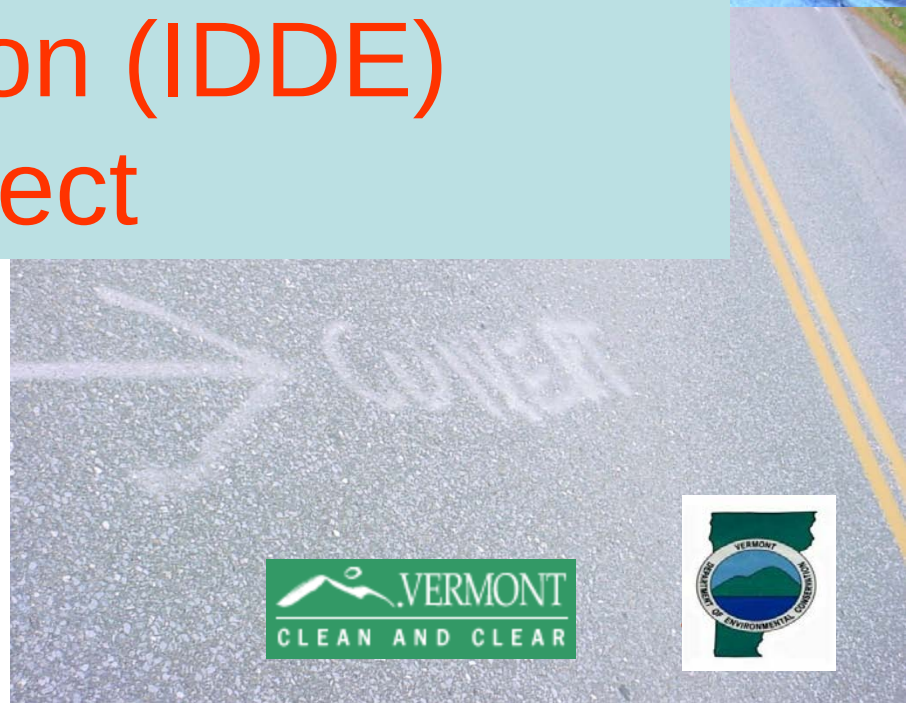
Illicit Discharge Detection and Elimination (IDDE) Project



STONE ENVIRONMENTAL INC

VERMONT CLEAN AND CLEAR

Why?

- Good stormwater maps provide a tool for maintenance of the municipal infrastructure.
- The maps provide a tool for planning for stormwater retrofit projects.
- The maps provide a tool for emergency response in the event of a hazardous waste spill or dumping.
- IDDE can be an extremely cost effective form of pollution control.

Potable Water System

charges a user fee

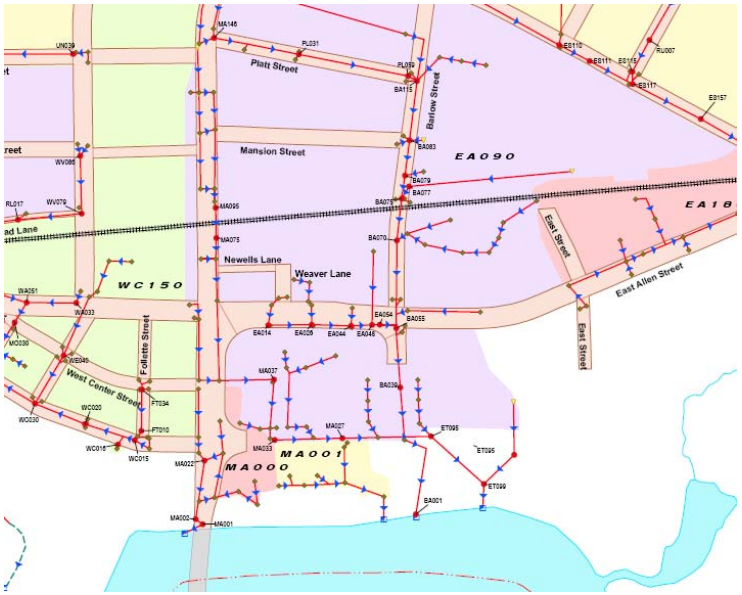
Wastewater System

charges a user fee

Stormwater System

only 2 VT muncipalities charge a user fee

What is a Storm Sewer? (legal)

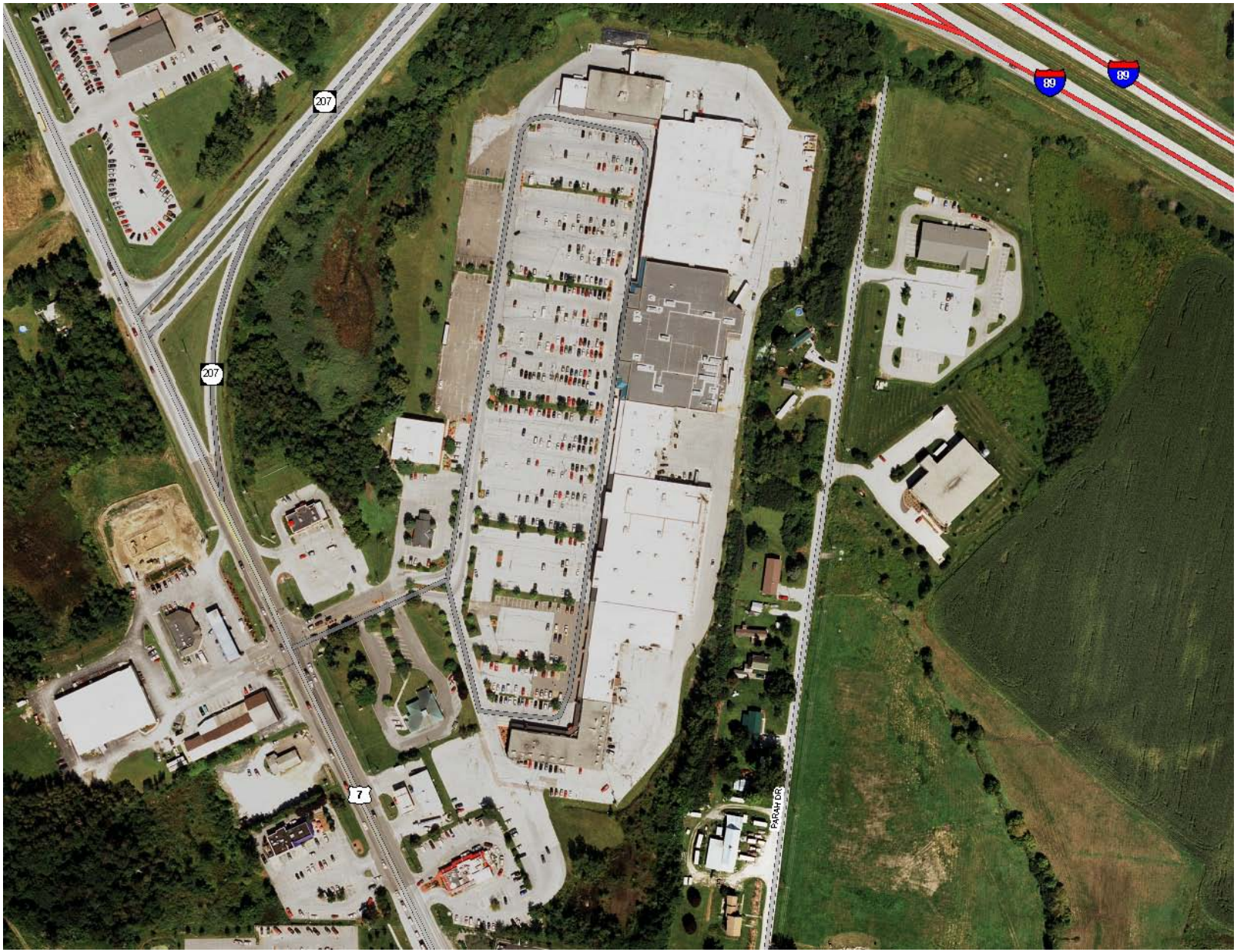


- Enclosed pipe or open channel
- From a regulatory standpoint (40 CFR 122.26(b)(5)):
  - Major outfall = enclosed storm drain pipes 36 inches or greater in diameter & open channels that drain more than 50 acres
  - For industrial land uses, major outfall = enclosed storm drain pipes 12 inches or greater in diameter & open channels that drain more than 2 acres
- Minor storm outfalls are smaller than these thresholds

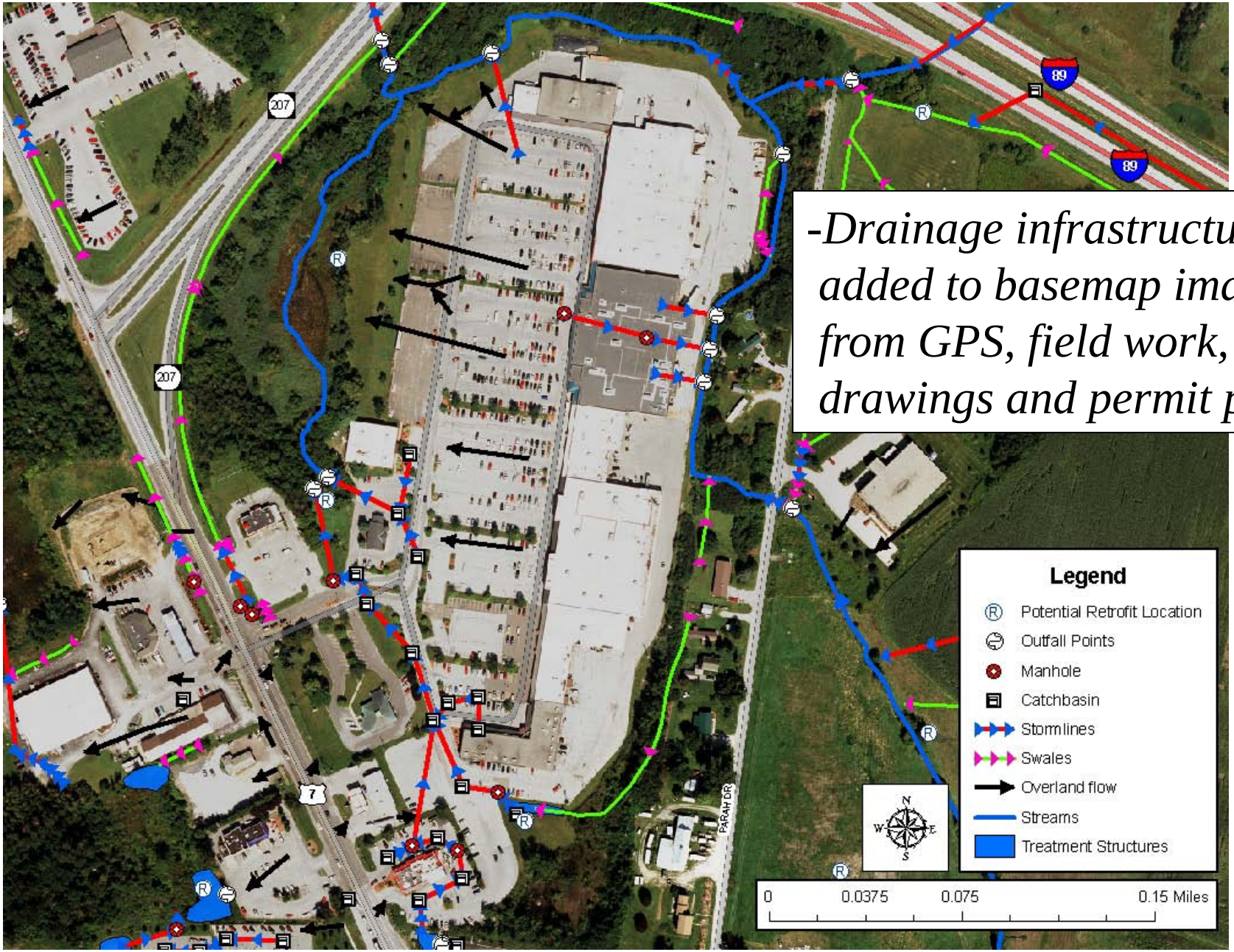
What is a Storm Sewer? (lay person)

- A system that conveys stormwater runoff. It can include catch basins, pipes, curbs, gutters, ditches, man made channels, etc…

Step One: Obtaining Imagery



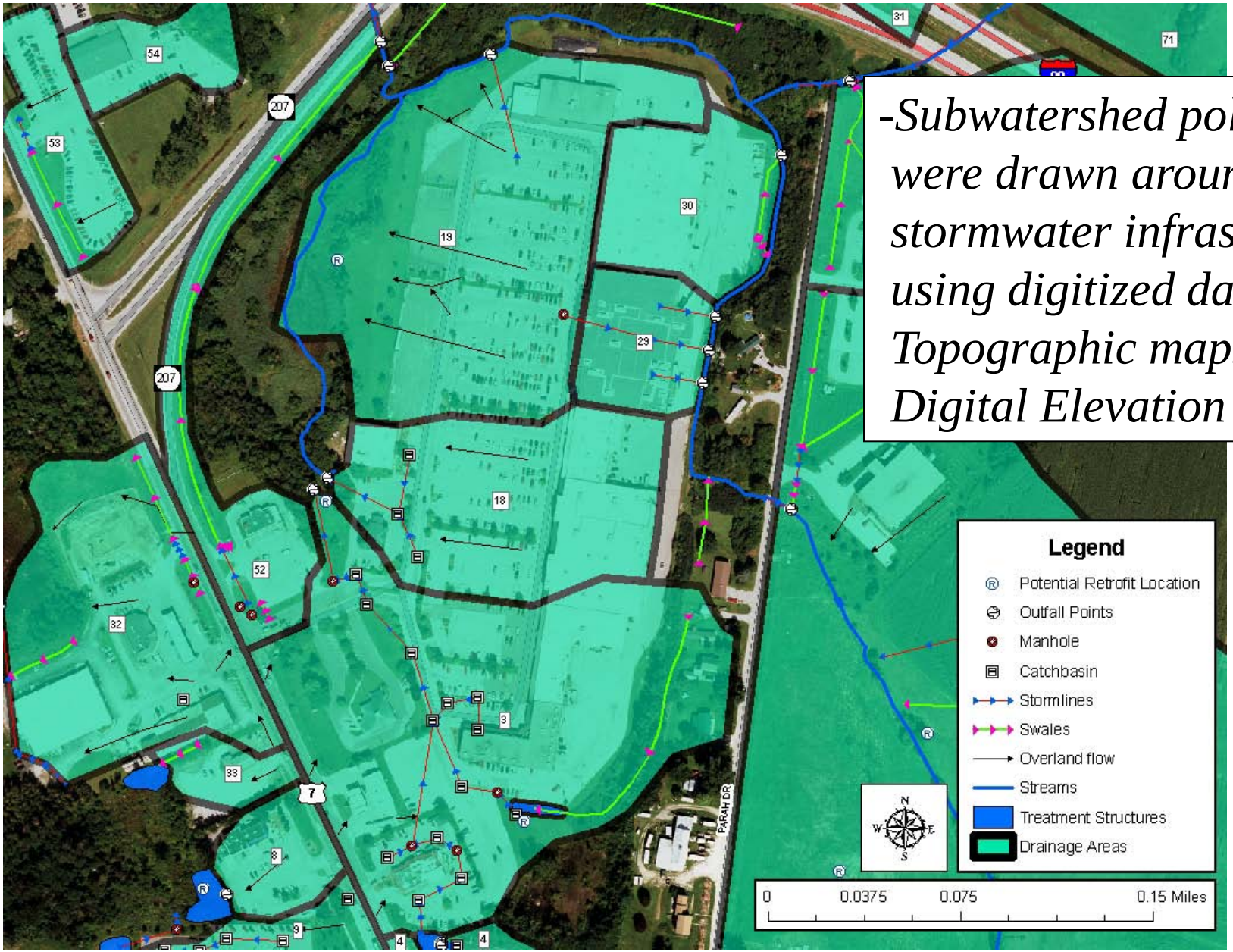
Step Two: Digitizing Stormwater Infrastructure



-Drainage infrastructure added to basemap images from GPS, field work, record drawings and permit plans.

Step Three: Digitizing the Impervious Cover Layer

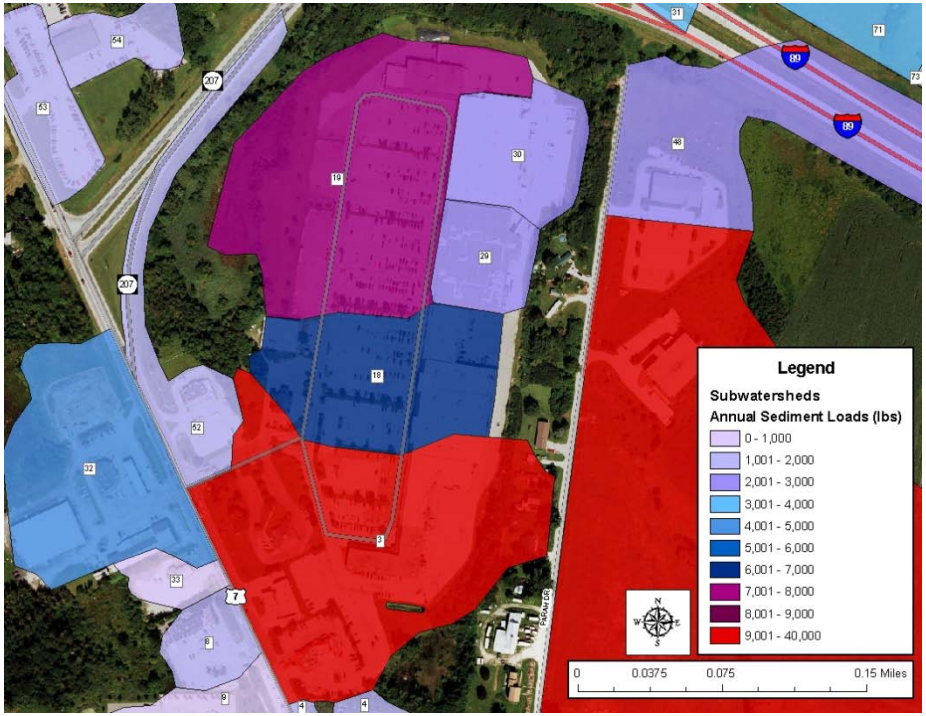
Step Four: Delineating Subwatershed Polygons



-Subwatershed polygons were drawn around stormwater infrastructure using digitized data, Topographic maps and Digital Elevation Models.

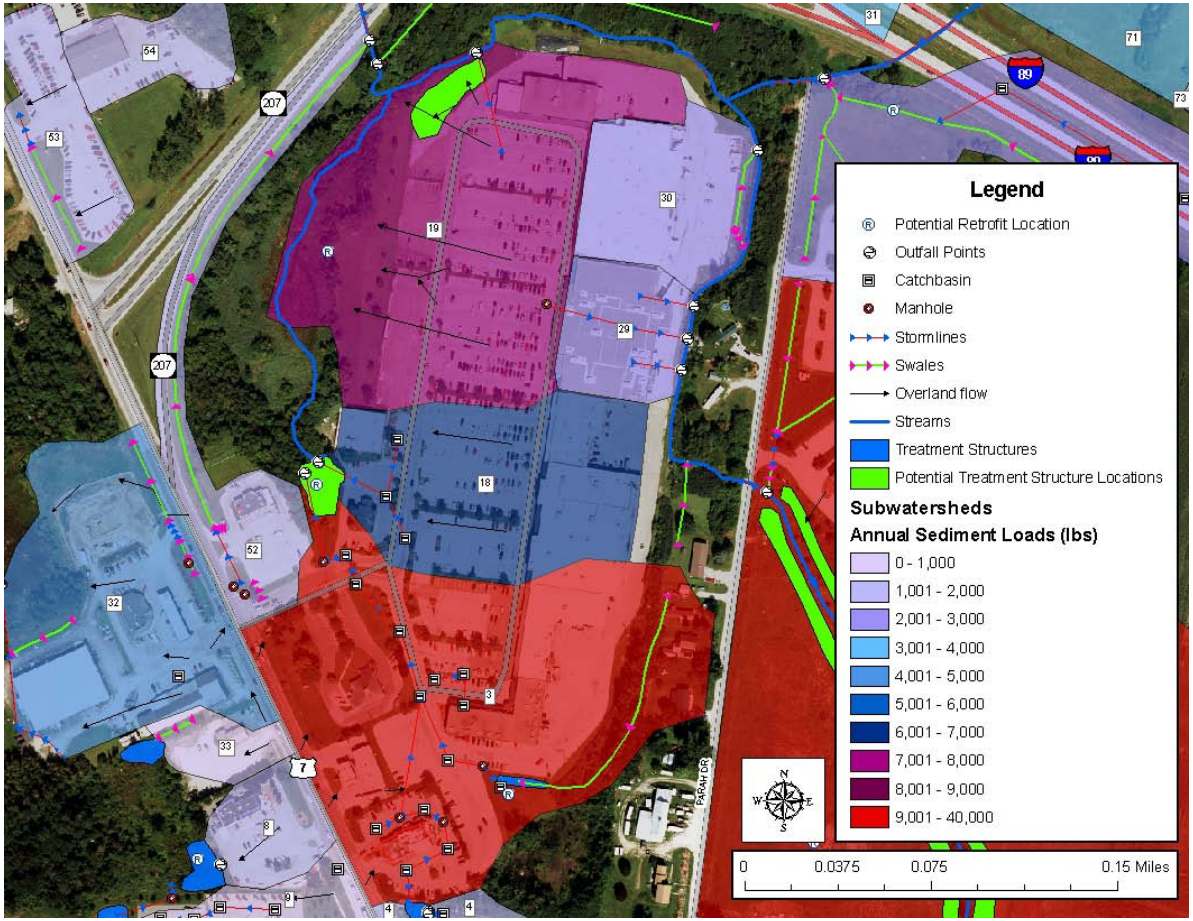
Step Five: SIMPLE Calculations

Watershed Number	Projected Sediment Load (lbs)	Projected Phosphorus Load (lbs)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
18	6,107	17.0	0.35	0.51
3	9,417	26.2	0.53	0.82
19	7,606	21.1	0.43	0.67
30	2,872	8.0	0.16	0.24
29	2,031	5.6	0.12	0.17



- Annual sediment and phosphorus loads were calculated using the SIMPLE method. This enabled the ranking of the subwatersheds by projected TSS and TP loads showing the potentially most problematic subwatersheds. The values are planning level estimates and are not intended for use for regulatory purposes.

Step Six: Potential Treatment Structure Locations



-The highest priority subwatersheds were looked at in more detail and potential treatment practices and funding options were suggested for each.

Watershed Number	Action List	Proposed or Existing Stormwater Treatment Practice	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal per pound	Cost of Phosphorus Removal per pound	Assistance Program
3	1/1	Upgrade permitted basin to ext. det. micro pool and combine with outfall # 18		$15,000	$3	$1,529	ANR-CWSRF C&C, 319

Potential Treatment Practice Suggestions Approximate Cost/lb of Phosphorus Removed

Suggested Treatment Practice	Projected Cost/lb of Phosphorus Removed
Adding stream buffers, stabilizing swales, cleaning catchbasins, IDDE	$200 – $6,000
Upgrading existing permitted basins/ponds or other stormwater structures	$1,500 – $7,000
Building new sedimentation tanks, wet ponds, extended detention micro-pools	$7,000 – $45,000

What is an illicit discharge and who is required to correct them?

- A discharge to an MS4 that is not composed entirely of storm water except permitted discharges and fire fighting related discharges (40 CFR 122.26(b)(2)).
- All regulated municipal separate storm sewer system (MS4) operators are required to develop IDDE plans and implement them. The plan requires monitoring, reporting, education, an ordinance and catch basin marking.
- VT law encourages non regulated MS4s to develop IDDE programs (Sec. 3. 10 V.S.A. § 1264 (b)(9)).

Why IDDE?

Average residential sewage contributes 3.39 lbs TP/yr

Approximate cost for 1 lb of Phosphorus removal:

@WWTP - $220/lb
IDDE - $350/lb
SW Treatment - $1500/lb+

Sources of Illicit Discharges

- Illegal dumping
- Broken sanitary sewer line
- Cross-connections
- Connection of floor drains to storm sewer
- Sanitary sewer overflows or leaking pipes
- Failing septic systems
- Improper RV waste disposal
- Pump station failures

- Examples of obvious illicit discharges

Acute
Antifreeze/Propylene Glycol-S.Burlington

Chronic
Sewage
Killington

Chronic
Soap/Detergent
Colchester

Acute
Paint
Essex

Chronic
Hot Water
Barre

Acute
Chlorinated
Pool Water
Colchester

•Examples of not so obvious illicit discharges

Chronic
Oil & Grit Separator Sediment
Williston

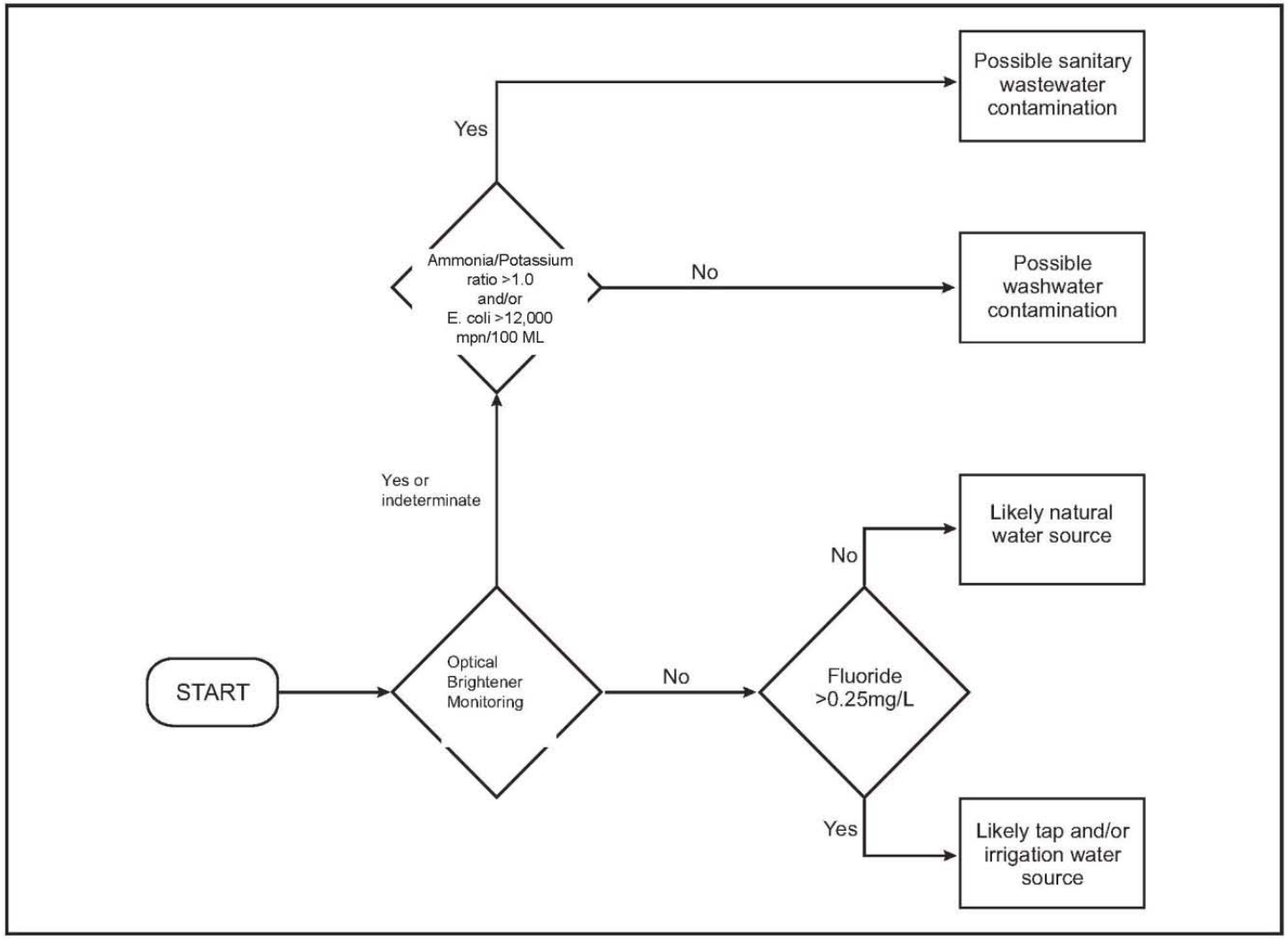
Chronic
Boiler Fungicide
S.Burlington

- Examples of discharges that are typically not illicit

Foam-natural surfactants

Iron bacteria

Example Flow Chart to Identify Illicit Discharges in Residential Drainage Areas Using Multiple Indicators



Source Area Ammonia/Potassium Ratios

Source of Water	**NH_3/K mean**
Springs	0.01
Car Washes	0.01
Radiator flushing	0.01
Household tap	0.02
Landscaping runoff	0.07
Shallow groundwater	0.16
Plating operations	0.16
Laundry	0.24
Sewage	1.69
Septic tank discharge	5.18

Optical Brightener Pad

Quanti-tray E.coli Sampler

MS4: Burlington Comments/Additional Information: This outfall suspect
Discharge Point Name: Map ID #2, Plattsburgh Ave 36" outfall
Location: Off Plattsburgh Avenue and Route 127, near the bikepath
Watershed/Drainage: Winooski River
Monitoring Dates: 10/7/04, 10/18/04, 1/5/05
Sample Collected By: S. Roy
Analyst or Laboratory: Main WWTP Lab
Date(s) of Analysis: 10/7/04, 10/18/04, 1/5/05
Analytical Methods: Standard Methods 9223 (*E. Coli*) and Optical Brightener Test

Date/Time	Parameter	Units	Results	Date/Time	Parameter	Units	Results
10/7 1130	*E. Coli*	cfu/100mls	>2,419				
10/18 0955	*E. Coli*	cfu/100mls	39,726				
10/18 0955	Optical B.	none	positive				
1/5/05 0745	*E. Coli*	cfu/100mls	4,884				

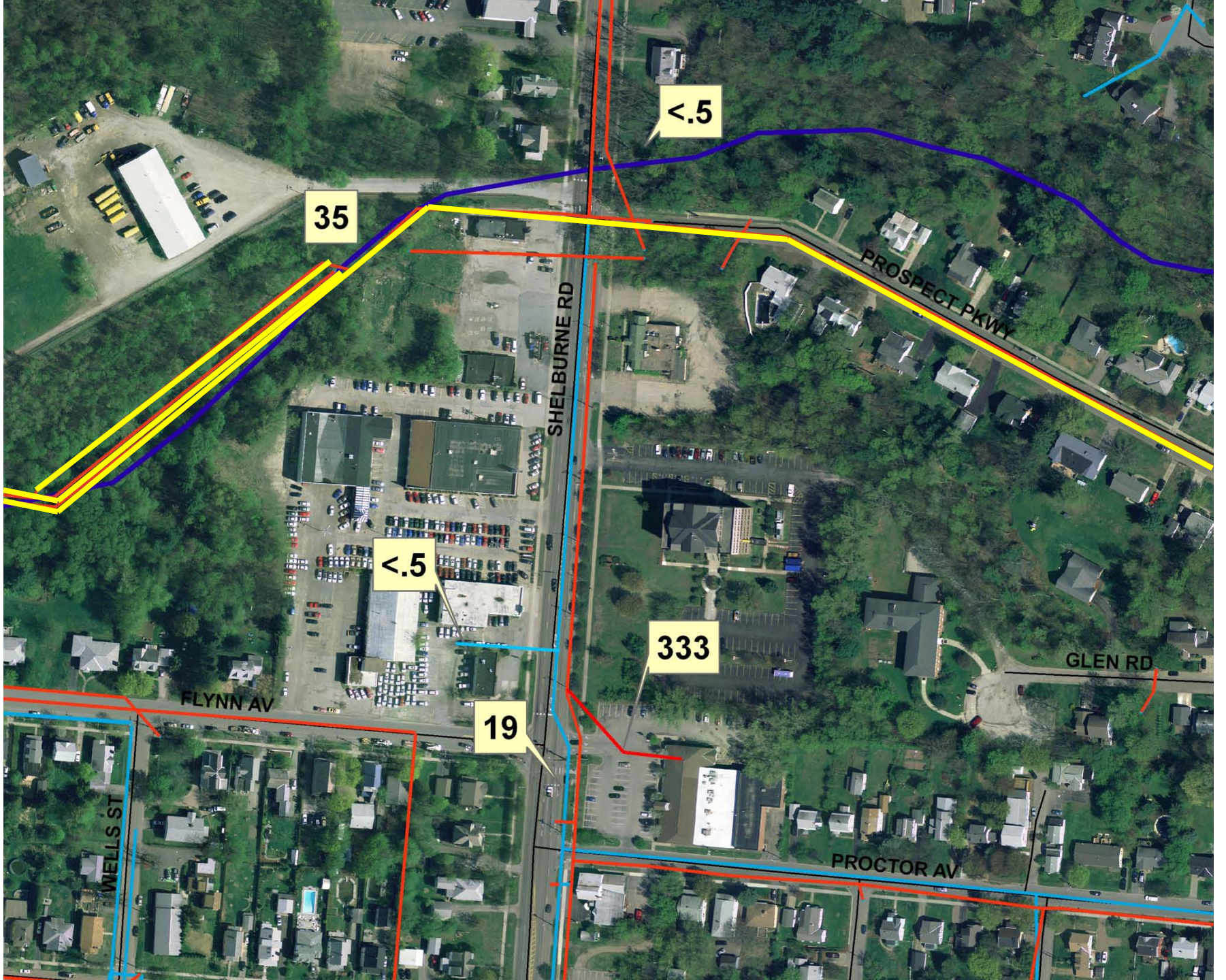
Discharge Monitoring Report

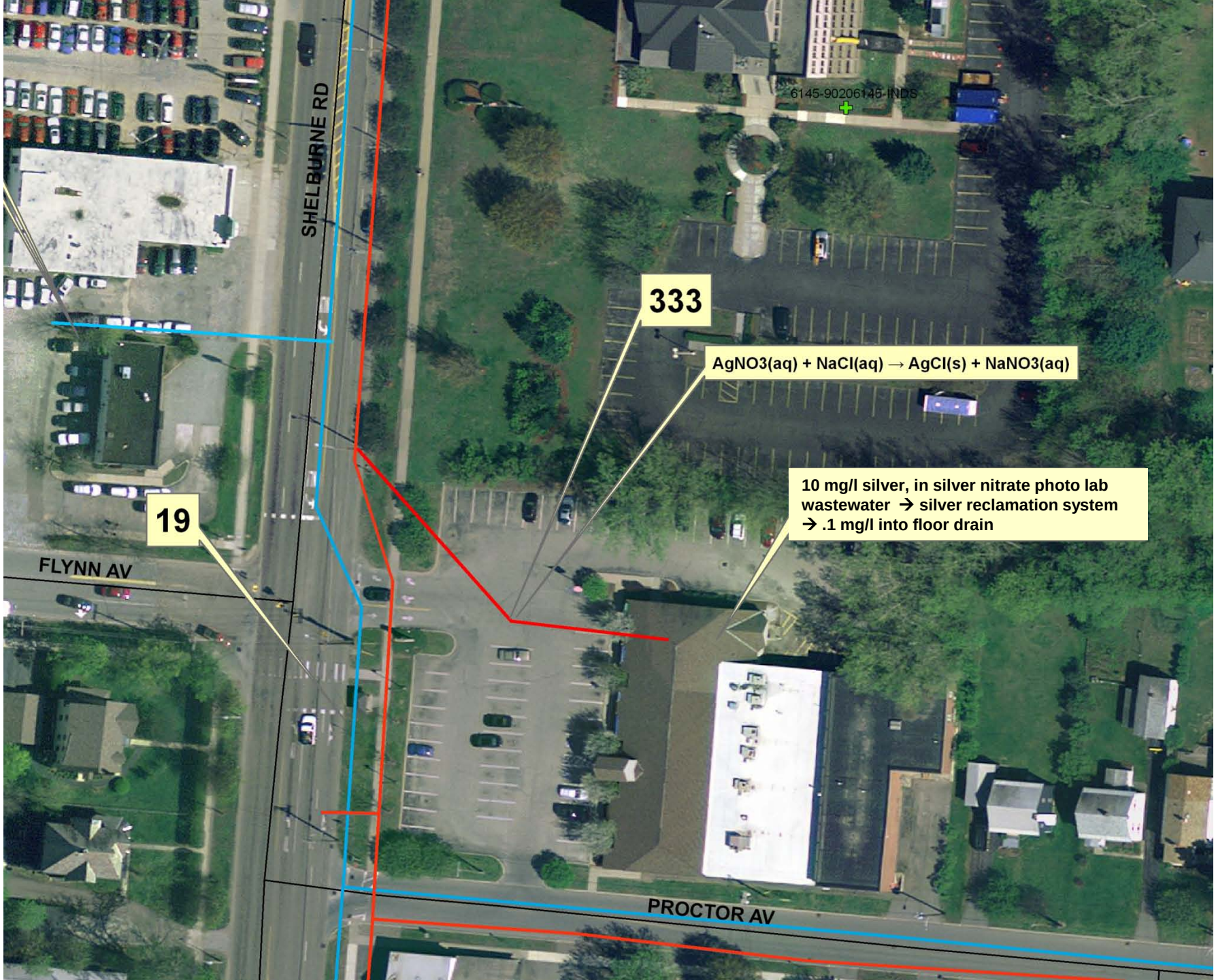
Example of using other data sources & bracketing an illicit discharge

Table 12. Mean Metal Concentrations in Urban Stream Fine (<63u) Sediments: ug/g dry weight with Relative Standard Deviation (SD/Mean x 100) expressed as % in ( ). N = 2 Field Replicates. Streams and metals listed in order of sediment criteria exceedence frequency of occurrence. Dark shaded values are in exceedence of ER-M and/or Ontario High Effects Sediment concentrations. Light shaded values are in exceedence of ER-L and/or Ontario No Effects Sediment concentrations. * = Detected in fish. ND = no data.

	Zinc	Nickel	Lead	Copper	Chromium	Mercury	Arsenic	Silver	Cadmium	Mean RSD
Steven's Brook	309* (11)	125 (19)	67.5 (20)	77.5 (10)	172* (18)	1.25* (17)	3.95 (20)	1.50 (9.3)	<5	15.5
Boynton St.	1070*	25.0	348	135	51.0	1.10	3.50	0.99	<5	
Englesby Ravine	276* (6.9)	43.5 (1.6)	92.5 (11)	43.0 (3.3)	43.0 (1.7)	0.38 (7.9)	9.40 (7.6)	4.72 (19)	<5	7.38
Potash Brook	279* (3.0)	30.5* (2.3)	40.0 (3.5)	33.5* (2.1)	38.0* (3.7)	<0.10	7.15 (1.0)	<0.50	<5	2.60
Centennial Brook	213* (2.7)	30.0* (4.7)	49.0 (0.0)	34.0* (4.1)	27.5* (2.6)	0.13* (5.6)	11.7 (15)	<0.50	<5*	4.96
Bartlett's Brook	144* (11)	33.0 (4.3)	<25	28.0* (10)	36.0 (12)	<0.10	6.10 (19)	<0.50	<5	11.3
Moon Brook	249* (9.6)	<25*	91.0 (7.8)	61.5 (13)	<26*	0.20 (7.0)	3.35 (10)	<0.50	<5	9.48
Muddy Brook	125* (2.8)	30.0 (4.7)	<25	26.5 (2.7)	25.5 (2.8)	<0.10	9.55 (3.7)	<0.50	<5	3.34
Sunderland Brook	116* (20)	31.5* (2.3)	<25	26.0* (5.4)	30.0* (0.0)	<0.10	7.90 (12)	<0.50	<5	7.94
Mallett's Creek	102* (4.2)	31.0 (0.0)	<25	<25	32.0 (4.4)	<0.10	<2.00	<0.50	<5	2.87
Indian Brook	76.5* (4.6)	<25*	<25	<25*	<26*	<0.10	5.80 (15)	<0.50	<5	9.80
Fieldhouse Brook	ND*	ND	ND	ND	ND*	ND	ND	ND	ND	
Mean RSD	7.58	4.86	8.46	6.33	5.65	9.38	11.5	14.2		

LOCUST ST
LEDGE RD
SHELBURNE RD
ADAMS CT
LAKESIDE AV
CHERRY LN
HOOVER ST
CENTRAL AV
4.7
17
30
PINE ST
<.5
35
CRESCENT RD
FLYNN AV
FOSTER AVE
FERGUSON AV
LYMAN AV
WHITE PL
ORCHARD RD
MORSE PL
WELLS ST
SCARFF AV
HADLEY RD
BACON ST
HOME AV
Sources of Silver:
Coal burning
Dental offices
Photo laboratories
Industrial metal plating


<.5
35
PROSPECT PKWY
SHELBURNE RD
<.5
333
GLEN RD
FLYNN AV
19
WELLS ST
PROCTOR AV


SHELBURNE RD
6145-90206145-INDS
333
AgNO3(aq) + NaCl(aq) → AgCl(s) + NaNO3(aq)
10 mg/l silver, in silver nitrate photo lab wastewater → silver reclamation system → .1 mg/l into floor drain
19
FLYNN AV
PROCTOR AV

Techniques to Confirm the Discharge

Source: www.darrscleaning.com

Source: NEIWPPC,2003

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Source: www.darrscleaning.com

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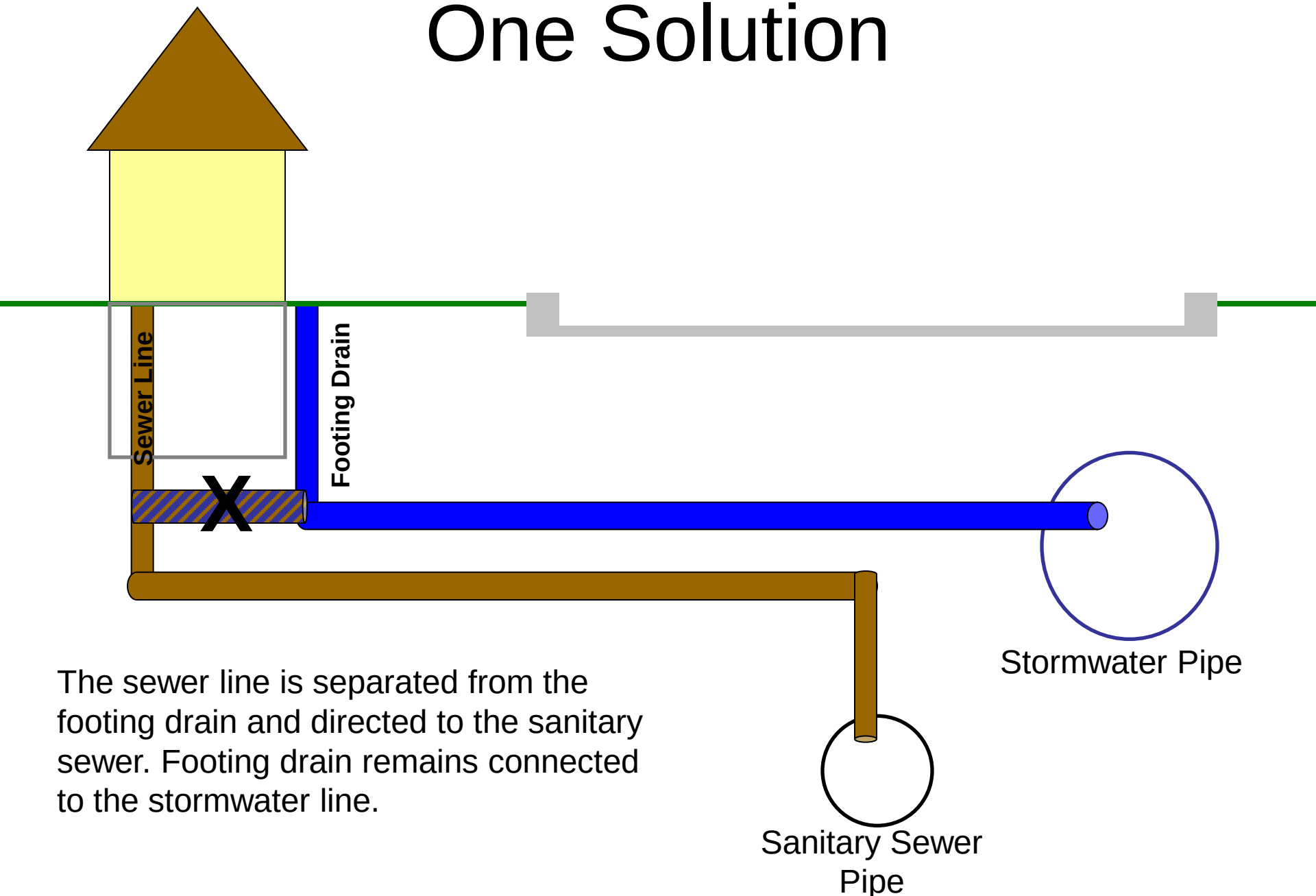
One Solution



The sewer line is separated from the footing drain and directed to the sanitary sewer. Footing drain remains connected to the stormwater line.

Another Solution

•As a result of storm drainage mapping and bracketed monitoring of polyaromatic hydrocarbons in sediment in the Shelburne Bay Watershed of Lake Champlain a constructed wetland on Bartlett Brook in South Burlington was built in 2002. The primary source area of the PAHs was the road.

The constructed wetland cost about $230,000 and removes an estimated 25 lbs/TP/yr. The cost is about $9200/lb/TP.

The wetland also removes 92% of the E.coli as well as oil/grease.

Lamoureux & Dickinson

IDDE since 2003:

Lake Champlain Basin

1. 12 Regulated Municipal Separate Storm Sewer Systems in Chittenden County have eliminated 36 illicit discharges to date, estimated to be the equivalent to 89 kg/TP/yr. or .089 metric tons.
2. Work conducted by volunteer watershed groups and VTDEC in the Missisquoi and Winooski River watersheds have eliminated 227 kg/TP/yr. or .227 metric tons.
3. Projects are currently ongoing in the Lamoille River and Otter Creek watersheds.

Connecticut River Basin

1. One corrected discharge involving a wastewater main is estimated to have eliminated 224 kg/TN/yr. or .224 metric tons.