Town of Elkton
Wastewater System Inflow and Infiltration Investigations Plan
Updated May 27, 2010

This document is an update from the October 1, 2008 Inflow and Infiltration[1] Plan of Action. This plan is divided into four consecutive divisions. All locations identified in the attached investigations schedule will receive the following investigations: flow metering, manhole inspection, smoke testing, and camera inspection.[2]

Town of Elkton will dedicate three FTEs from the Town Public Works Department to provide staffing for the I & I[3] investigations plan. These staff members will be responsible for identification and remediation of I & I sources in the system. These staff members will also be responsible for taking the necessary actions to remove the identified I & I sources from the collection system. These efforts are intended to be systematic to help quantify the amount of I & I found in and removed from the system.

The Town of Elkton has divided its wastewater system into six general sewer basins from which all wastewater flows.[4] In order to determine which basins have the largest amount of I & I, staff will conduct flow metering at the most downstream manhole from the sewer basin possible. When flows are determined, staff will compare the amount of water sold within that basin and determine how much more wastewater flows in the system than water is sold. This will give the Town a general estimate of the amount of I & I flow that is available to be repaired. The majority of flow metering of the major branches of the system will be complete by the end of the summer. When the major branches are done, the basins will be divided into smaller sections to find specific areas of major I & I problems. The remainder of the Flow Meter Placement Schedule[5] is designed find the major problem areas within the major basins. The current Flow Meter Placement Schedule only works with sewer pipe which is known to be very old. Newly installed sewer lines[6] will not be investigated at this time, but should be in future work to ensure that there are no cross connections between storm sewer and wastewater collection.

In addition to flow metering, Town staff will conduct smoke testing, manhole inspection, and camera inspections work within each of the sewer basins.[7] The schedule provided on the next page is only an estimate of the time frame needed for each phase of inspections. If work is

---

[1] Inflow and Infiltration is a term used to identify groundwater and rainwater which enters the wastewater collection system inappropriately because of broken sewer pipes, etc. This extra water must then be treated at the Wastewater Treatment Plant and, at times, causes the flow to be above the rated capacity of the plant.
[2] A general schedule of the work to be completed is available as Attachment A, beginning on Line 20.
[3] I & I is used as an abbreviation for Inflow and Infiltration
[4] These basins have been identified in Attachment B.
[5] See Attachment C
[6] Specifically in the most recently developed subdivisions; these pipes are new and are unlikely to have a significant amount of I & I.
[7] Each basin has been assigned to a particular time period as described in the Attachment D depending on the number and length of sewer pipes in the area.

completed ahead of schedule, staff will move to the next section immediately. In order to report the findings of the inspections, staff will use standard reporting forms. [8]

When major problem locations are identified, Public Works management staff will prioritize the necessary I & I repairs and place them on the comprehensive I &I Repairs spreadsheet where they will be assigned a project number with an anticipated start and completion date.

When inspection works is complete for this year, the Town will analyze the results and try to determine if any sections need further investigations. At that time, the Town will again update this plan. This cycle of analysis and investigations will continue until a significant and meaningful amount of I & I is eliminated from the system.

The following is a general outline of the major dates and actions associated with this plan.

Date	Action
Early June 2010	Begin flow metering, smoke testing, camera work, and manhole inspections
Early August 2010	Begin major camera inspections [9]
End September 2010	Complete smoke testing and manhole inspections
End December 2010	Complete flow metering and camera inspections
January/February 2011	Update repair project list and re-prioritize as necessary. Town will report updates to DEQ at the end of the first quarter of 2011.
March 2011	Begin construction of new repairs locations identified.
April/May 2011	Update I & I investigations plan. Town will report this updated plan at the end of the second quarter of 2011.

Description of Investigations Methods

Manhole Inspections

Work will include inspecting all manholes within the sewer system. Each manhole will be inspected for sources of I & I and for its physical condition. Documentation will include an inspection form for each manhole and a picture of manhole interior. Existing mapping will be updated from manhole inspection forms to reflect actual conditions in the field.

Smoke Testing

Work will involve smoke testing of the system using a portable smoke blower. Documentation will include a physical location of any identified problems, a picture showing the problem, and recommended repairs necessary to fix the problem. The Town will contact property owners

[8] Attachments E, F, and G

[9] Camera work will likely begin earlier in the summer with the Town's old camera. This camera has limited capabilities, but the Town will complete as much as possible with its old camera while waiting for replacement. This date indicates when the Town anticipates being able to place in service the new camera funded through Revolving Loan Fund.

found to have illegal connections[10] to request removal of connections. Any illegal connections will be requested to be repaired within 90 days.

Flow Metering

Work will consist of flow metering in key locations to help quantify the sources of I & I. This will include developing both dry and wet weather flow rates at the key locations. This will allow for quantification of I & I removed by the repair efforts.

In order to determine the effect of the overall I & I program, a log of plant flows and rainfall will be kept. The overall goal of this plan is to reduce the total amount of I & I flowing to the plant. Since it is impossible to accurately and efficiently monitor the flow at a particular location before and after an I & I repair, the Town will conduct a correlation analysis in which the there is consideration of total plant flow, the amount of rain, and the date of each I & I repair. This will allow the Town to demonstrate the reduction of I & I in the system and its effect on the wastewater treatment plant.

Video inspection

Camera equipment will be procured in accordance with appropriate funding guide lines. The video camera will be used to determine conditions of existing pipe lines and potential sources of I & I. Video inspection of sanitary sewer will occur during dry and wet weather conditions. Dry weather video inspection will be used to ascertain pipe conditions and repair needs. Wet weather video inspection will be used to verify sources of infiltration and help quantify it. Town staff will be trained in the use of the video camera equipment during the wastewater improvements project funded by DEQ. Documentation will include recorded video inspection and a paper log will be used to summarize any identified problems.

Documentation and Reporting

All sources of I & I located will be documented and quantified with inspection logs, video inspection, pictures, and flow metering as described above. A summary of findings and repairs will be prepared by the Town and submitted with each quarterly report. Estimates of quantity of I & I removed will also be prepared and submitted with quarterly report.

---

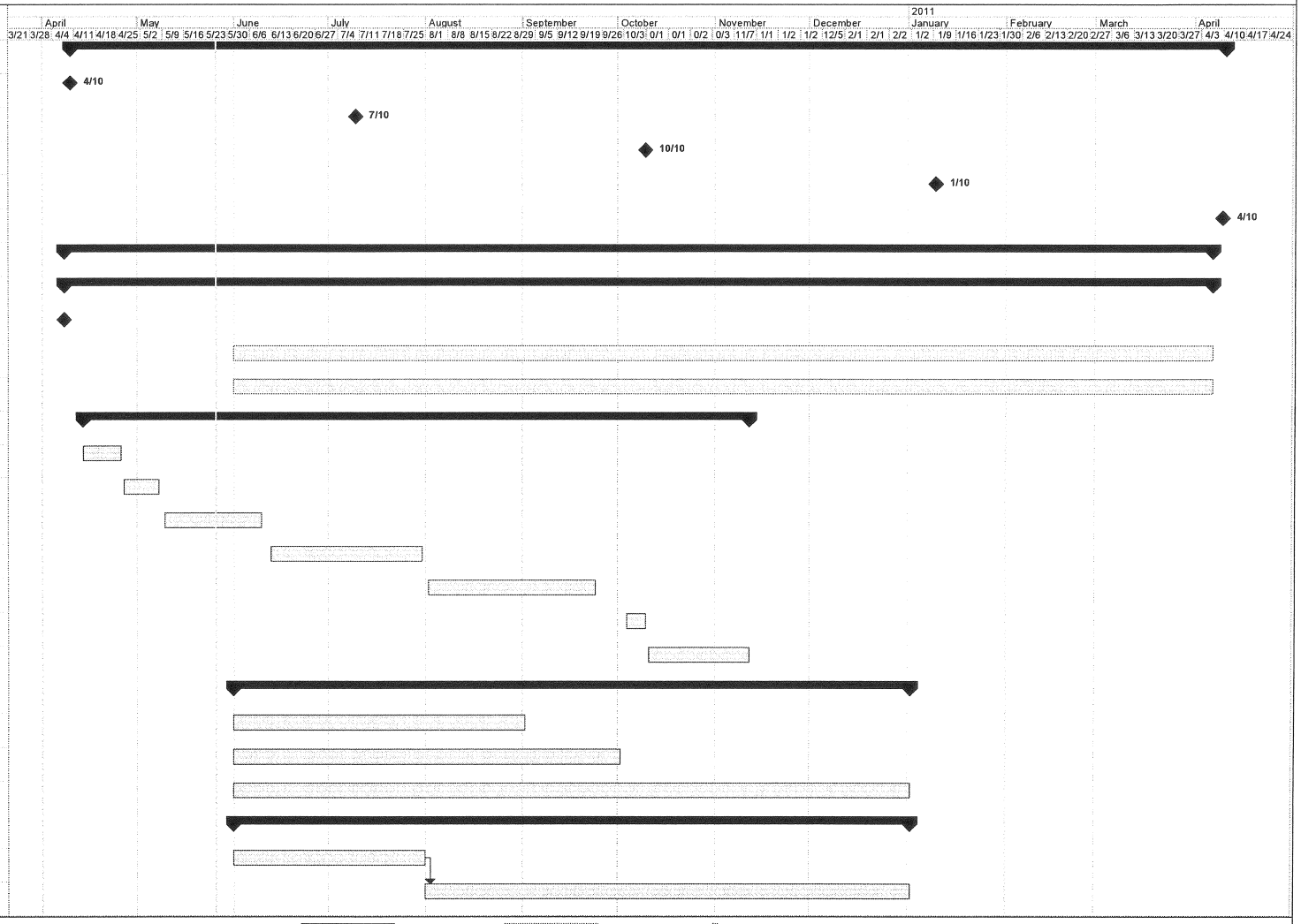
[10] Some of examples of illegal connections are downspouts, sump pumps, other drainage, etc.

TOWN OF ELKTON
PLAN OF ACTION

JN 26962
May 28, 2010

ATTACHMENT A

ID	Task Name
1	**Quarterly Reports**
2	Quarterly Report (April 10)
3	Quarterly Report (July 10)
4	Quarterly Report (October 10)
5	Quarterly Report (January 10)
6	Quarterly Report (April 10)
7	**Wastewater Improvements (Construction)**
8	**Revolving Loan Fund Projects**
9	Blue & Gold Drive (Completed)
10	Wastewater Treatment Plant
11	Linework
12	**Town Projects**
13	II-2010-1 North Street
14	II-2010-2 W. Washington Ave.
15	II- 2010-3 Harnsberger Street
16	II-2010-4 W. Prospect Avenue
17	II-2010-5 Wirt Avenue
18	II-2010-6 Spotswood Avenue (Triangle)
19	II-2010-7 Blue and Gold Drive
20	**Inflow & Infiltration Investigation by Town**
21	Manhole Inspection
22	Smole Testing
23	Flow Metering
24	**Camera Inspection**
25	Procure Camera
26	Investigation Work



Project: Project1
Date: Wed 5/26/10

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

Town of Elkton

I and I Investigations Plan

ATTACHMENT B

Basin Identification

Basin Name	Streets Including	
Comertown/Southeast	Roland	5th
	Park	West Summit
	4th	West Prospect
	Elm	6th
	Fairfax	West Washington
	West Spring	West Marshall
	7th	
Spotswood	West Spotswood	2 blocks Lewis
	East Spotswood	East C
	1 Block Ashby	Clark
	1 block Hill	2 blocks Lee
	2 blocks North Stuart	2 blocks Jackson
North Terrace	2 blocks Ashby	North Terrace
	West C	Noth blocks of North Stuart
	3 blocks Hill	West B
	West E	
North Street	North	Chestnut
	Virginia	Barkman
	Clover	All of Elkwood subdivsion
	F	North blocks of Jackson
	Davis	North blocks of Lee
Downtown	Shenandoah	North 1st
	West Spotswood	2nd
	Wirt	N. 5th
	Gibbons	
Rockingham	East Rockingham	
	West Rockingham	
	Jackson	

ATTACHMENT C

Flow Meter Placement Schedule

Date	Number	Map Book	Manhole	Comments
June 7 - July 5	II-2010-8I	4	5	Continued Blue and Gold issues
	II-2010-9I	2	15	Baseline for Comertown
	II-2010-10I	1	12	Baseline for North Terrace
July 5 - August 9	II-2010-11I	5	11	Remove pump line from N. Terrace
	II-2010-12I	3	2	Middle Southeast side
	II-2010-13I	6	28	Clover Line specific
August 9 - September 6	II-2010-14I	3	31	Upper Southeast side (South facing)
	II-2010-15I	3	31	Upper Southeast side (North facing)
	II-2010-16I	1	15	West Spotswood east facing
September 6 - October 4	II-2010-17I	6	50	F Street specific
	II-2010-18I	4	29	Rockingham Street specific
	II-2010-19I	4	1	Baseline for Ace line
October 4 - November 8	II-2010-20I	1	17	Water Street connection
	II-2010-21I	1	20	Lower Wirt Avenue
	II-2010-22I	1	9	Downtown midsection

Map book and manhole numbers are based on TOE Downstream Analysis

ATTACHMENT D

Smoke Testing and Camera Schedule - By Basin

Basin Name	**Dates**
Comertown	June 14 to July 12
Spotswood	July 13 to August 13
North Terrace	August 16 to October 1
North Street	October 4 to November 12
Downtown	November 15 to November 30
Rockingham	December 1 to December 10

Staff will be given a map of the sewer system and will highlight and date each location

Staff will fill out an inspection sheet on each line inspected

New problems found will be given a new project number starting with II-2010-23 and repair dates will be determined as they are found.

Elkton Sanitary Sewer System

Field Inspection Report

Date: _____ Time: _____

Inspection by: _____

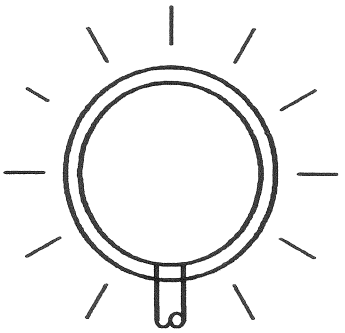
Weather: _____ **Attachment E**

Rain Fall (if any): _____

Estimated leakage: _____ (gpm)

Manhole No: _____

Location: _____



Rim Elevation: _____ ft.

Outlet:

Diameter: _____ in.

Material: _____

Flow Depth: _____ ft.

Inlet #1 Name: _____

Diameter: _____ in.

Material: _____

Flow Depth: _____ ft.

Position: _____

Inlet #2 Name: _____

Diameter: _____ in.

Material: _____

Flow Depth: _____ ft.

Position: _____

Inlet #3 Name: _____

Diameter: _____ in.

Material: _____

Flow Depth: _____ ft.

Position: _____

Inlet #4 Name: _____

Diameter: _____ in.

Material: _____

Flow Depth: _____ ft.

Position: _____

Construction: ☐ Brick ☐ Block ☐ Precast

Condition:

Bench	E G F P None
Walls	E G F P None
Pipe Connections	E G F P None
Access	E G F P None
Casting	E G F P None
Lid (# Holes)	0 1 2 3 4 5 6 7 8 9 +

Deposits in bottom:

Depth: _____ ft. Type: _____

Has MH surcharged recently?	Yes	No	
Would MH take runoff?	Yes	No	
Would MH flood?	Yes	No	
Obstructions in downstream line?	Yes	No	
Are repairs needed?	Immediate	Future	None

Rehabilitation Checklist:

Frame & Cover

- ☐ Install watertight casting
- ☐ Install non-watertight casting
- ☐ Raise & install watertight casting
- ☐ Seal existing frame to riser
- ☐ Raise & seal existing riser
- ☐ Seal cover to frame (temporary)

Interior Wall

- ☐ Repair sidewall cracks & holes
- ☐ Waterproof interior walls
- ☐ Remove existing steps
- ☐ Install new steps
- ☐ Replace joint gasket

Base & Pipe Connections

- ☐ Cut protruding pipe
- ☐ Seal pipe connections
- ☐ Seal wall-floor joint
- ☐ Pour new bench

Additional Remarks:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Anderson & Associates Inc.
TV Inspection of Sanitary Sewer Lines

Sketch #_____

Subarea _____
Direction

MH # TV Flow MH #
_____ _____

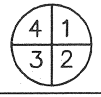
Inspector_____
Video Tape #_____
Counter Reading_____
Page_____of_____

Date: ___/___/___
Time_____
Weather_____
_____

Pipe Material_____ Size_____

Distance Reading	Quad	Remarks

Distance Reading	Quad	Remarks

QUADRANT 

CODE

ACAD SD-TV-SS

Attachment F

ATTACHMENT G

Town of Elkton
Smoke Testing Problem Identification

Date: _____

Basin _____

Location _____

Closest Manhole
Mapbook _____

Manhole _____

Possible Illegal Connection? YES NO

Type: Sump Pump Downspout

Drainage Other:

Description of Problem

Other Comments

Staff Member _____

_____

Office Use

Further Investigation _____

Date Entered in Spreadsheet _____

Project Number _____

REMEMBER TO ATTACH PHOTOS