built plans, had a continuous flow of smoke coming from the cover and surrounding ground area. After opening the cover, it was evident that the frame and corbel was poorly installed and many gaps and holes are present. There were four 1-inch holes in the ground that seem to be from rodent infestation into the manhole and are also a potential source of inflow. On the east side of the apartment building, there are 4-inch PVC pipes for each apartment unit that are all capped, but are connected to the SMH. These pipes are in close proximity to the roof leaders for each unit, and appear that they were at one time connected to the sewer system but have been repaired.

13B, 13C, 13D Railroad Street: On the west side of the apartment building, as shown in the diagram below, there are three 4-inch PVC pipes that are missing covers. It is evident that these PVC pipes are connected to the sewer system by means of SMH #103.



Following the smoke testing effort the WWTF operator was inspecting the wetwell at Pump Station #2 and identified an intermittent flow of up to 15 gpm entering the pump station. This flow is very indicative of an illicit sump pump connection. Future I/I effort should focus on the immediate collection system of station #2 consisting of the Faulkner Hill Road sewers and the Main Street sewers between house numbers 59 and 105. Recently high flows have not been observed at the treatment plant and therefore immediate investigation of this area is not recommended.

Table 1: March / April, 2008 Sewer TV Inspection Summary					
Priority	Location	Issue	Estimated Flow Rate (gpd)		Status
			Min.	Max.	
High	#21 Maple Street	Continuous Flow - 4/28 identified broken clean-outs and visible infiltration	4,320	7,200	Addressed
High	#18 Railroad Street	Continuous Flow	720	3,600	Sump pumps disconnected - no flow on 4/28
High	#128 Prospect Street	Possible Sump Pump, 15 to 20 minute cycles	1,440	2,880	Addressed
Medium	MH #104 (Railroad Street)	MH #104 - infiltration at joints, pipe knockout and cover	-360	2,880	Addressed
Medium	Maple Street	Infiltration through manhole covers located in large puddles/depressions	Not estimated, could be up to 2 gpm (2,880 gpd) each		Addressed
Low	#100 Prospect Street	Continuous Flow - 1/2± gpm	360	1,080	Located in long driveway and will not be pursued.
Low	MH #235 - Intersection with Hennessey Drive	Infiltration through manhole cover	-0	-360	Addressed
June 2009 Sewer Smoke Testing Inspection Summary					
Priority	Location	Issue	Estimated Flow Rate (gpd)		Status
			Min.	Max.	
High	#81 Prospect Street	Broken cleanout with missing cap in low lying area of yard	Not calculated	Not Calculated	
High	SMH in front of 9A Railroad Street	Manhole with holes/gaps in frame and corbel	Not calculated	Not Calculated	
High	13B, 13C, & 13D Railroad Street	Cleanouts with missing caps	Not calculated	Not Calculated	
Low	PS #2 Immediate Collection System	Apparent sump pump connection - flow assumed to be 33% of time		7,200	Not inspected

ACTON, MA
SMOKE TESTING REPORT
JUNE 2009

FLOWAssessment SERVICES L.L.C.

June 25, 2009

Woodard & Curran
980 Washington Street
Suite 180
Dedham, MA 02026
Attn: Lucy Hayes

Re: Acton, MA
Smoke Testing Report

Dear Ms. Hayes,

We are pleased to provide you with the attached smoke testing summary report for your use and review.

A total of 6,118 linear feet was smoke tested in June 2009.

Included within the report is the following:

- **Summary of Findings**
- **Smoke Testing Logs with Photos and Sketches**
- **Production Summary**
- **Suspect Sources**
- **Sketches**
- **Photos**

A list of suspect inflow sources is included within the report. Although these sources did not smoke during testing, they may have the potential to add inflow into the sanitary sewer.

If you should have any questions, please let us know.

Very Truly Yours,
Flow Assessment Services, LLC



Sydney Raines
Project Manager

Sub-System: *

Acton, MA

Page: 1

Smoke Testing Summary of Findings
Table 1

Line Section	Date	Line Footage	Location	Findings	Drainage Area SqFT	Rapid Cost	Further Invest. Req.
100 To Pump Station	06/16/09	23	Railroad Street	No Defects Observed	0	0	<input type="checkbox"/>
101 To 100	06/16/09	128	Railroad Street	No Defects Observed	0	0	<input type="checkbox"/>
102 To 100	06/16/09	70	Railroad Street	No Defects Observed	0	0	<input type="checkbox"/>
103 To 102	06/16/09	94	Railroad Street	No Defects Observed	0	0	<input type="checkbox"/>
103.1 To 103	06/16/09	35	Railroad Street	<p>Three 4" PVC pipes with caps and one 4" PVC pipe without a cap, above grade located at 13B/13D Railroad Street. At one time they were directly connected to MH 103.1, but have since been repaired. - indirect connection</p> <p>Three 4" PVC pipes with caps and one 4" PVC pipe without a cap, above grade located at 13B/13D Railroad Street. At one time they were directly connected to MH 103.1, but have since been repaired. - indirect connection</p> <p>MH 103.1 is missing mortar in the corbel - indirect connection</p> <p>MH 103.1 is missing mortar in the corbel - indirect connection</p> <p>MH 103.1 is not on map. MH 103.1 has four 1" holes in the corbel - indirect connection</p>	0	0	<input type="checkbox"/>
104 To 103	06/16/09	180	Railroad Street	No Defects Observed	0	0	<input type="checkbox"/>

Sub-System:

Acton, MA

Page: 2

Smoke Testing Summary of Findings
Table 1

Line Section	Date	Line Footage	Location	Findings	Drainage Area Sqft	Retrofit Count	Findings Res.
105 To 106	06/16/09	84	Maple Street	No Defects Observed	0	0	<input type="checkbox"/>
106 To 106A	06/16/09	20	Maple Street R.O.W.	Footage was scaled	0	0	<input type="checkbox"/>
106A To 102	06/16/09	146	Maple Street R.O.W. at Railroad Street	No Defects Observed	0	0	<input type="checkbox"/>
107 To 106	06/16/09	131	Maple Street	Force main from Main Street enters MH 107	0	0	<input type="checkbox"/>
108 To 105	06/16/09	175	Maple Street	No Defects Observed	0	0	<input type="checkbox"/>
109 To 108	06/16/09	75	Maple Street	No Defects Observed	0	0	<input type="checkbox"/>
110 To 109	06/16/09	363	Maple Street	No Defects Observed	0	0	<input type="checkbox"/>
111 To 110	06/16/09	352	Maple Street	No Defects Observed	0	0	<input type="checkbox"/>
112 To 111	06/16/09	344	Maple Street	No Defects Observed	0	0	<input type="checkbox"/>
113 To 112	06/16/09	185	Maple Street	No Defects Observed	0	0	<input type="checkbox"/>

Sub-System: *

Acton, MA

Page: 8

Smoke Testing Summary of Findings
Table 1

Line Section	Date	Line Footage	Location	Findings	Drainage Area Sq Ft	Runoff Gall	Estimate Invert Foot
114 To 113	06/16/09	195	Maple Street	No Defects Observed	0	0	<input type="checkbox"/>
225 To Pump Station	06/16/09	22	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
225A To 225	06/16/09	19	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
226 To 245	06/16/09	163	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
227 To 226	06/16/09	349	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
228 To 227	06/16/09	339	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
231 To 225A	06/16/09	145	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
232 To 231	06/16/09	310	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
233 To 232	06/16/09	194	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
234 To 233	06/16/09	179	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>

Sub-System: *

Acton, MA

Page: 4

Smoke Testing Summary of Findings
Table 1

Line Section	Date	Line Footage	Location	Findings	Drainage Area SqFT	Rooftop Contrib	Further Invest. Req.
235 To 234	06/16/09	270	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
235 To 234	06/16/09	270	Prospect Street at Hennessey Drive	No Defects Observed	0	0	<input type="checkbox"/>
236 To 235	06/16/09	220	Prospect Street	Smoke from 4" PVC celanout cap that is broken and in a low area at 81 Prospect Street. Taking water during rain events - direct connection	242	0.3	<input type="checkbox"/>
237 To 235	06/16/09	87	Hennessey Drive at Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
238 To 237	06/16/09	83	Hennessey Drive	No Defects Observed	0	0	<input type="checkbox"/>
239 To 238	06/16/09	103	Hennessey Drive	No Defects Observed	0	0	<input type="checkbox"/>
240 To 239	06/16/09	326	Hennessey Drive	No Defects Observed	0	0	<input type="checkbox"/>
241 To 240	06/16/09	117	Hennessey Drive at St. James Circle	No Defects Observed	0	0	<input type="checkbox"/>
242 To 240	06/16/09	253	St. James Circle	No Defects Observed	0	0	<input type="checkbox"/>
245 To 225	06/16/09	69	Prospect Street	No Defects Observed	0	0	<input type="checkbox"/>
Total Sub-System Footage:		6,118					

Sub-System: *

Acton, MA

Page: 8

Smoke Testing Summary of Findings
Table 1

Line Section	Date	Line Footage	Location	Findings	Drainage Area SUFF	Runoff Good	Further Invest. Req.
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Grand Total Footage: 6,118

Flow Assessment Services, L.L.C.

Smoke Testing Log

Municipality: Acton, MA

Sub-System *

Project No: 09051

From MH / To MH

Line Footage:

Street #/Location:

Date: 06/16/2009

103.1 To 103

35

Railroad Street

Inspector: RST/DE

Findings:

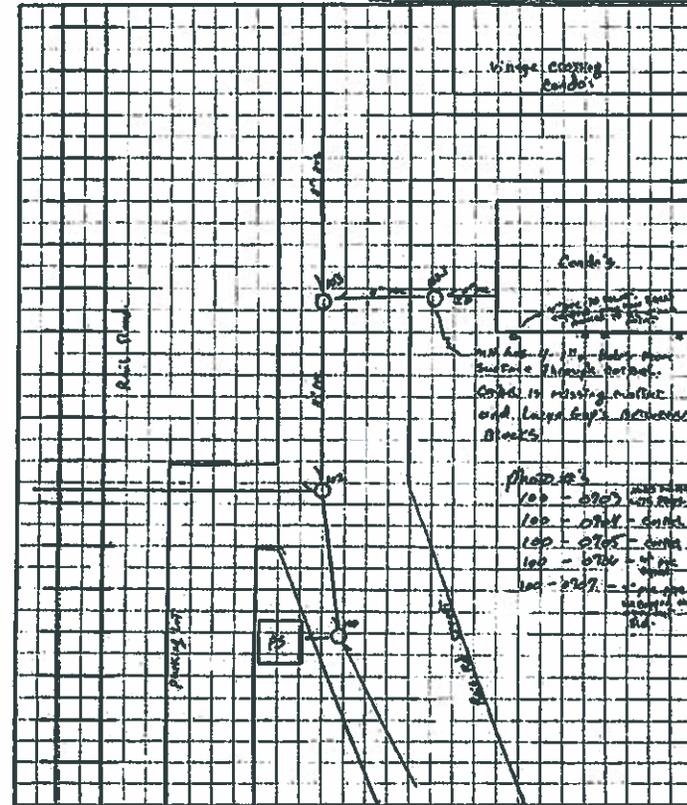
Drainage Area SqFt Runoff Coeff

Three 4" PVC pipes with caps and one 4" PVC pipe without a cap, above grade located at 13B/13D Railroad Street. At one time they were directly connected to MH 103.1, but have since been repaired. - indirect connection



FLOW ASSESSMENT SERVICES L.L.C.
19 Harvey Road, Suite 22
BEDFORD, NH 03110
(603) 638-8799

City: Acton, MA
Sheet: 1 of 2
Contractor: RST
Contract No: 09-10-09
Scale: NOT TO SCALE



Flow Assessment Services, L.L.C.

Smoke Testing Log

Municipality: Acton, MA

Sub-System *

Project No: 09051

From MH / To MH

Line Footage:

Street #/Location:

Date: 06/16/2009

103.1 To 103

35

Railroad Street

Inspector: RST/DE

Findings:

MH 103.1 is missing mortar in the corbel - indirect connection

Drainage Area SqFt

Runoff Coeff

0

0

FLOW ASSESSMENT SERVICES L.L.C.
 39 Harvey Road, Suite 22
 BEDFORD, MA 03110
 (603) 836-9799

as Acton MA.
 SHEET NO: 1 of 2
 CALCULATED BY: RST DATE: 6-16-09
 DRAWN BY: DATE:
 SCALE: NOT TO SCALE

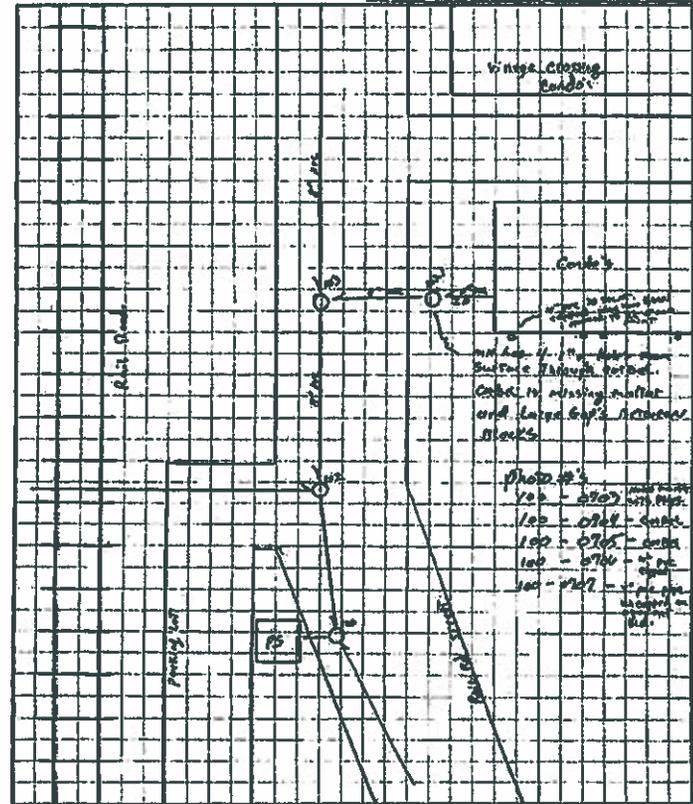
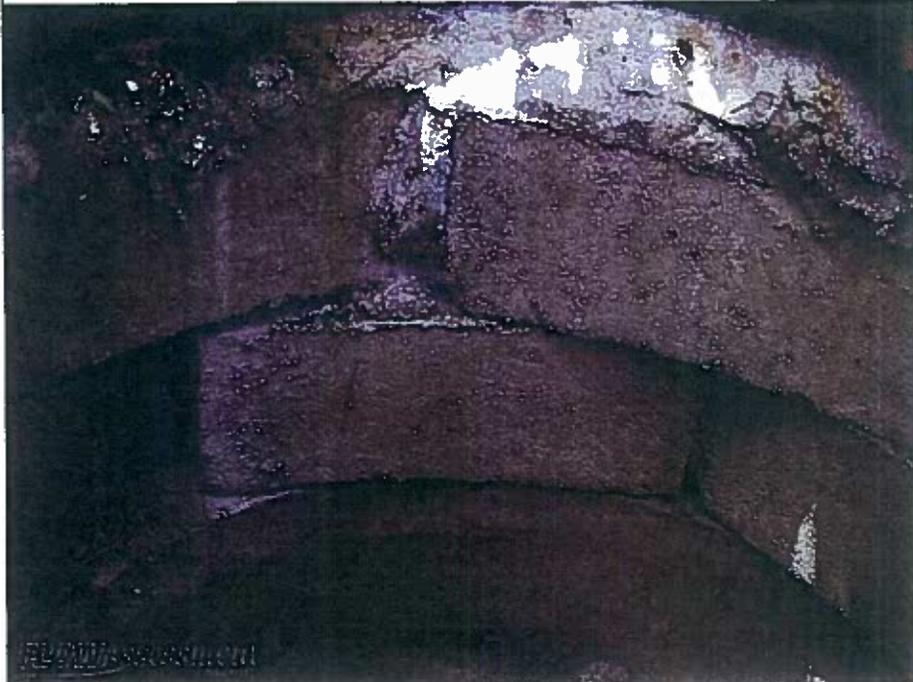


Image #: DSCF0705.jpg

Sketch #: ActonMA Smoke Sketch 1.tif

Flow Assessment Services, L.L.C.

Smoke Testing Log

Municipality: Acton, MA

Sub-System *

Project No: 09051

From MH / To MH

Line Footage:

Street #/Location:

Date: 06/16/2009

103.1 To 103

35

Railroad Street

Inspector: RST/DE

Findings:

MH 103.1 is missing mortar in the corbel - indirect connection

Drainage Area SqFt

Runoff Coeff

0

0

FLOW ASSESSMENT SERVICES L.L.C.
19 Harvey Road, Suite 22
BEDFORD, MA 02110
(603) 634-9799

m. Acton MA
SHEET NO. 1 of 2
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CHECKED BY: DATE:
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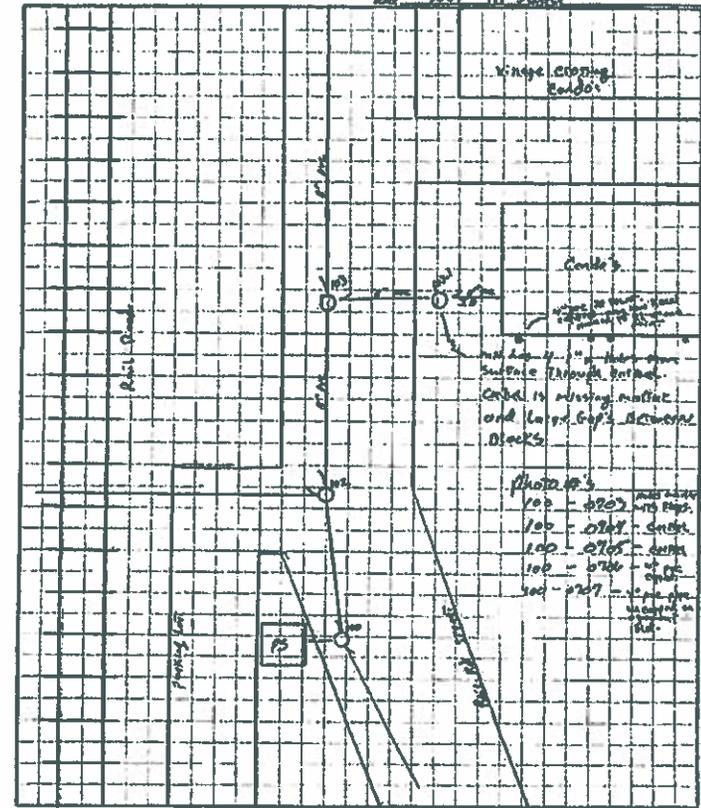


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Sketch #: ActonMA Smoke Sketch 1.tif

Flow Assessment Services, L.L.C.

Smoke Testing Log

Municipality: Acton, MA

Sub-System *

Project No: 09051

From MH / To MH

Line Footage:

Street #/Location:

Date: 06/16/2009

103.1 To 103

35

Railroad Street

Inspector: RST/DE

Findings:

MH 103.1 is not on map. MH 103.1 has four 1" holes in the corbel - indirect connection

Drainage Area SqFt	Runoff Coeff
0	0

FLOW ASSESSMENT SERVICES LLC.
19 Harvey Road, Suite 22
BEDFORD, MA 03110
(603) 696-8799

NO ACTON MA.
DATE: 1
CALCULATED BY: RST
DATE: 6-16-09
DRAWN BY: DE
SCALE: NOT TO SCALE

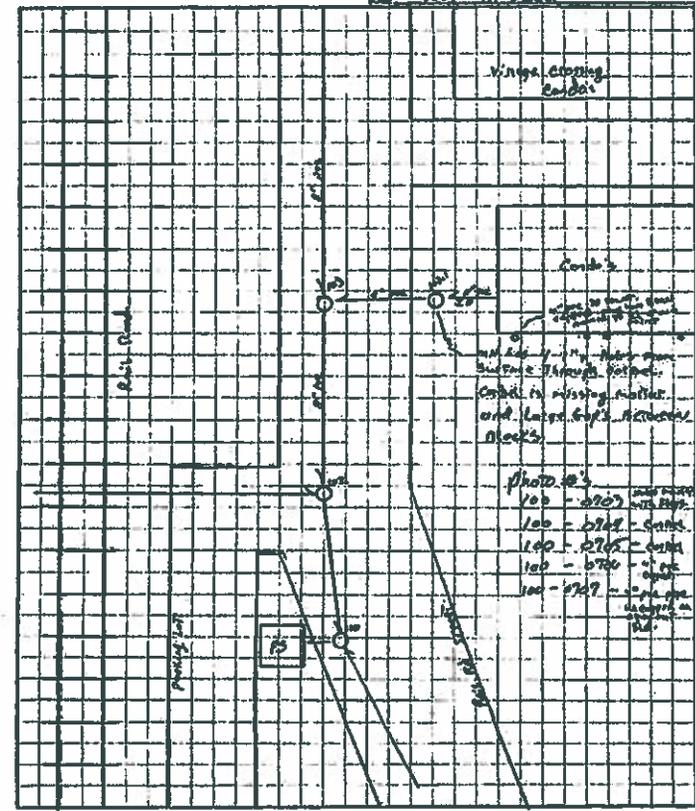


Image #: DSCF0703.jpg

Sketch #: ActonMA Smoke Sketch 1.tif

Flow Assessment Services, L.L.C.

Smoke Testing Log

Municipality: Acton, MA

Sub-System *

From MH / To MH

Line Footage:

Street #/Location:

Project No: 09051

106 To 106A

20

Maple Street R.O.W.

Date: 06/16/2009

Inspector: RST/DE

Findings:	Drainage Area SqFt	Runoff Coeff
Footage was scaled	0	0

Image #: _____ Sketch #: _____

Flow Assessment Services, L.L.C.

Smoke Testing Log

Municipality: Acton, MA

Sub-System *

Project No: 09051

From MH / To MH

Line Footage:

Street #/Location:

Date: 06/16/2009

107 To 106

131

Maple Street

Inspector: RST/DE

Findings:	Drainage Area (SQFT)	Barrel Count
Force main from Main Street enters MH 107	0	0

Image #: _____ Sketch #: _____

Flow Assessment Services, L.L.C.

Smoke Testing Log

Municipality: Acton, MA

Sub-System *

Project No: 09051

From MH / To MH

Line Footage:

Street #/Location:

Date: 06/16/2009

236 To 235

220

Prospect Street

Inspector: RST/DE

Findings:

Drainage Area SqFt	Runoff Coeff
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Smoke from 4" PVC celanout cap that is broken and in a low area at 81 Prospect Street. Taking water during rain events - direct connection

242	0.3
-----	-----



FLOW ASSESSMENT SERVICES L.L.C.
19 Harvey Road, Suite 22
BEDFORD, MA 03110
(603) 656-9799

JOB: ACTON MA
SHEET NO: 2 OF 2
CALCULATED BY: RST DATE: 6-16-09
CHECKED BY: _____ DATE: _____
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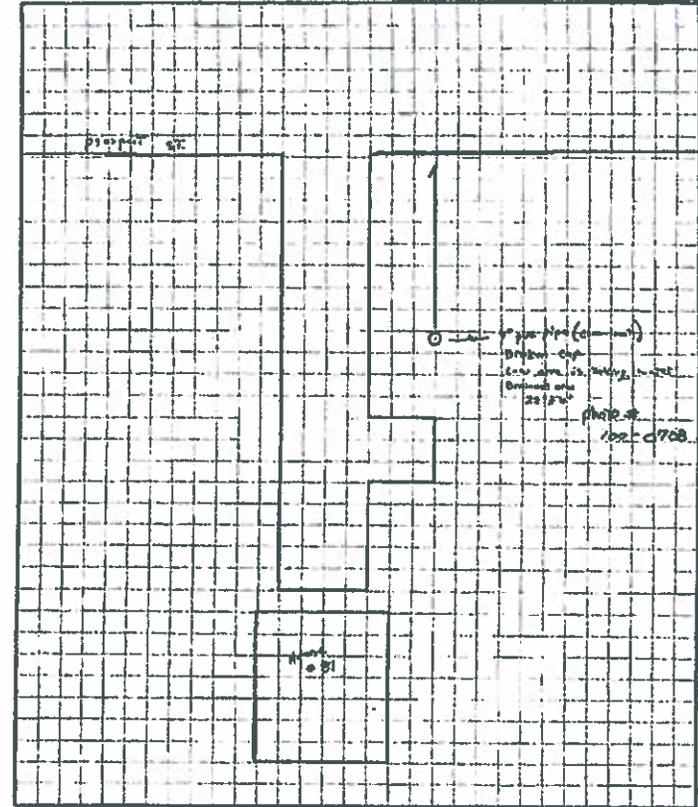


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Sketch #: ActonMA Smoke Sketch 2.tif

**Flow Assessment Services, LLC Smoke Test Log
Production Summary and Billing Report For: 09051
Acton, MA
Sub-System: ***

Sub-System	Location	Log Date	Line Section	Length in Feet
*	Railroad Street	06/16/09	100 To Pump Station	23
*	Railroad Street	06/16/09	101 To 100	128
*	Railroad Street	06/16/09	102 To 100	70
*	Railroad Street	06/16/09	103 To 102	94
*	Railroad Street	06/16/09	103.1 To 103	35
*	Railroad Street	06/16/09	104 To 103	180
*	Maple Street	06/16/09	105 To 106	84
*	Maple Street R.O.W.	06/16/09	106 To 106A	20
*	Maple Street R.O.W. at Railroad Street	06/16/09	106A To 102	146
*	Maple Street	06/16/09	107 To 106	131
*	Maple Street	06/16/09	108 To 105	175
*	Maple Street	06/16/09	109 To 108	75
*	Maple Street	06/16/09	110 To 109	363
*	Maple Street	06/16/09	111 To 110	352
*	Maple Street	06/16/09	112 To 111	344
*	Maple Street	06/16/09	113 To 112	185
*	Maple Street	06/16/09	114 To 113	185
*	Prospect Street	06/16/09	225 To Pump Station	22
*	Prospect Street	06/16/09	225A To 225	19
*	Prospect Street	06/16/09	226 To 245	163
*	Prospect Street	06/16/09	227 To 226	349
*	Prospect Street	06/16/09	228 To 227	339
*	Prospect Street	06/16/09	231 To 225A	145
*	Prospect Street	06/16/09	232 To 231	310
*	Prospect Street	06/16/09	233 To 232	194
*	Prospect Street	06/16/09	234 To 233	179

**Flow Assessment Services, LLC Smoke Test Log
Production Summary and Billing Report For: 09051**

**Acton, MA
Sub-System: ***

Sub-system	Location	Log Date	Line Section	Length In Feet
*	Prospect Street	06/16/09	235 To 234	270
*	Prospect Street at Hennessey Drive	06/16/09	235 To 234	270
*	Prospect Street	06/16/09	236 To 235	220
*	Hennessey Drive at Prospect Street	06/16/09	237 To 235	87
*	Hennessey Drive	06/16/09	238 To 237	83
*	Hennessey Drive	06/16/09	239 To 238	103
*	Hennessey Drive	06/16/09	240 To 239	328
*	Hennessey Drive at St. James Circle	06/16/09	241 To 240	117
*	St. James Circle	06/16/09	242 To 240	253
*	Prospect Street	06/16/09	245 To 225	69

Line Sections Logged for sub-system: *	36	Total Footage:	6,118
Total Line Sections Logged:	36	Grand Total Footage:	6,118

SUBAREA: *

SUSPECT INFLOW SOURCES

Municipality: Acton, MA

Job # 09051

Field Inspector RST/DE

STREET/LOCATION		No. of RL's Into Ground	No. of RL's into Foundation	No. of DWD	No. of YD	No. of SWD	No. of WWD	Flat Roof
89	Prospect Street	1						
81	Prospect Street	1			1			
3	Hennessey Street	3						
4	St. James Circle	1						
143	Prospect Street	1						
75	Maple Street	3						
117	Prospect Street	1						
10	Maple Street	4						
16	Maple Street	1						
C1	Maple Street	5						

FLOW ASSESSMENT SERVICES L.L.C.

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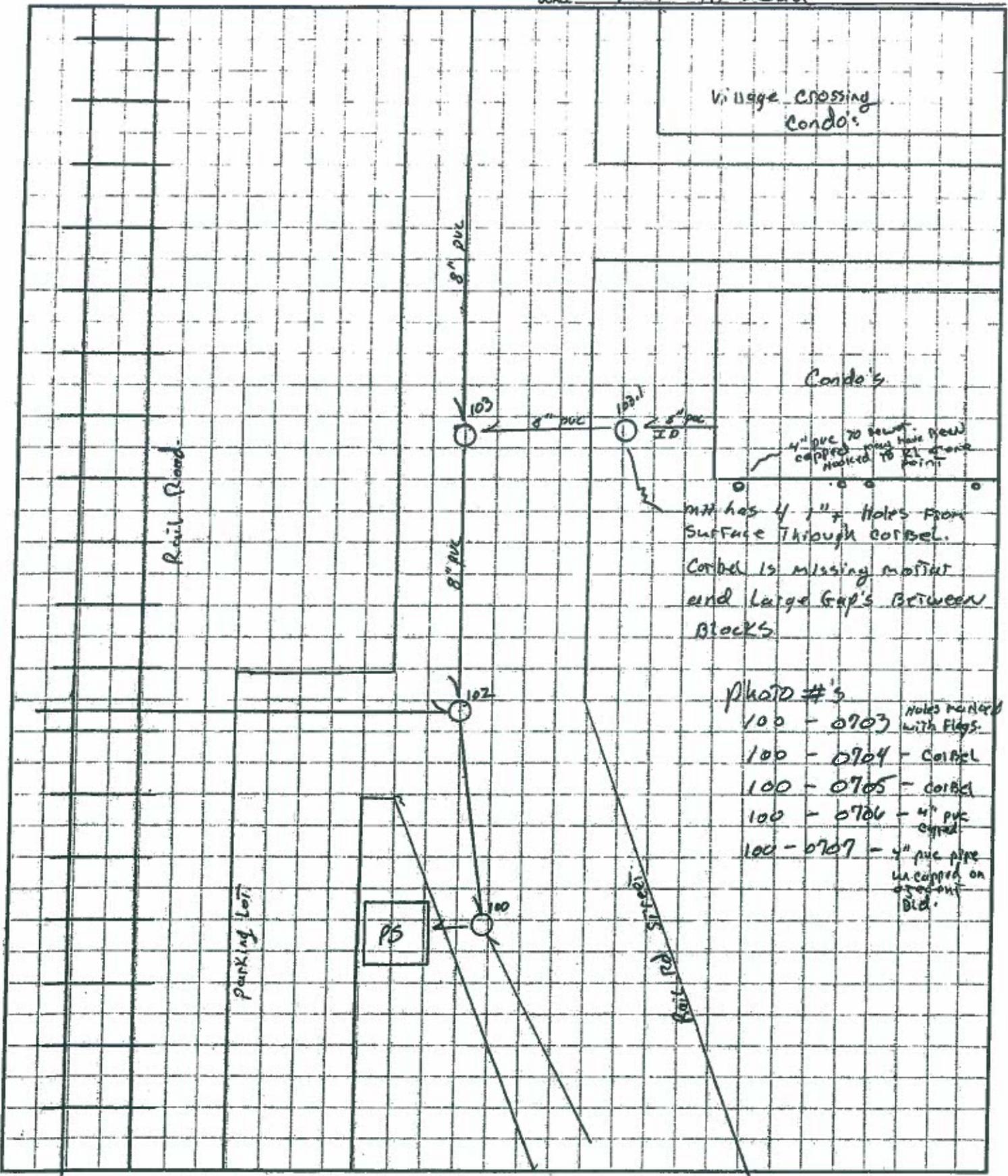
JOB ACTON MA.

SHEET NO. 1 OF 2

CALCULATED BY RST DATE 10-16-09

CHECKED BY _____ DATE _____

SCALE NOT TO SCALE



Village Crossing
 Condo's

Condo's

4" PVC TO BEW. HOLE FROM
 CAPPED HOLED TO EL. CONC. POINT

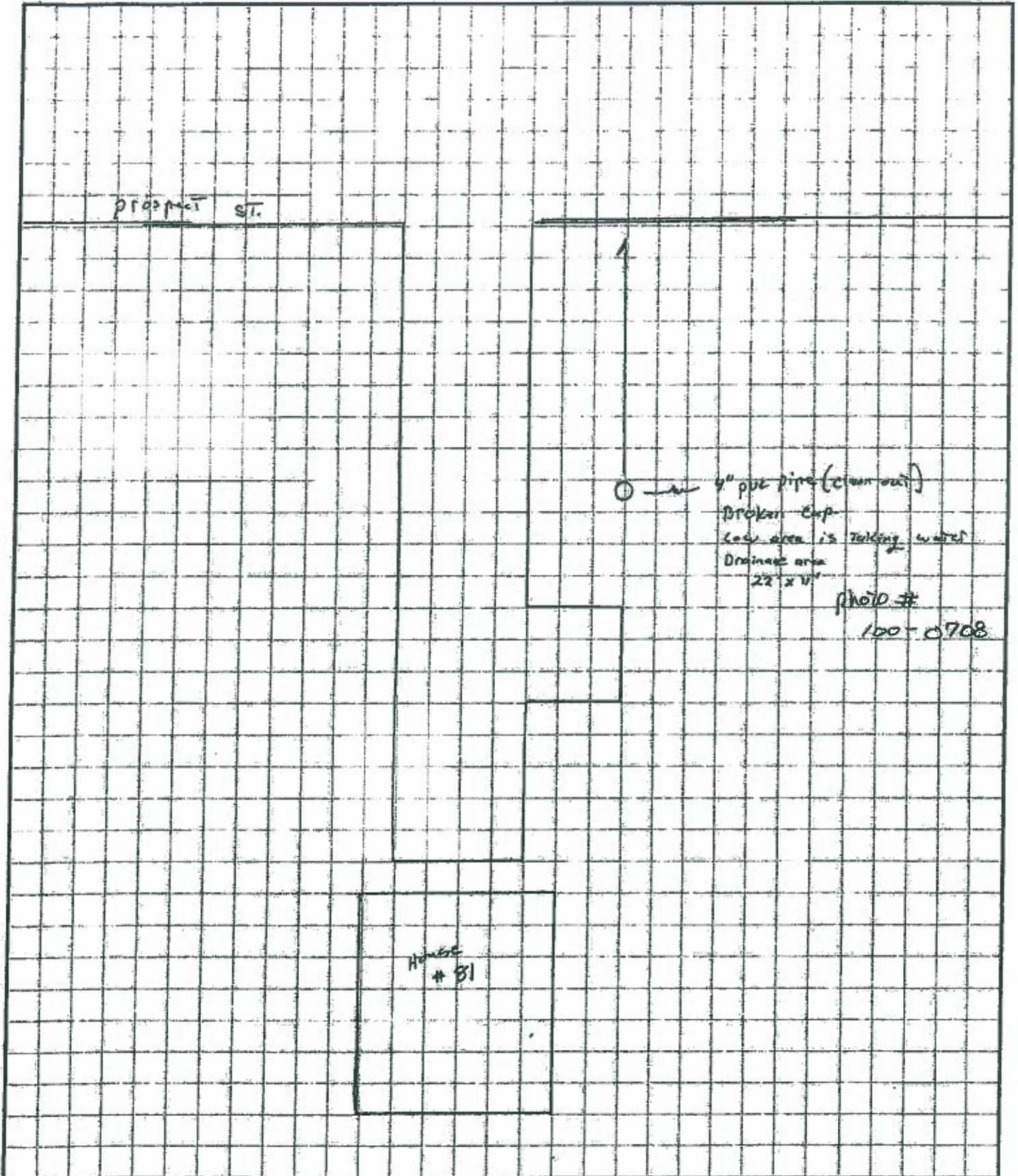
MH has 4 1" Holes From
 Surface Through Corbel.
 Corbel is missing mortar
 and large gaps between
 blocks

- Photo #'s
- 100 - 0703 Holes marked with flags.
 - 100 - 0704 - Corbel
 - 100 - 0705 - Corbel
 - 100 - 0706 - 4" PVC capped
 - 100 - 0707 - 4" PVC pipe uncapped on 0706-0707

FLOW ASSESSMENT SERVICES L.L.C.

19 Harvey Road, Suite 22
BEDFORD, NH 03110
(603) 656-9799

JOB ACTION MA
SHEET NO. 2 OF 2
CALCULATED BY RST DATE 6-16-09
CHECKED BY _____ DATE _____
SCALE NOT TO SCALE



**ACTON, MA
PHOTO LOG
SMOKE TESTING**

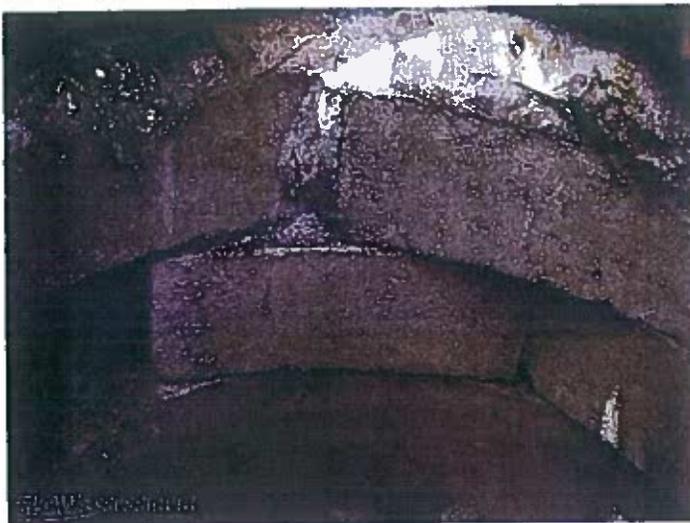
JPG # (OXX.JPG)	STREET LOCATION	COMMENT (MH#, DEFECT OR OBSERVATION)
703	Railroad Street	View of area surrounding MH 103.1
704	Railroad Street	View of missing mortar in MH 103
705	Railroad Street	View of missing mortar in MH 103
706	Railroad Street	View of capped PVC pipe in ground
707	Railroad Street	View of uncapped PVC pipe in ground
708	81 Hennessey Street	View of PVC cleanout with broken cap



DSCF0703.jpg



DSCF0704.jpg



DSCF0705.jpg



DSCF0706.jpg



DSCF0707.jpg



DSCF0708.jpg