

Woburn Engineering Department's Efforts to Meet MS-4 Permit Requirements

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The Beginning

UMass Lowell ASCE students want an environmental project.

Faculty advisor, Ed Hajduk, contacts Lexington Town Engineer John Livsey to inquire if the Town has any work for environmental engineering students.

The Town of Lexington & ASCE Student Chapter begins the *Stream Team*; student volunteers travel to Lexington weekly to perform outfall testing.

Woburn contacts UML ASCE and request to start similar program.

The Woburn MS-4 Stormwater Management Program begins in the Summer of 2015.





Woburn's Focus

- Obtaining a sufficient and affordable workforce to complete the following tasks:
 - Illicit Discharge Detection and Elimination (IDDE)
 - System Mapping
 - Outfall/Interconnection Inventory
 - Dry Weather Screening
 - Public Education and Outreach
 - Residents, public school students
 - Businesses, institutions, & commercial facilities
 - Developers
 - Industrial Facilities

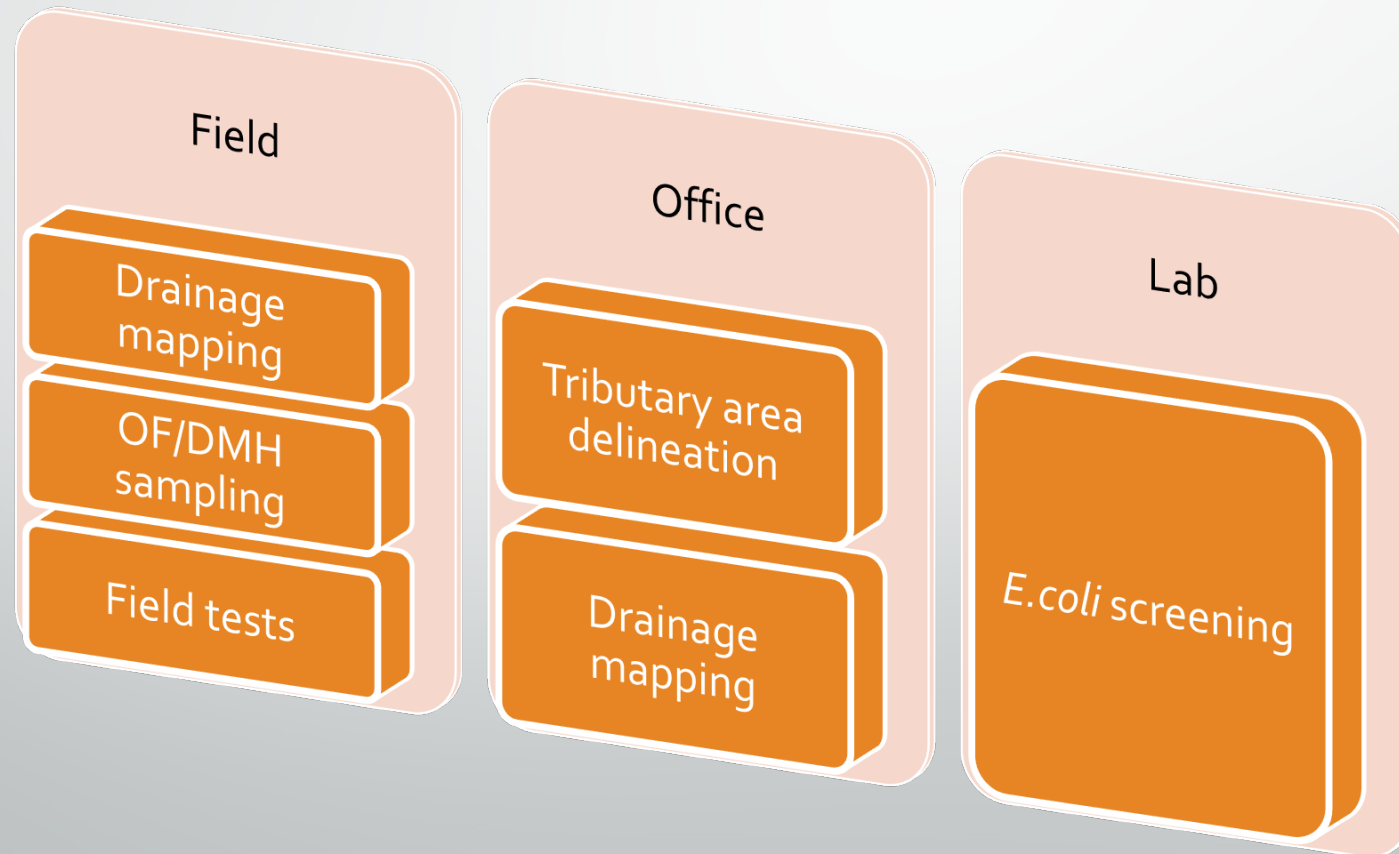


Students on their way to test.



Overview of Program

- UMass Lowell Civil & Environmental Engineering students travel to Woburn to assist the City in meeting MS-4 requirements.
- Students spend approximately 2 hours each visit doing field, lab and/or office work.





IDDE- System Mapping

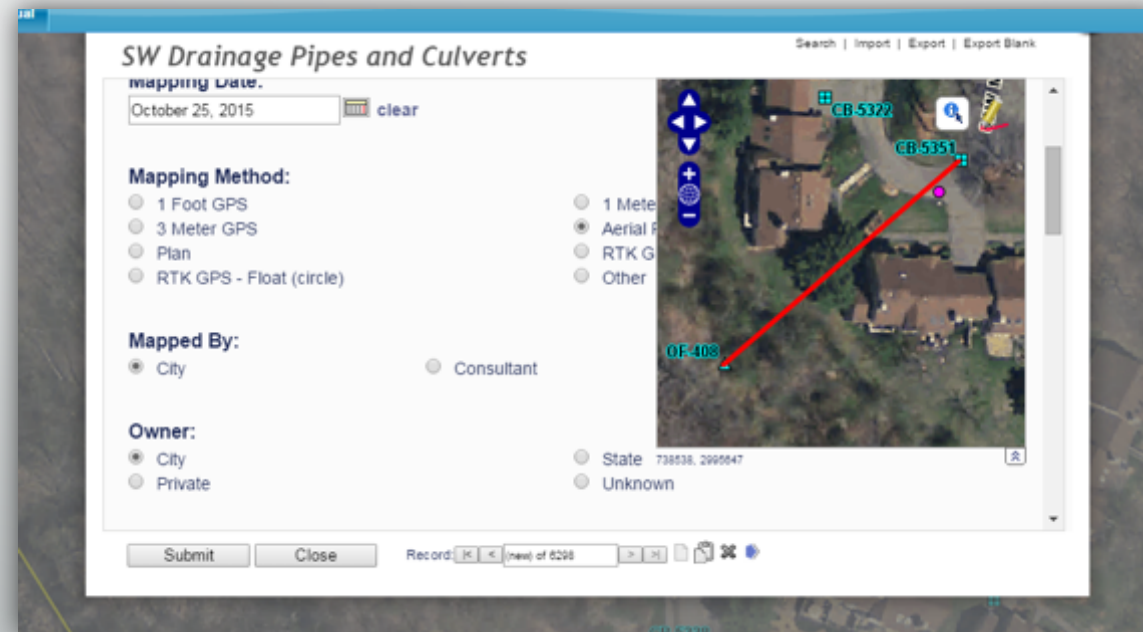
- Outfalls and drainage can be mapped in the field as they are discovered.
- Tablets allow for an accuracy of +/- 10 feet, well within permit requirements of +/- 30 feet.
- As-built plans are also used by students to fill in areas missing drainage.



Connected and unconnected drainage.



A student, using an as-built plan, adds a drain pipe to connect a catch basin and outfall. These additions will be field checked for accuracy.



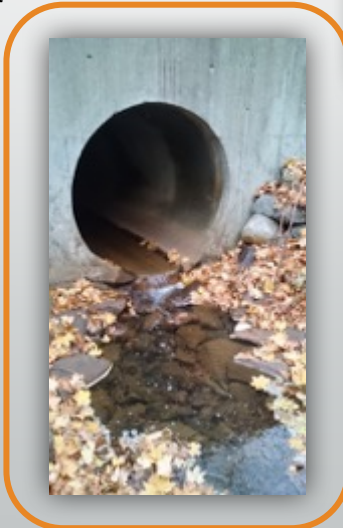


IDDE- Dry Weather Screening *Outfall Sampling & Testing*

- Field tests: ammonia, total & free chlorine, D.O., specific conductivity, surfactants & temperature.
- All testing results, outfall photos and pertinent information are logged in the GIS using tablets.



OF's that have been sampled are denoted in green, yellow represents an un-sampled outfall.



OF-118 on Woburn Pky.

SW Water Quality Field Screening Form

FIELD SCREENING	
Ammonia	
Boron	
Chloride	
Color	
Specific Conductance	
Detergents & Surfactants	
Fluoride	
Hardness	
pH	
Potassium	
Turbidity	

Comments:
Temperature: 59.4°F

Submit Cancel Record: 1 of 3 of

Color

Specific Conductance

Detergents & Surfactants

Test Method: EPA 425.1/SM5540C
Benchmark: >0.25 mg/L

Field Test Instrument:

CHEMetrics I-2017

Field Test Kit:

CHEMetrics K-9400/4

Hach DE-2

Result:

25

Dissolved Oxygen

10.86



IDDE- Dry Weather Screening *E.coli* Testing

- Students screen for *E.coli* at the Water Treatment Plant using the IDEXX Colilert method.
- Salinity and 5- day biochemical demand (B.O.D.) tests are done periodically.
- Phosphate and nitrate tests will be added this summer.

IDEXX Quanti-Tray 2000 MPN Table

# Large Wells Positive	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
0	25.3	26.4	27.4	28.4	29.5	30.5	31.6	32.6	33.6	34.7	35.7	36.8	37.8	38.9	40.0	41.0	42.1	43.1	44.2	45.3	46.3	47.4	48.5	49.5
1	26.6	27.7	28.7	29.8	30.8	31.9	32.9	34.0	35.0	36.1	37.2	38.2	39.3	40.4	41.4	42.5	43.6	44.7	45.7	46.8	47.9	49.0	50.1	51.2
2	27.9	29.0	30.0	31.1	32.2	33.2	34.3	35.4	36.5	37.5	38.6	39.7	40.8	41.9	43.0	44.0	45.1	46.2	47.3	48.4	49.5	50.6	51.7	52.8
3	29.3	30.4	31.4	32.5	33.6	34.7	35.8	36.8	37.9	39.0	40.1	41.2	42.3	43.4	44.5	45.6	46.7	47.8	48.9	50.0	51.1	52.2	53.3	54.4
4	30.7	31.8	32.8	33.9	35.0	36.1	37.2	38.3	39.4	40.5	41.6	42.8	43.9	45.0	46.1	47.2	48.3	49.5	50.6	51.7	52.8	54.0	55.1	56.3
5	32.1	33.2	34.3	35.4	36.5	37.6	38.7	39.8	41.0	42.1	43.2	44.4	45.5	46.6	47.7	48.9	50.0	51.2	52.3	53.5	54.6	55.8	56.9	58.1
6	33.5	34.7	35.8	36.9	38.0	39.2	40.3	41.4	42.6	43.7	44.8	46.0	47.1	48.3	49.4	50.6	51.7	52.9	54.1	55.2	56.4	57.6	58.7	59.9
7	35.0	36.2	37.3	38.4	39.5	40.7	41.9	43.0	44.2	45.3	46.5	47.7	48.9	50.0	51.2	52.3	53.5	54.7	55.9	57.1	58.3	59.5	60.7	61.9
8	36.6	37.7	38.9	40.0	41.2	42.3	43.5	44.7	45.9	47.0	48.2	49.4	50.6	51.8	53.0	54.1	55.3	56.5	57.7	58.9	60.1	61.3	62.5	63.8
9	38.1	39.3	40.5	41.7	42.9	44.1	45.3	46.5	47.8	48.9	50.1	51.2	52.4	53.6	54.8	56.0	57.2	58.4	59.6	60.8	62.1	63.3	64.6	65.8
10	39.7	40.9	42.1	43.3	44.5	45.7	46.9	48.1	49.3	50.6	51.8	53.0	54.2	55.5	56.7	57.9	59.2	60.4	61.7	62.9	64.2	65.4	66.7	67.9

# Large Wells Positive	25	26	27	28
0	25.3	26.4	27.4	28.4
1	26.6	27.7	28.7	29.8
2	27.9	29.0	30.0	31.1
3	29.3	30.4	31.4	32.5
4	30.7	31.8	32.8	33.9
5	32.1	33.2	34.3	35.4
6	33.5	34.7	35.8	36.9
7	35.0	36.2	37.3	38.4
8	36.6	37.7	38.9	40.0
9	38.1	39.3	40.5	41.6
10	39.7	40.9	42.1	43.3



Colilert test materials.

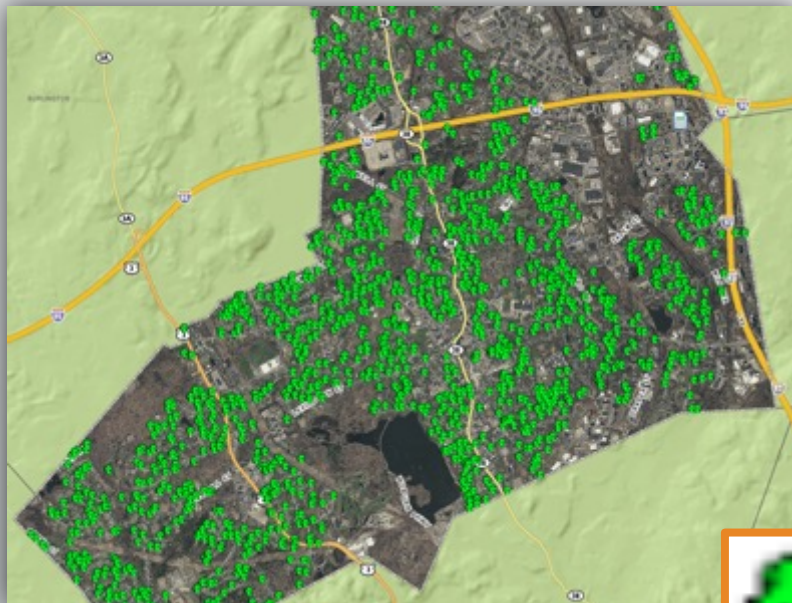


Students prepare the samples for incubation.



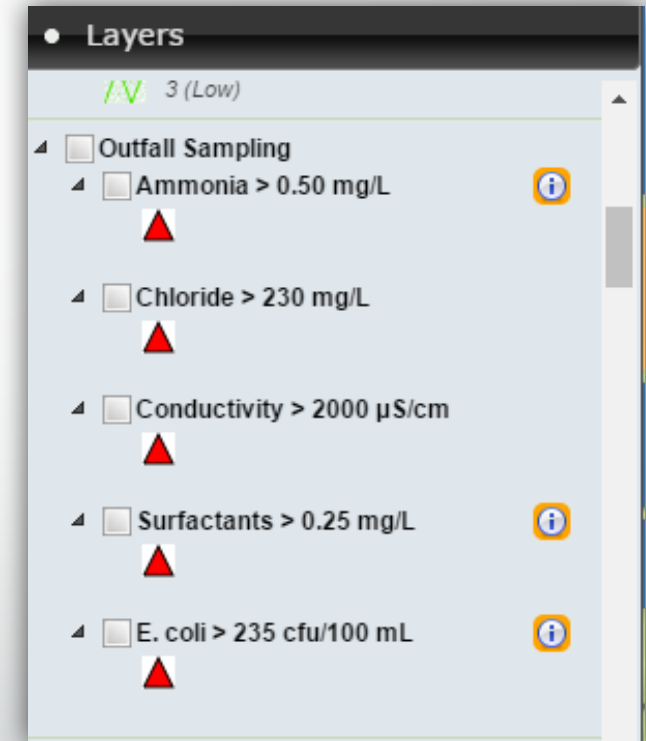
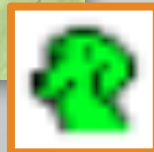
Utilizing the GIS

- Tailoring the GIS to one's needs:
 - Outfalls with test results exceeding EPA thresholds.
 - Outfall has a dry weather inspection.
 - Homes with dogs.
 - Adding links to the permit, SWPPP's, etc.



- ▶ High bacterial counts...?
- ▶ High Ammonia...?
- ▶ No other indications of an illicit connection...?

Where are the dogs?



Users can quickly toggle on the above options to see if any outfall has test results exceeding EPA thresholds.

Utilizing the GIS *Tributary Area Delineation*

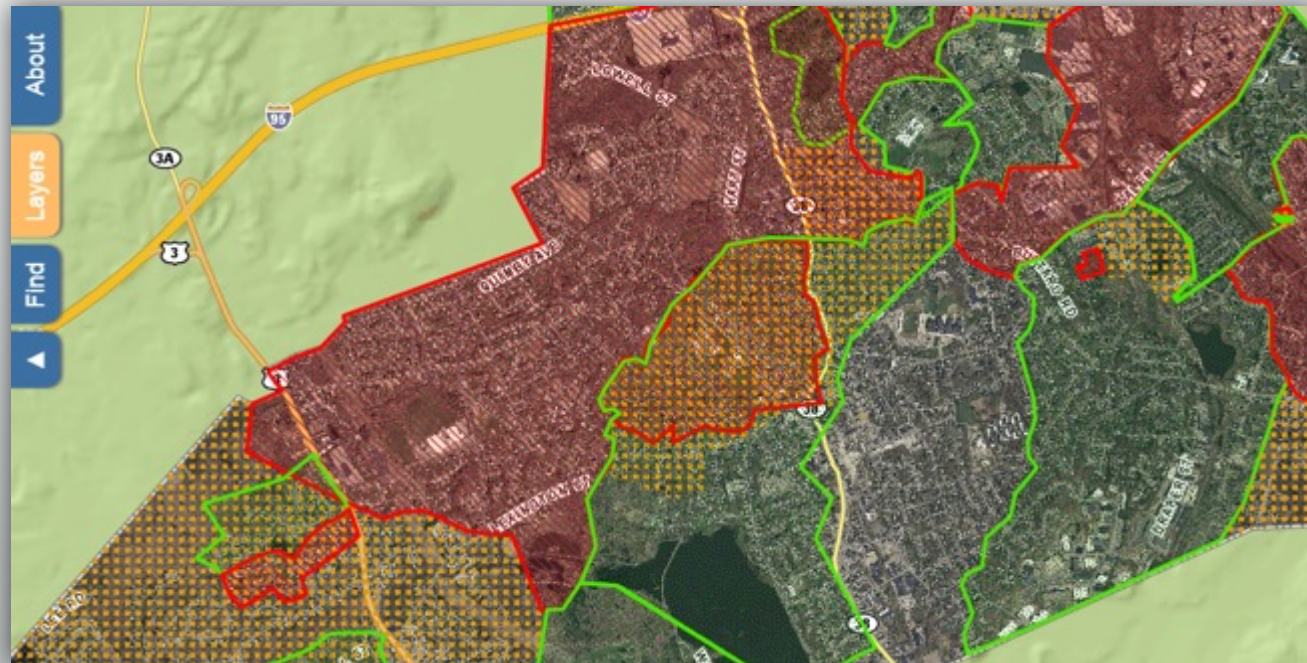


- Will delineate:
 - State and private campuses in yellow.
 - Public areas visited and deemed clean in green.
 - Public areas visited and problematic in red.



Contours at Horn Pond.

Initial, roughed-in tributary areas that will be altered and corrected as data is collected.





Utilizing the GIS

Catch Basin Cleanings & Street Sweeping

- Quantify amount of debris removed from the MS-4.
- Track number of swept streets and cleaned CBs.
- Woburn has...
 - 7173 catchbasins (4400 public, 2773 private)
 - 718 outfalls (640 public, 78 private)
 - 91.7 miles of drains
 - 3800 drain manholes (1700 public, 2100 private)

Woburn

Woburn Street Sweeping

Street Segment ID

Street Name

Date

Has the Street Been Swept
 Yes
 No

Amount of Material In Hopper When Dumping
 Full Hopper
 Half Hopper

Map: A street map showing a highlighted segment and a red location marker.

Woburn

Catch Basin Cleaning Form

Condition of Catch Basin Grate
 Good
 Fair
 Poor

Condition of Catch Basin Collar
 Good
 Fair
 Poor

Catch Basin Material
 Brick
 Cobble Stone
 Concrete Block
 Precast Concrete

Condition of Catch Basin Leads
 Clean
 Partially Full
 Full

Depth of silt in feet (cb base to pipe outlet)

Volume of silt in cubic yards (auto-calculated)

Type of Work Required

Comments

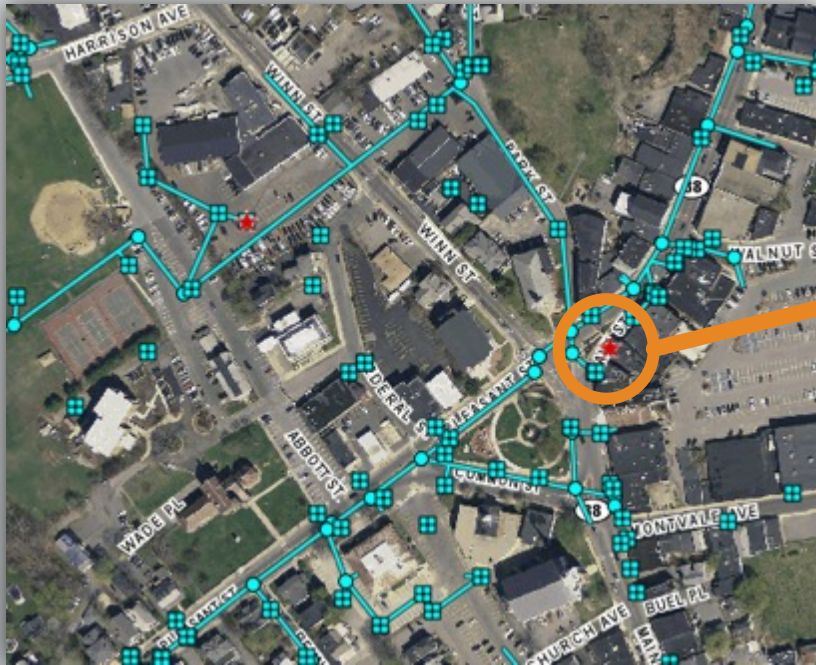
Map: A street map showing a highlighted catch basin location with a blue marker.

CB and Street Sweeping Forms



Utilizing the GIS *Illicit Connections*

- Red stars indicate illicit connections that were found while testing or mapping.



A sewer line was found connected to a DMH on Main Street



- ID the icon to see photos of the illicit connection & the work done to remove the connection.

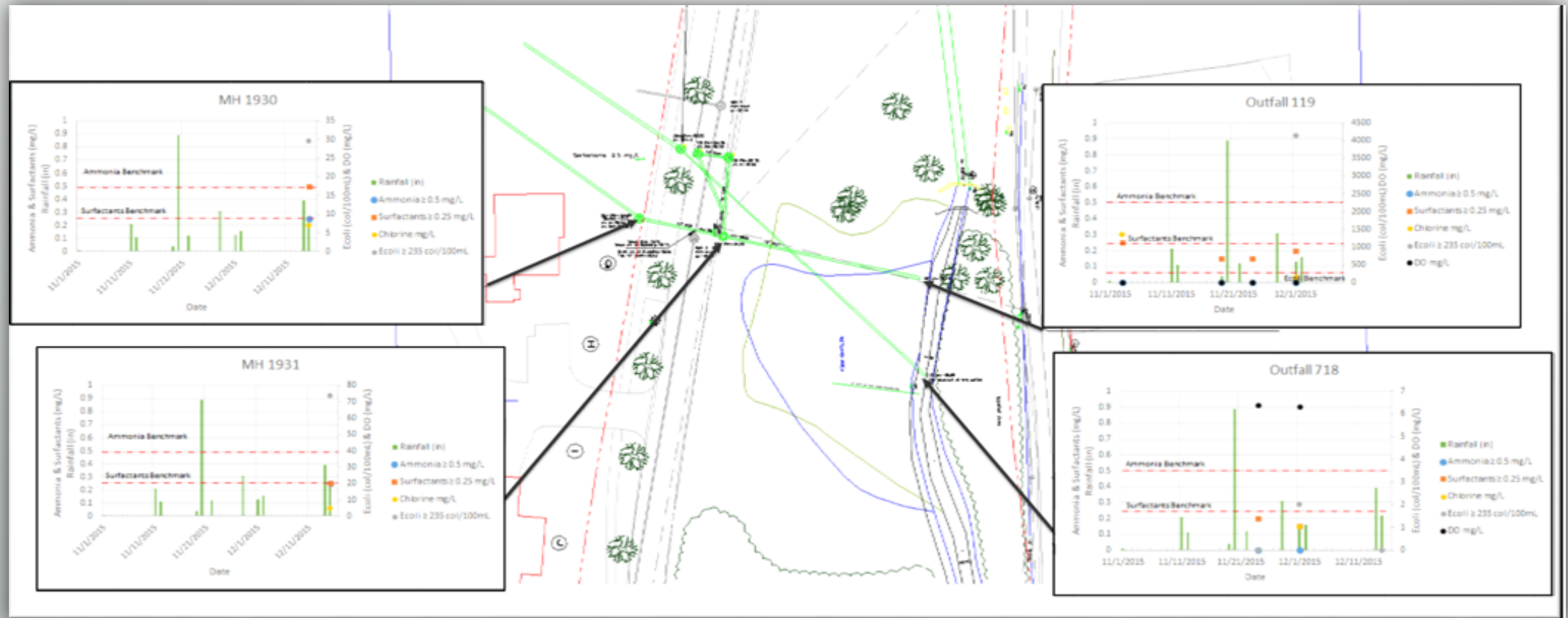
- Two illicit connections have been found and eliminated thus far. Additionally, two water main leaks have also been identified.



Utilizing the GIS

After Illicit Connection Removal

- Once an illicit connection is eliminated, the problem sites are re-tested to determine if that was the sole cause of contamination.





Cost

- To get the program up and running will cost around \$11,500. However, this equipment should last 3-5+ years.

Reusable (3-5 yrs)	Cost
Field book	\$24.47
Hard hat	\$24.47
Safety vest	\$25.45
Work gloves	\$13.77
Supply bag	\$64.30
Cooler	\$34.35
Tape measure	\$20.19
Rubber overshoes	\$39.20
Sample grabber 72"	\$76.35
D.O. probe	\$708.00
Conductivity probe	\$426.00
Meter	\$1,052.00
Colorimeter	\$418.00
Sealer	\$4,063.02
Tablet	\$400.00
Stormwater Suite	\$4,000.00
TOTAL	\$11,389.57

Supply list and cost for City of Woburn MS-4 Stormwater Management Program.

- It is approximately \$14 per sample. Labs typically charge \$55+ for ammonia, surfactant and *E.coli*.

Consumables	Cost per test
Surfactants	\$4.09
Ammonia	\$0.90
Chlorine- free	\$1.05
Chlorine- total	\$1.05
E.coli vessel	\$0.62
E.coli tray/food	\$6.47
	\$14.18

- Some of the items on the supply list can be omitted or bought elsewhere while others are most likely already owned by the municipality.



Public Education & Outreach

- Partner with Mystic River Watershed Association (MyRWA) to develop a basin wide community outreach program.
- Collaborate with high school science teachers to start a stormwater initiative.
- Mayor's Stormwater Taskforce consisting of business people, residents and government officials.
- Further personalize stormwater website.

Anyone, including Woburn residents and business owners, can access the interactive map at

www.mapsonline.net/woburnma/index.html



R. Judkins and A. Candiloro test an outfall.



Stormwater Utility

- Method to fund stormwater programs outside of the general fund.
- Consensus Building Institute sponsored by EPA is working with MyRWA member communities to develop a stormwater utility in each community.
- A typical program for the City of Woburn based on an equivalent stormwater unit (ESU) wherein 10,700 households would pay \$20 each per year and businesses would pay \$30 per ESU, would generate approximately \$1 million annually.



Thank you for your attendance!

Your nap is over...

...any questions?