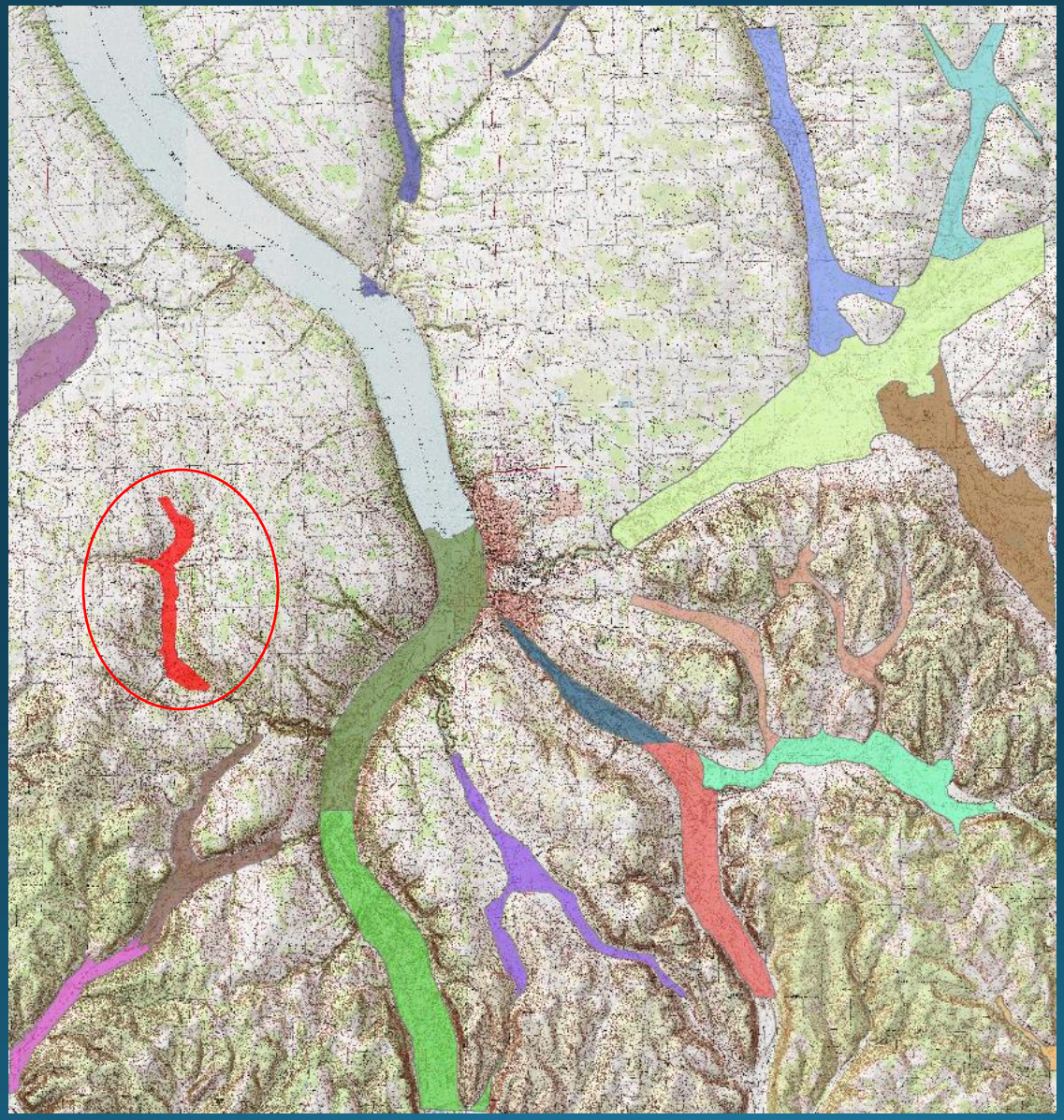
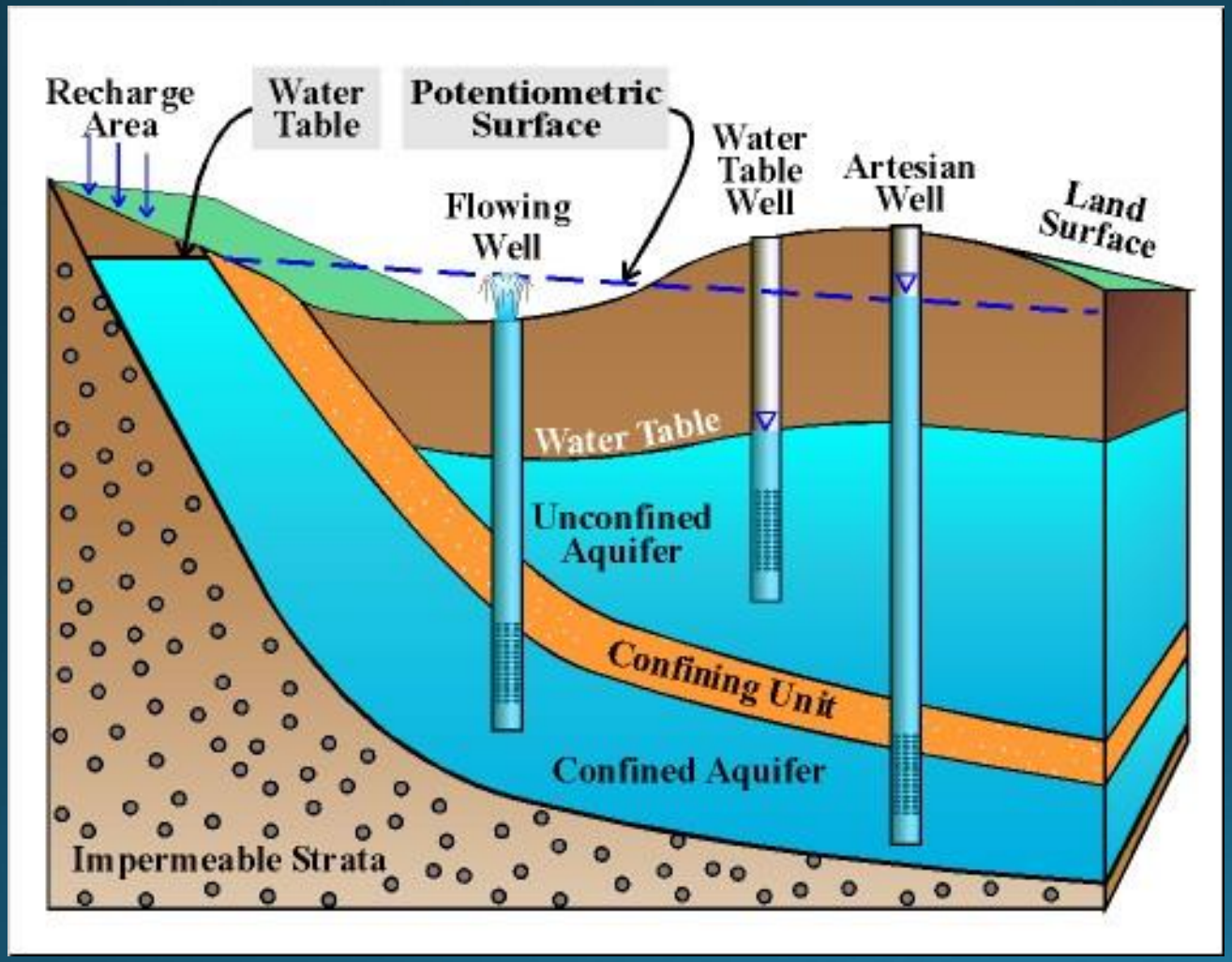
Enfield Aquifer Project



One of the original 17 valley-fill, unconsolidated aquifer segments in Tompkins County, NY

Aquifer Characterization



- Aquifer type- confined, unconfined
- Recharge and discharge
- Direction of groundwater flow
- Groundwater /surface water interaction
- Water use
- Well yields
- Water quality

Approach

General Geohydrologic assessment

Geohydrologic framework

- Construct base map
- Inventory wells
- Conduct several passive seismic surveys
- Install up to 4 wells
- Construct geohydrologic sections
- Compile a surficial geology map

Potentiometric surface and direction of ground-water flow

- Conduct synoptic groundwater-level measurements
- Install water-level recorders in wells finished at various depths and geohydrologic units
- Analyze aquifer-test data from drillers' records

Approach cont.

Groundwater/surface-water interaction

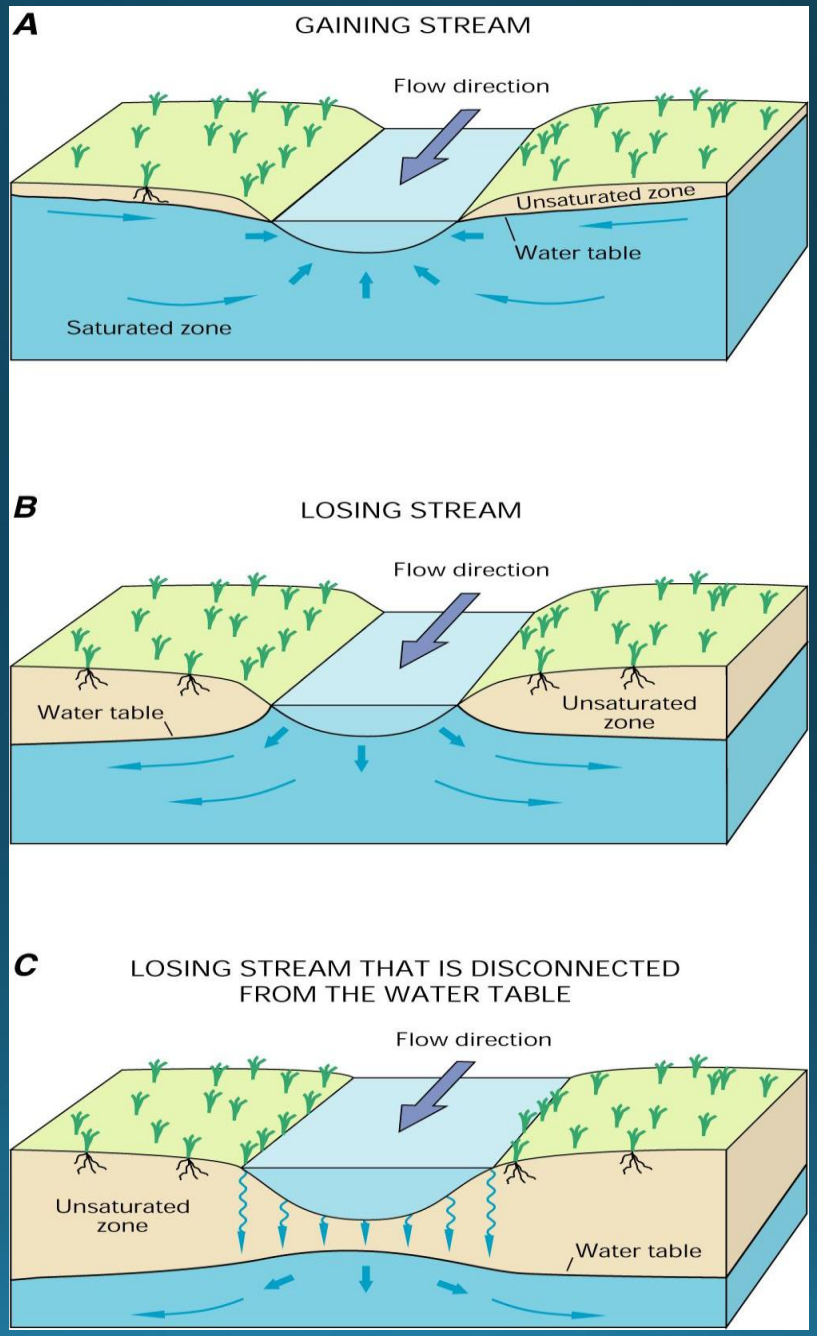
- Conduct stream gain/loss measurements in Enfield Creek and its major tributaries

Water quality

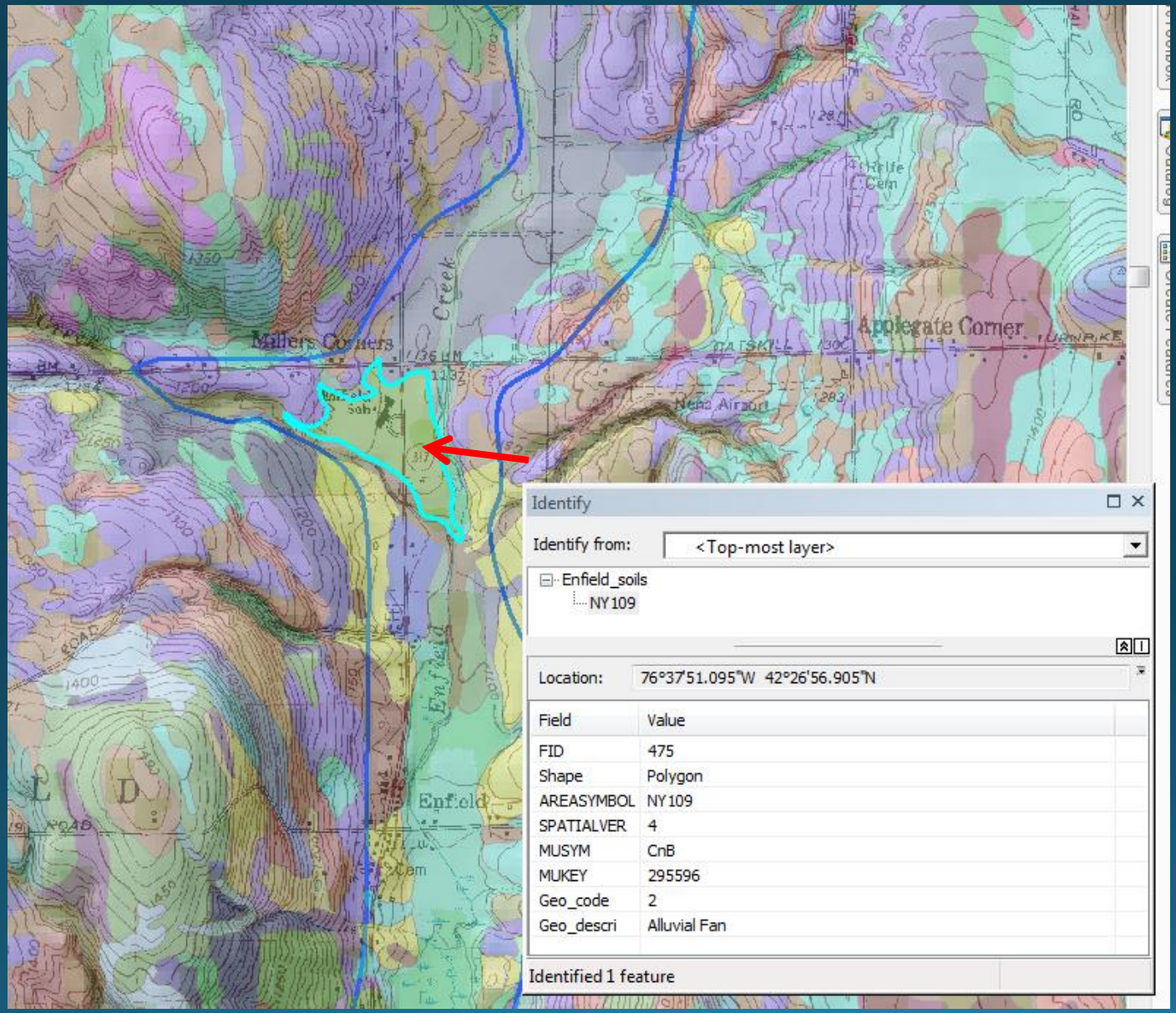
- Collect and compile available chemical data
- Collect four ground-water samples
- Sample three surface-water sites- at least two from tributary streams and one from Enfield Creek.

Inorganics
Trace metals
Alkalinity
Voc's
Nutrients GW samples
Pesticides
Inorganics

Ground-water/ surface-water interactions

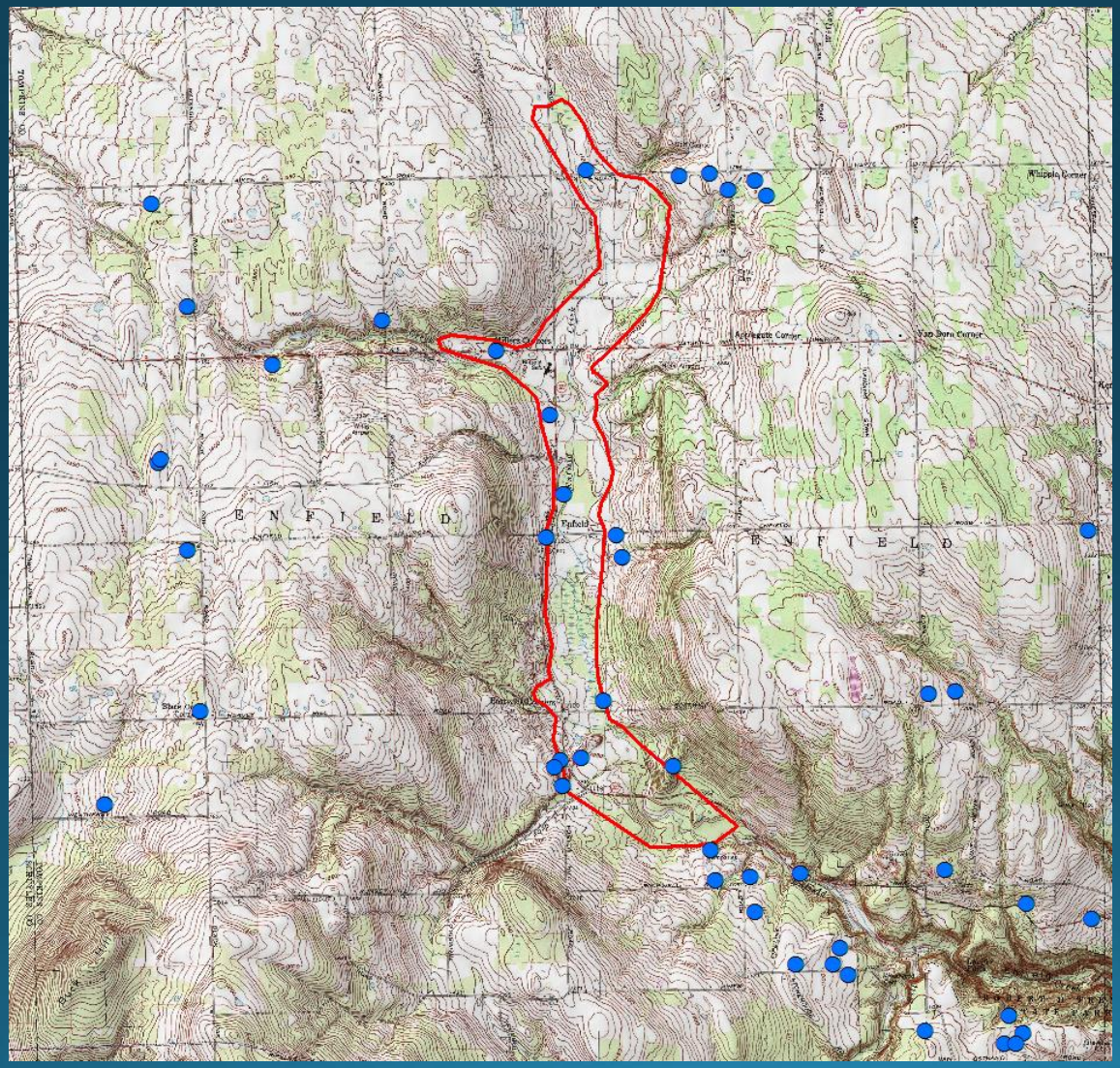


Using soils maps to help determine surficial geology = different types of materials with different aquifer properties



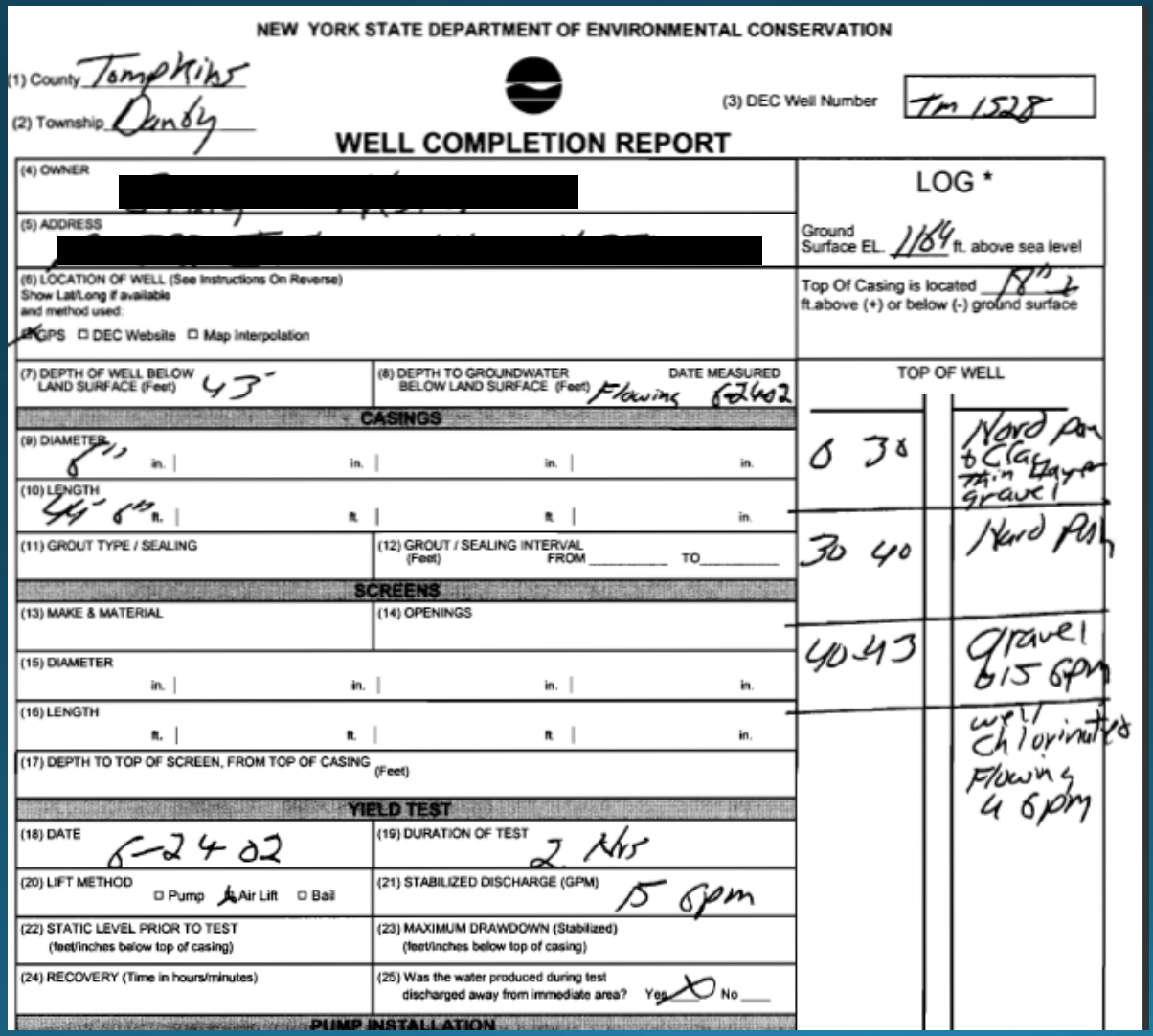
Work completed in FY-15

- Wells collected from DEC and stored in our Groundwater Site Inventory (GWSI) in order to better characterize aquifer geometry



Work completed in FY-15

- Each well drilled in NYS post-2000 has a driller's log associated with it that looks similar to this example



NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

(1) County Tompkins
(2) Township Dandy
(3) DEC Well Number Tm 1528

WELL COMPLETION REPORT

(4) OWNER [redacted]
(5) ADDRESS [redacted]
(6) LOCATION OF WELL (See Instructions On Reverse)
Show Lat/Long if available
and method used:
☒ GPS ☐ DEC Website ☐ Map Interpolation

(7) DEPTH OF WELL BELOW LAND SURFACE (Feet) 43'
(8) DEPTH TO GROUNDWATER BELOW LAND SURFACE (Feet) Flowing DATE MEASURED 6/24/02

CASINGS
(9) DIAMETER 6" in. | in. | in. | in.
(10) LENGTH 44' 8" ft. | ft. | ft. | in.
(11) GROUT TYPE / SEALING
(12) GROUT / SEALING INTERVAL (Feet) FROM _____ TO _____

SCREENS
(13) MAKE & MATERIAL
(14) OPENINGS
(15) DIAMETER in. | in. | in. | in.
(16) LENGTH ft. | ft. | ft. | in.
(17) DEPTH TO TOP OF SCREEN, FROM TOP OF CASING (Feet)

YIELD TEST
(18) DATE 6-24-02
(19) DURATION OF TEST 2 Hrs
(20) LIFT METHOD ☐ Pump ☒ Air Lift ☐ Bail
(21) STABILIZED DISCHARGE (GPM) 5 GPM
(22) STATIC LEVEL PRIOR TO TEST (feet/inches below top of casing)
(23) MAXIMUM DRAWDOWN (Stabilized) (feet/inches below top of casing)
(24) RECOVERY (Time in hours/minutes)
(25) Was the water produced during test discharged away from immediate area? Yes X No ___

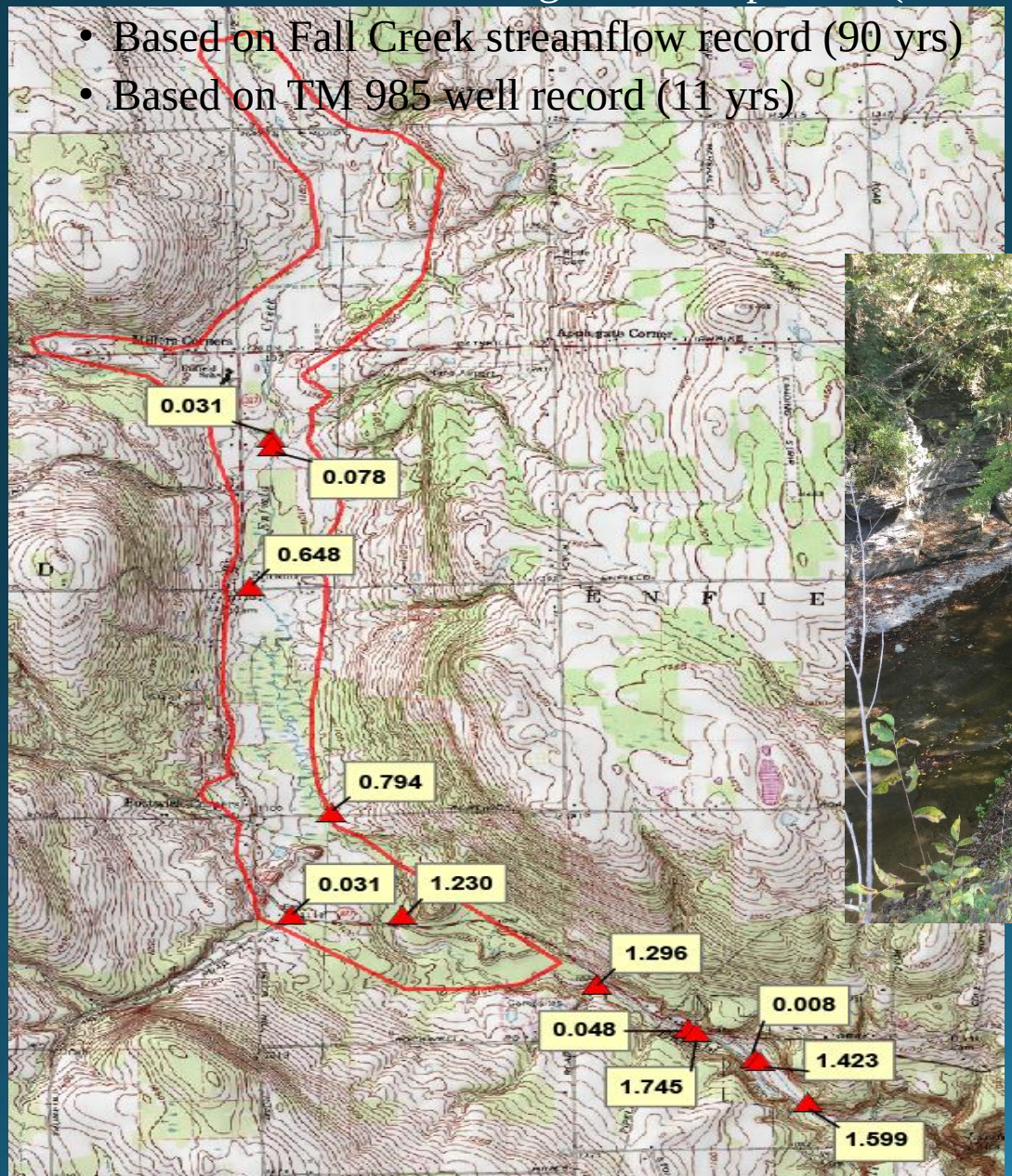
PUMP INSTALLATION

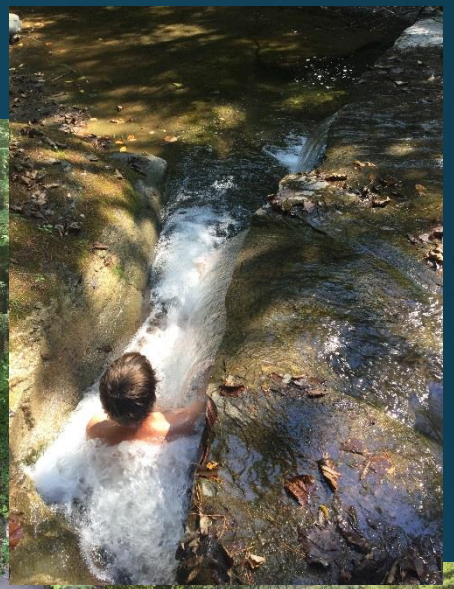
LOG *
Ground Surface EL. 1164 ft. above sea level
Top Of Casing is located 18" + ft.above (+) or below (-) ground surface

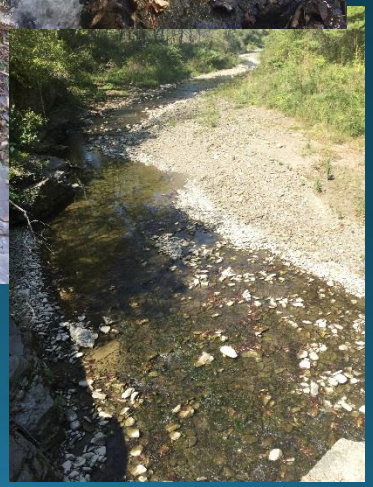
TOP OF WELL	
0 38	Hard Pan to Clay Mix Layers of Gravel
38 40	Hard Pan
40 43	Gravel 15 GPM
	well Chlorinated Flowing 4 GPM

Work completed in FY-15

- Measured streamflow during low-flow periods (summer/average low flow) at 12 sites
  - Based on Fall Creek streamflow record (90 yrs)
  - Based on TM 985 well record (11 yrs)





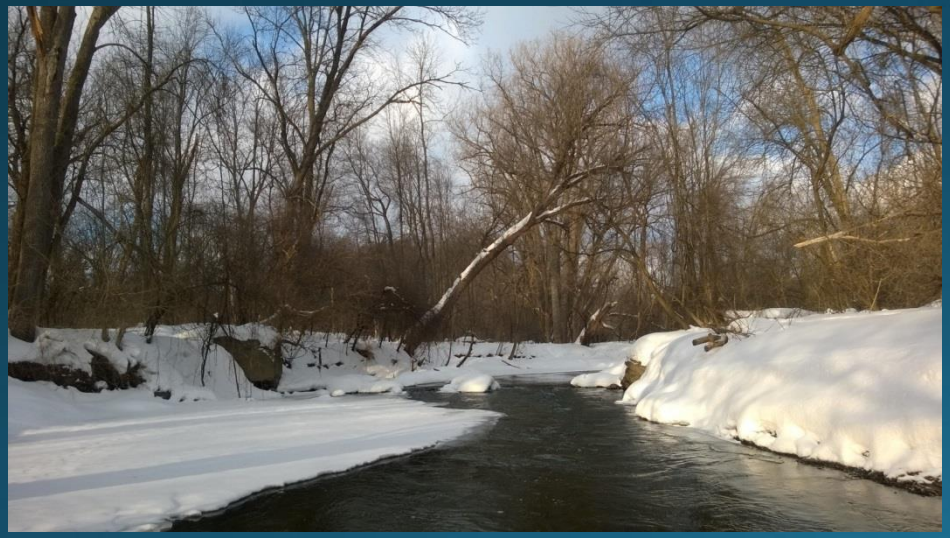


Work completed in FY-15

- Collected 6 water quality samples from 5 streams

Nutirents GW samples

Nitrogen, ammonia as N
nitrogen, ammonia + organic nitrogen
nitrogen, nitrite
nitrogen, nitrite + nitrate
phosphorus, phosphate, ortho



Inoraganics & trace elements

Alkalinity, laboratory
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Bromide
Cadmium
Calcium
Chloride
Chromium
Cobalt
Copper
Fluoride

Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
pH, laboratory
Potassium
Residue, 180 degrees Celsius (TDS)
Selenium
Silica
Silver
Sodium
specific conductance, laboratory
Strontium
Sulfate
Uranium, natural
Zinc

Work completed in FY-15

- Water quality results from stream sampling

Station number	Station name	Dates	Sample start time	Medium code	P00061 Discharge, instantaneous, cubic feet per second	P00300 Dissolved oxygen, water, unfiltered, milligrams per liter	P00400 pH, water, unfiltered, field, standard units	Specific conductance, water, unfiltered, microsiemens per centimeter at 25	P00010 Temperature, water, degrees Celsius	P70300 Dissolved solids dried at 180 degrees Celsius, water, filtered, milligrams per liter	P00915 Calcium, water, filtered, milligrams per liter	P00925 Magnesium, water, filtered, milligrams per liter	P00935 Potassium, water, filtered, milligrams per liter	P00930 Sodium, water, filtered, milligrams per liter
04233051	ENFIELD CR ABV FIVEMILE CR AT MILLERS CORNERS NY	20150917	0705 EST	WS	0.03	7.6	7.4	375	11.8	322	61	9.5	1.45	36.9
04233060	ENFIELD CR AT ENFIELD CENTER RD 3 AT ENFIELD NY	20150917	0850 EST	WS	0.65	9.6	7.9	451	14.8	266	51.2	8.76	1.59	25.7
04233080	ENFIELD CREEK ABOVE SR-327 AT BOSTWICK CORNERS NY	20150917	1145 EST	WS	1.2	8.7	7.9	462	17.9	264	56.1	10.2	1.65	21.4
04233085	ENFIELD CREEK AT HINES RD NR BOSTWICK CORNERS NY	20150917	1250 EST	WS	1.3	10.3	8.4	440	18.2	272	55	10.2	1.63	22.1
04233097	ENFIELD CR BLW TRIB 4 NR ROBERT H TREMAN ST PK NY	20150917	1445 EST	WS	1.4	9.6	8.4	264	19.5	258	51.5	10.6	1.71	22.4
04233097	ENFIELD CR BLW TRIB 4 NR ROBERT H TREMAN ST PK NY	20150917	1446 EST	WSQ	1.4	9.6	8.4	264	19.5	264	52.3	10.6	1.72	22.6

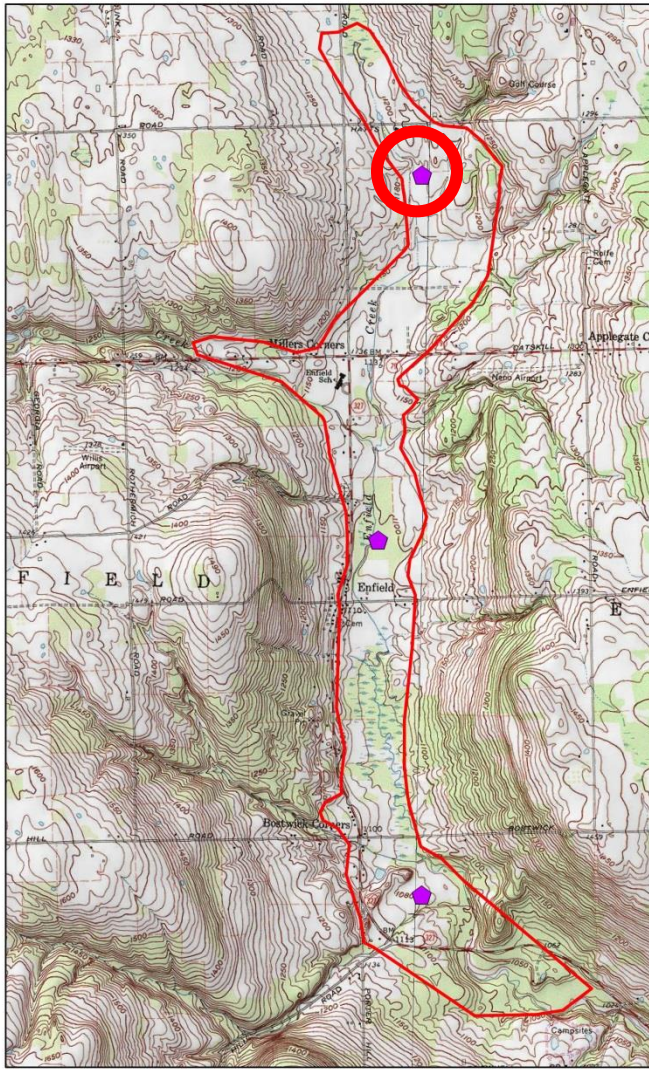
P00930 Sodium, water, filtered, milligrams per liter	Alkalinity, water, filtered, fixed endpoint (pH 4.5) titration, laboratory,	P71870 Bromide, water, filtered, milligrams per liter	P00940 Chloride, water, filtered, milligrams per liter	P00950 Fluoride, water, filtered, milligrams per liter	P00955 Silica, water, filtered, milligrams per liter as SiO2	P00945 Sulfate, water, filtered, milligrams per liter	Ammonia plus organic nitrogen, water, filtered, milligrams per liter as nitrogen	P00608 Ammonia, water, filtered, milligrams per liter as nitrogen	P00631 Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	P00613 Nitrite, water, filtered, milligrams per liter as nitrogen	P00671 Orthophosphate, water, filtered, milligrams per liter as phosphorus	P01106 Aluminum, water, filtered, micrograms per liter	P01005 Barium, water, filtered, micrograms per liter	P01010 Beryllium, water, filtered, micrograms per liter	P01025 Cadmium, water, filtered, micrograms per liter	P01030 Chromium, water, filtered, micrograms per liter	P01035 Cobalt, water, filtered, micrograms per liter	P01040 Copper, water, filtered, micrograms per liter
36.9	185	0.043	61.2	0.05	6.5	9.45	0.12	0.02	1.96	0.002	<0.004	8.5	29.1	<0.02	<0.03	<0.3	0.101	1.4
25.7	156	0.032	44.8	0.05	6.67	11.5	0.11	<0.01	1.26	0.004	0.005	<3	30.3	<0.02	<0.03	0.83	0.073	<0.8
21.4	175	0.04	37.4	0.06	6.79	12.3	0.12	<0.01	0.384	0.003	0.004	3.5	42	<0.02	<0.03	<0.3	0.12	0.97
22.1	178	0.053	38.9	0.07	6.09	14.5	0.14	<0.01	0.194	0.002	0.004	3.1	43.4	<0.02	<0.03	<0.3	0.058	1.1
22.4	166	0.049	38.7	0.07	5.83	15.7	0.12	<0.01	0.105	0.002	<0.004	<3	40.4	<0.02	<0.03	<0.3	0.058	0.91
22.6	165	0.045	38.4	0.07	5.81	15.5	0.12	<0.01	0.1	0.002	<0.004	12.3	40.4	<0.02	<0.03	<0.3	0.133	1.3

P01046 Iron, water, filtered, micrograms per liter	P01049 Lead, water, filtered, micrograms per liter	P01130 Lithium, water, filtered, micrograms per liter	P01056 Manganese, water, filtered, micrograms per liter	P01060 Molybdenum, water, filtered, micrograms per liter	P01065 Silver, water, filtered, micrograms per liter	P01075 Silver, water, filtered, micrograms per liter	P01080 Strontium, water, filtered, micrograms per liter	P01090 Zinc, water, filtered, micrograms per liter	P01095 Antimony, water, filtered, micrograms per liter	P01000 Arsenic, water, filtered, micrograms per liter	P01020 Boron, water, filtered, micrograms per liter	P01145 Selenium, water, filtered, micrograms per liter	P22703 Uranium (natural), water, filtered, micrograms per liter
<4	0.63	0.72	0.51	0.099	0.4	<0.02	114	<2	0.036	0.14	26	<0.05	0.225
9.9	0.109	0.67	10.4	0.232	0.37	<0.02	101	<2	0.058	0.21	20	<0.05	0.207
7.2	0.116	1.59	6.78	0.266	0.39	<0.02	104	<2	0.096	0.41	17	0.05	0.31
<4	0.463	1.02	5.07	0.393	0.4	<0.02	127	<2	0.065	0.4	17	<0.05	0.362
<4	0.084	1.65	1.03	0.466	0.36	<0.02	123	<2	0.068	0.45	17	<0.05	0.39
<4	0.105	1.44	1.26	0.469	0.39	<0.02	124	<2	0.087	0.45	17	<0.05	0.389

Work completed in FY-15

- Worked with county and town to let drilling contract
- Drilled 6 test wells

Work completed in FY-15



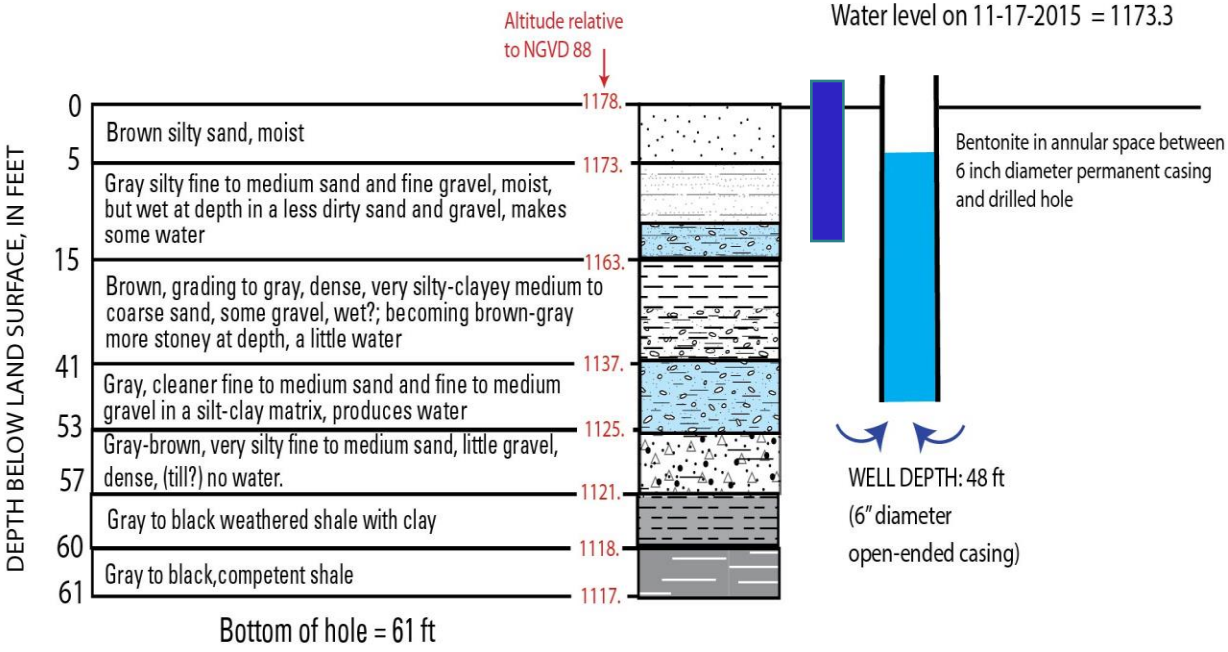
USGS TEST WELL TM1079

Hayts Road - Town of Enfield, N.Y.

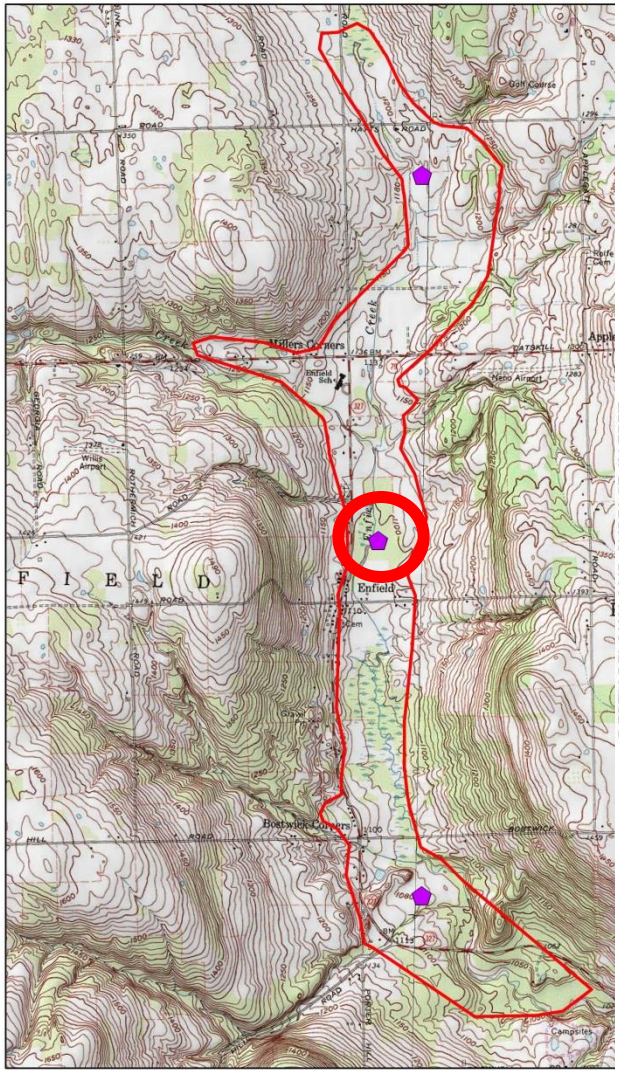
Site name: TM1079 (hole depth = 61 ft)
Site ID: 422744076373401
Latitude: 42° 27′ 43.72″
Longitude: 076° 37′ 33.94″

Date completed: 11/16/2015
Drilling contractor: Frey Well Drilling, Alden, NY
6-inch diameter steel casing
Casing above ground = 3.1 ft

Latitude and longitude measurement made by GPS (NAD83)



Work completed in FY-15



USGS TEST WELL TM1077

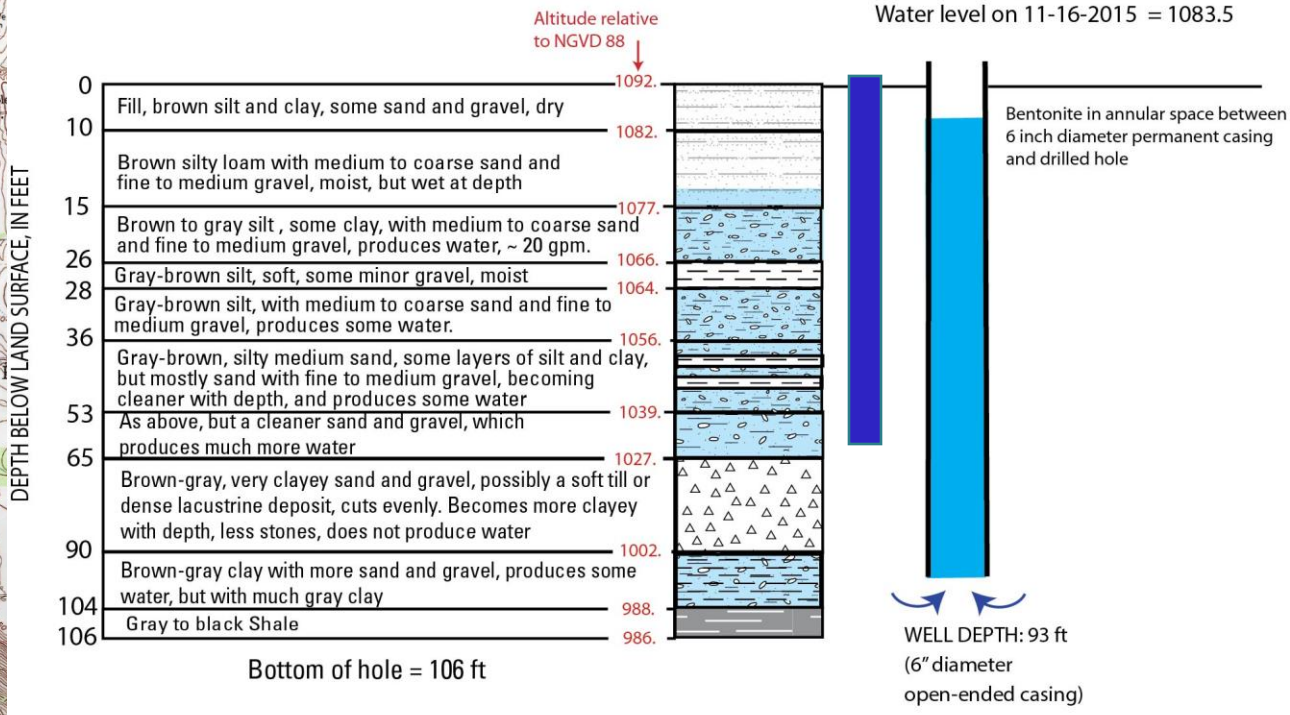
Stoneybrook - Town of Enfield, N.Y.

Site name: TM1077 (hole depth = 106 ft)
Site ID: 422623076374501
Latitude: 42° 26′ 22.74″
Longitude: 076° 37′ 44.90″

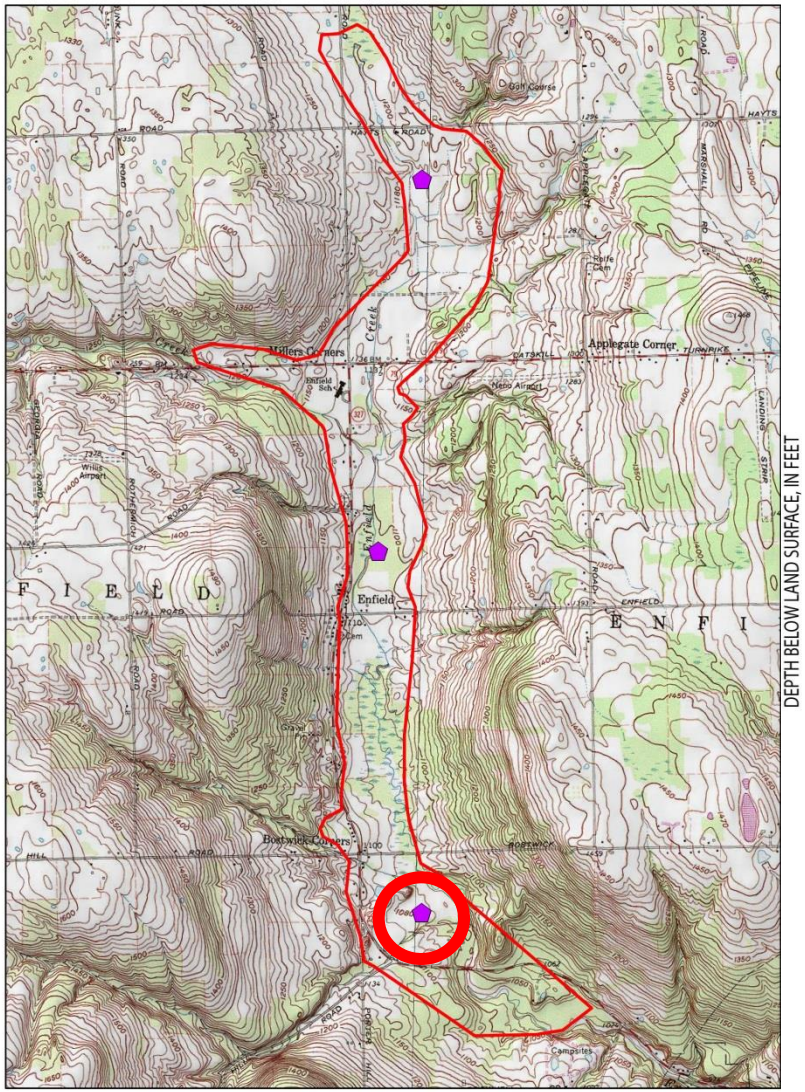
Date completed: 11/13/2015
Drilling contractor: Frey Well Drilling, Alden, NY
6-inch diameter steel casing
Casing above ground = 4.1 ft

Latitude and longitude measurement made by GPS (NAD83)

Elev. TOC (6 in.) = 1096.1 ft
Water level on 11-16-2015 = 1083.5



Work completed in FY-15



USGS TEST WELL TM1075

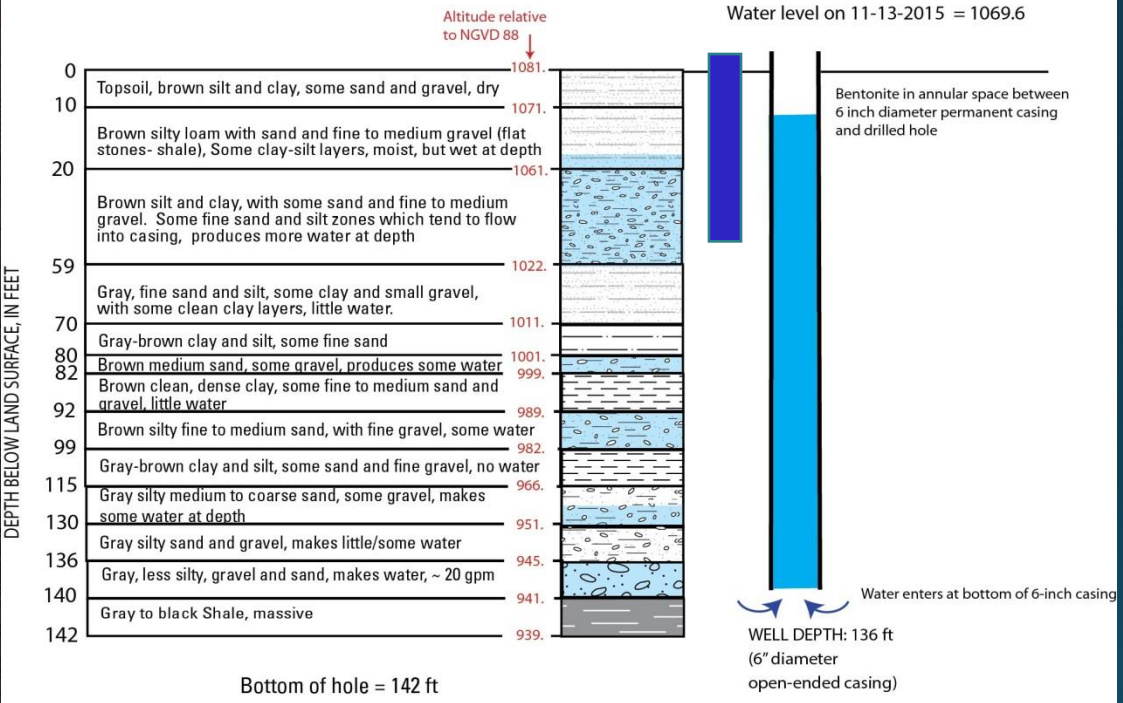
Town of Enfield Highway Department, Town of Enfield, N.Y.

Site name: TM1075 (hole depth = 142 ft)
Site ID: 422504076373001
Latitude: 42° 25′ 04.28″
Longitude: 076° 37′ 29.89″

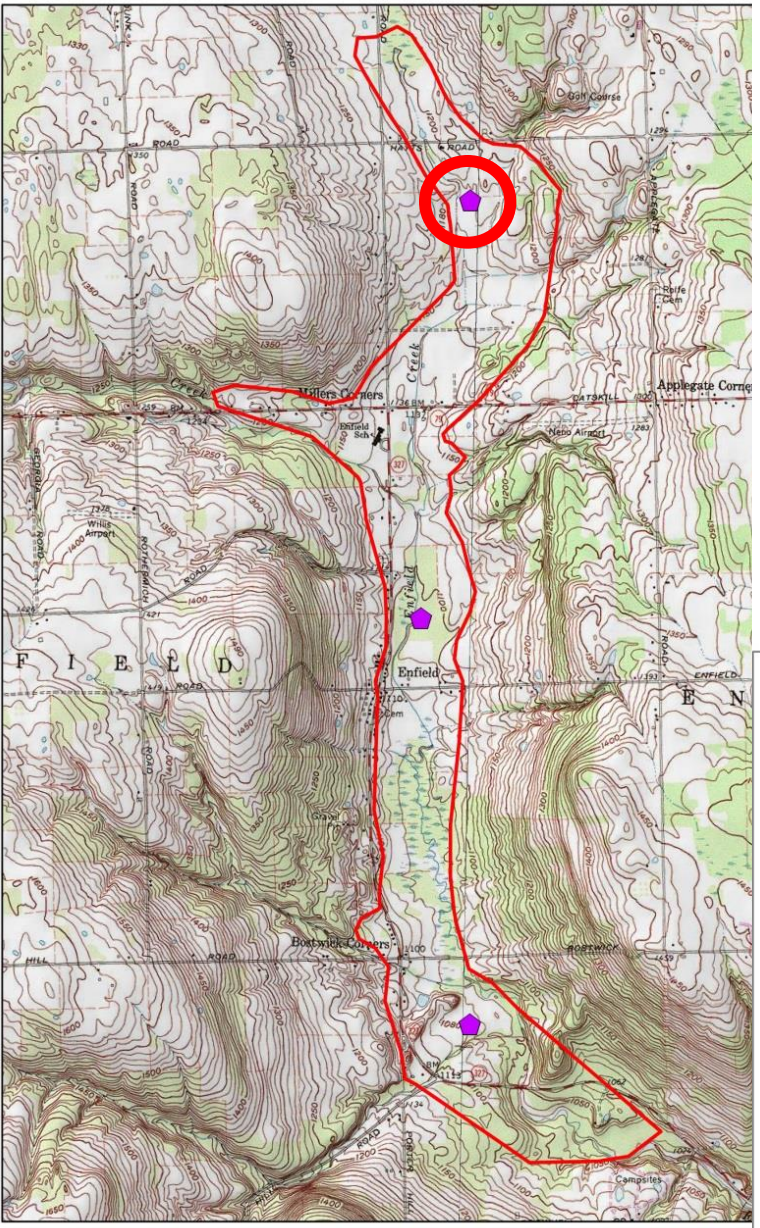
Date completed: 11/11/2015
Drilling contractor: Frey Well Drilling, Alden, NY
6-inch diameter steel casing
Casing above ground = 3.1 ft

Latitude and longitude measurement made by GPS (NAD83)

Elev. TOC (6 in.) = 1084.1 ft
Water level on 11-13-2015 = 1069.6

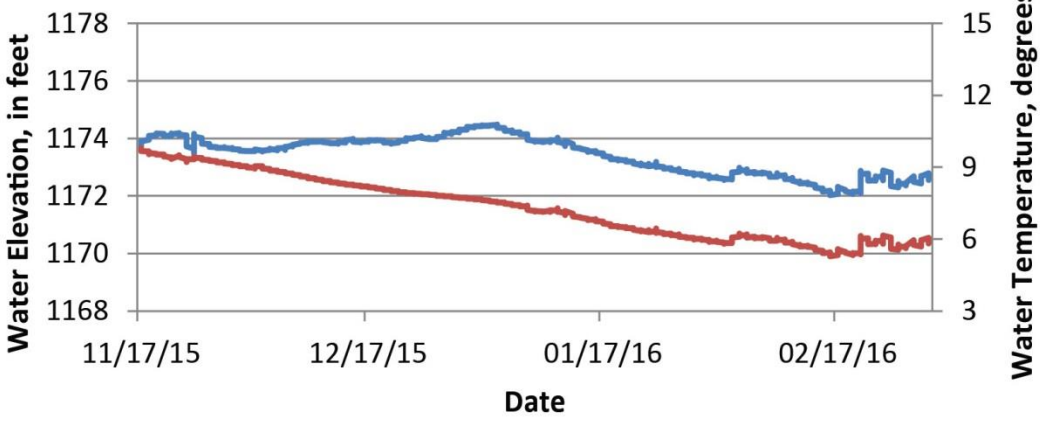


Bottom of hole = 142 ft



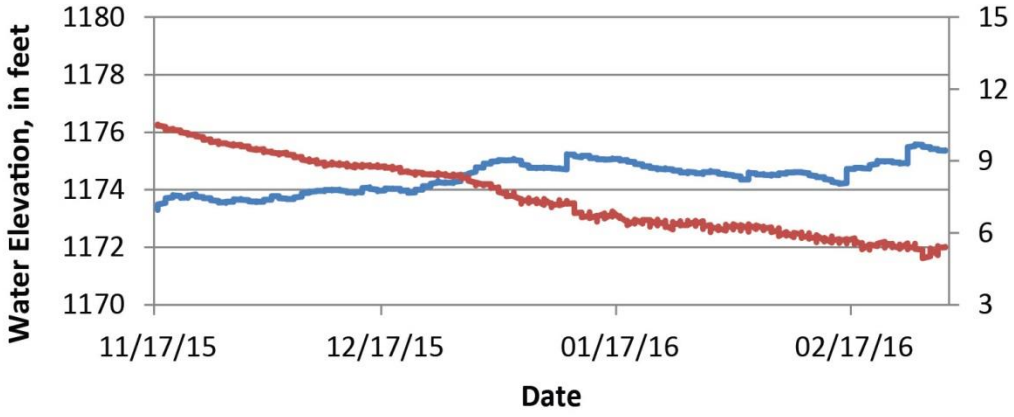
Hayts Rd - Shallow Well (10 ft)
Nov. 2015 - Feb. 2016

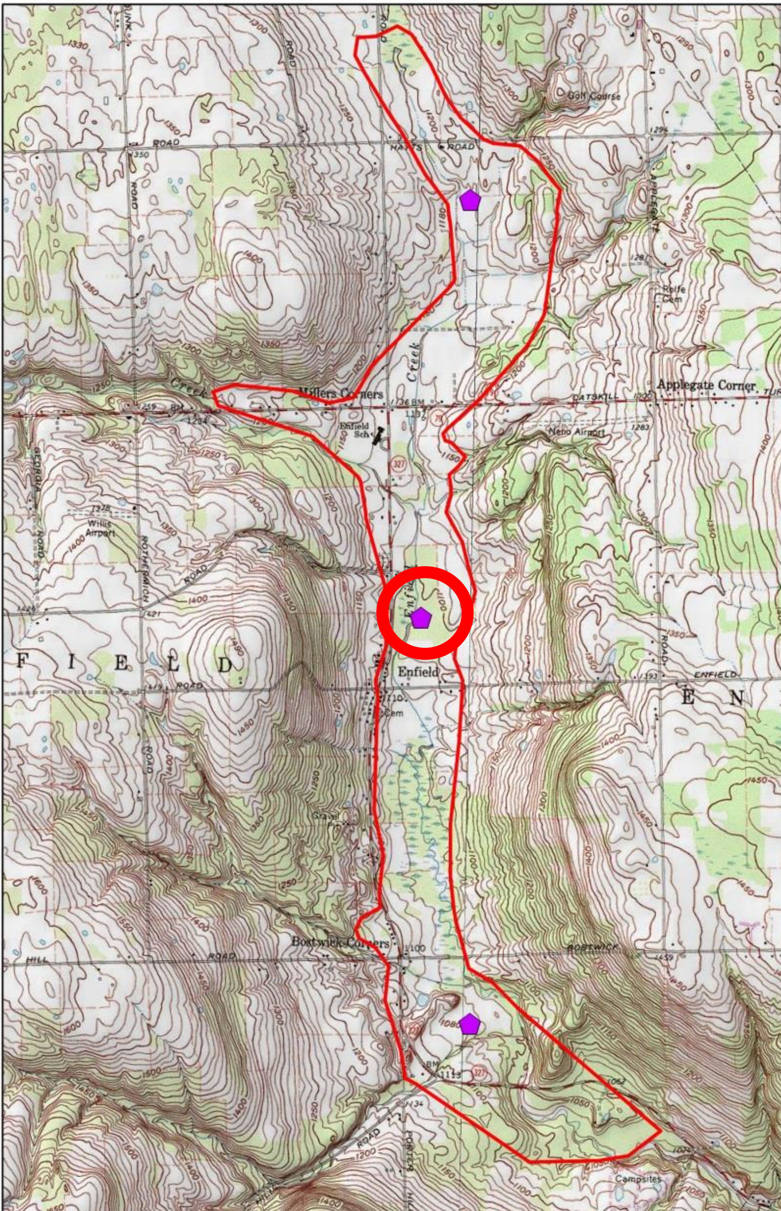
Blue - Water level Red - Water temperature

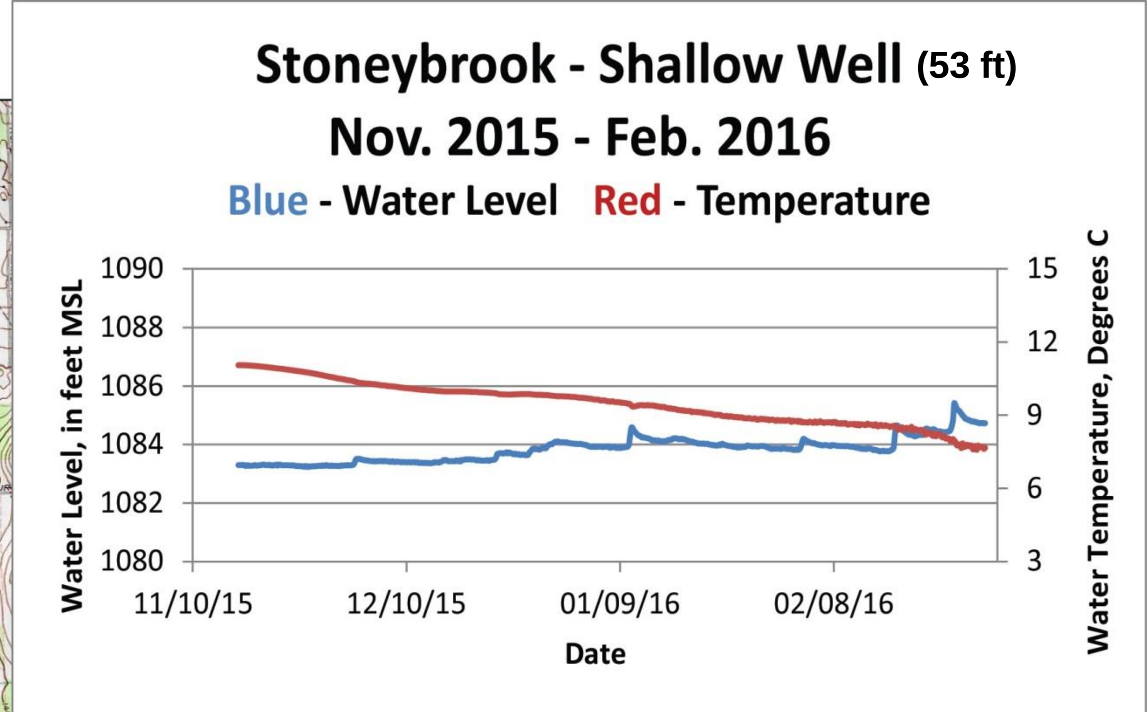


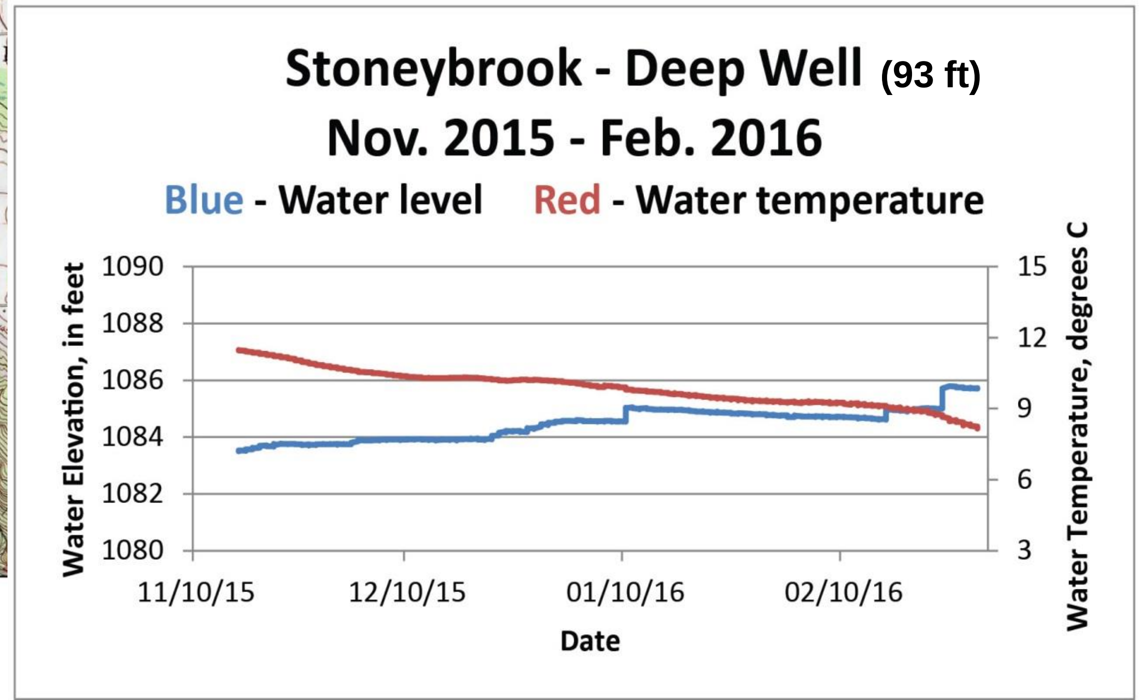
Hayts Rd - Deep Well (48 ft)
Nov. 2015 - Feb. 2016

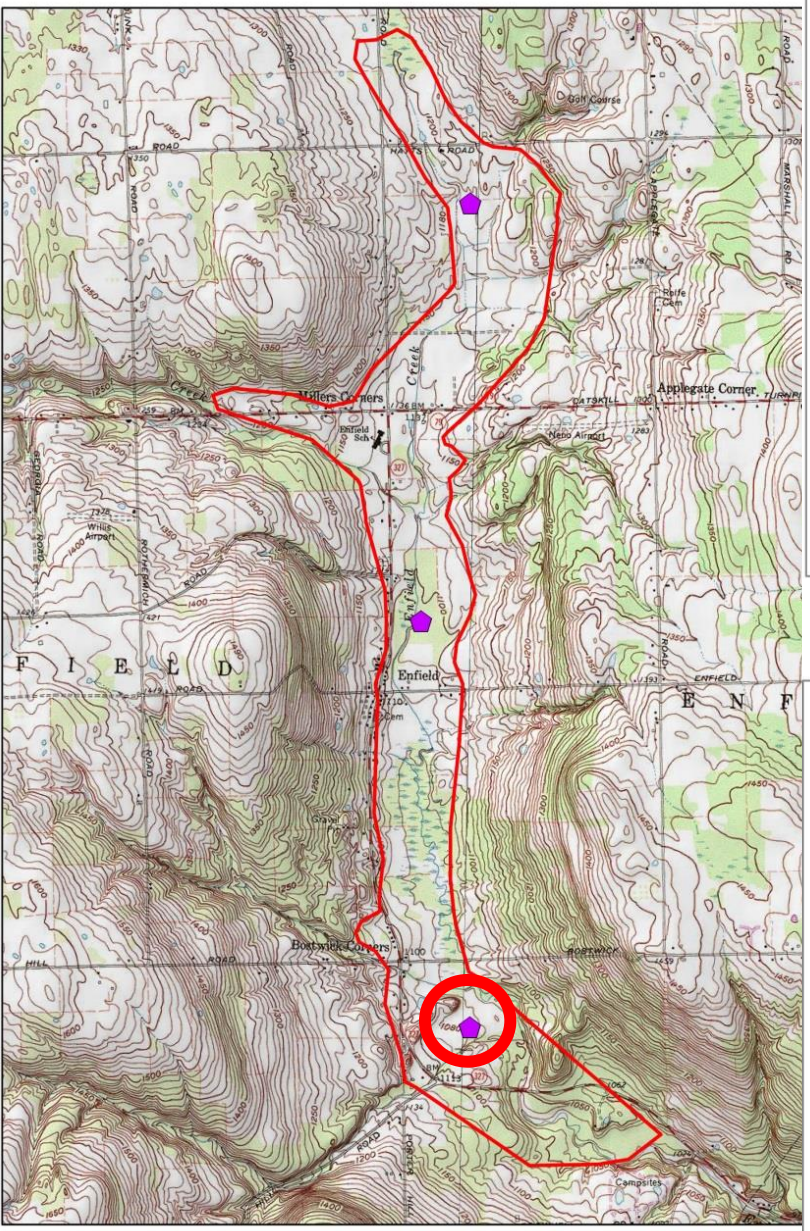
Blue - Water level Red - Water temperature




Golf Course
Millers Corners
Applegate Corner
Enfield
Bostwick Corners
Campsites

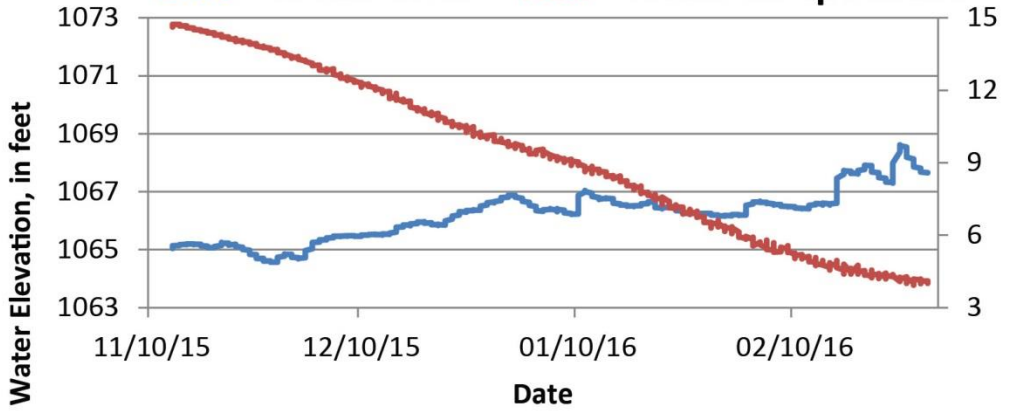

Stoneybrook - Shallow Well (53 ft)
Nov. 2015 - Feb. 2016
Blue - Water Level Red - Temperature
Water Level, in feet MSL
1090
1088
1086
1084
1082
1080
Water Temperature, Degrees C
15
12
9
6
3
11/10/15
12/10/15
01/09/16
02/08/16
Date


Stoneybrook - Deep Well (93 ft)
Nov. 2015 - Feb. 2016
Blue - Water level Red - Water temperature
Water Elevation, in feet
1090
1088
1086
1084
1082
1080
Water Temperature, degrees C
15
12
9
6
3
11/10/15
12/10/15
01/10/16
02/10/16
Date



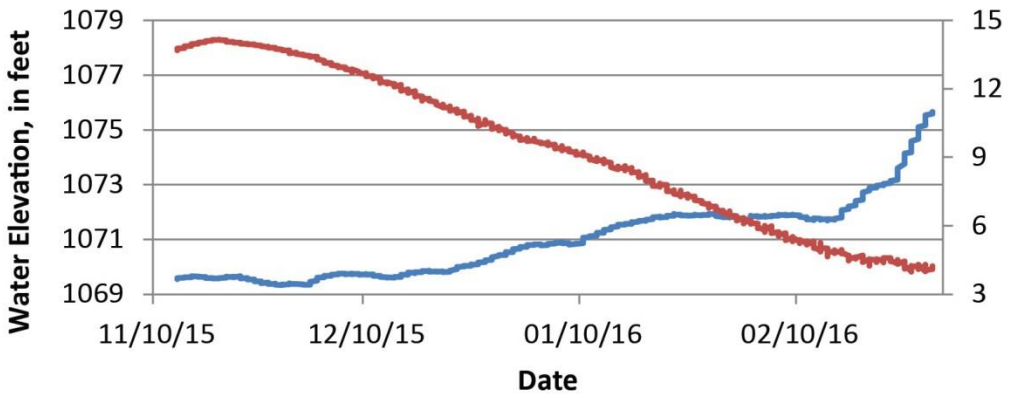
Enfield DPW - Shallow Well (56 ft)
Nov. 2015 - Feb. 2016

Blue - Water level Red - Water temperature

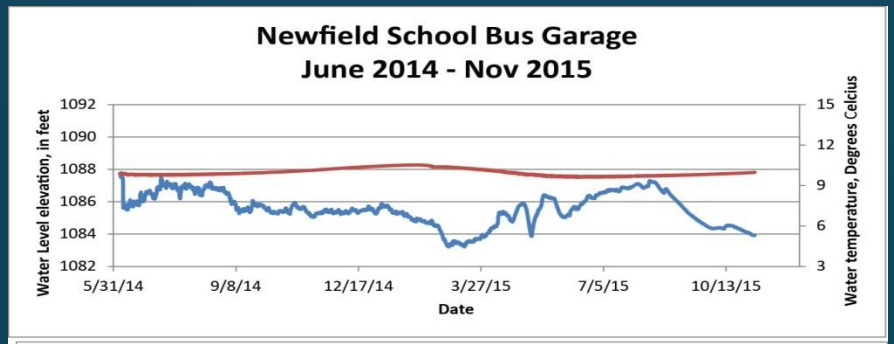


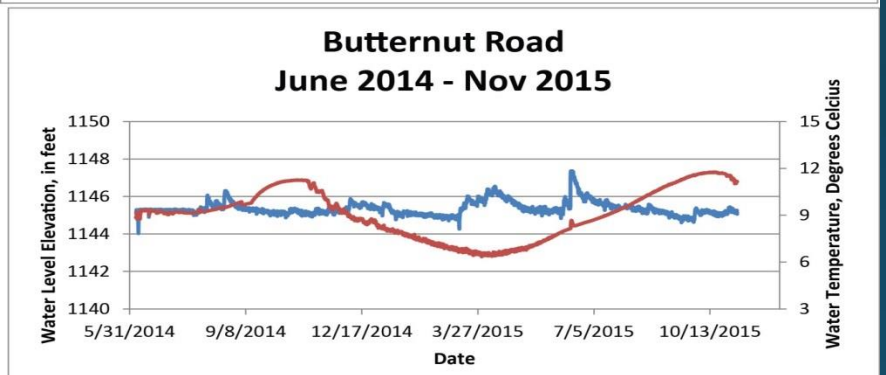
Enfield DPW - Deep Well (136 ft)
Nov. 2015 - Feb. 2016

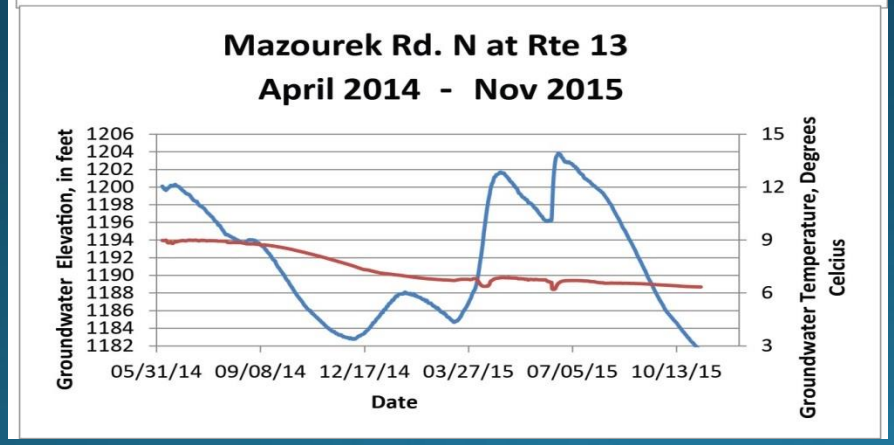
Blue - Water level Red - Water temperature



Newfield Aquifer Study
Longer-term Hydrographs



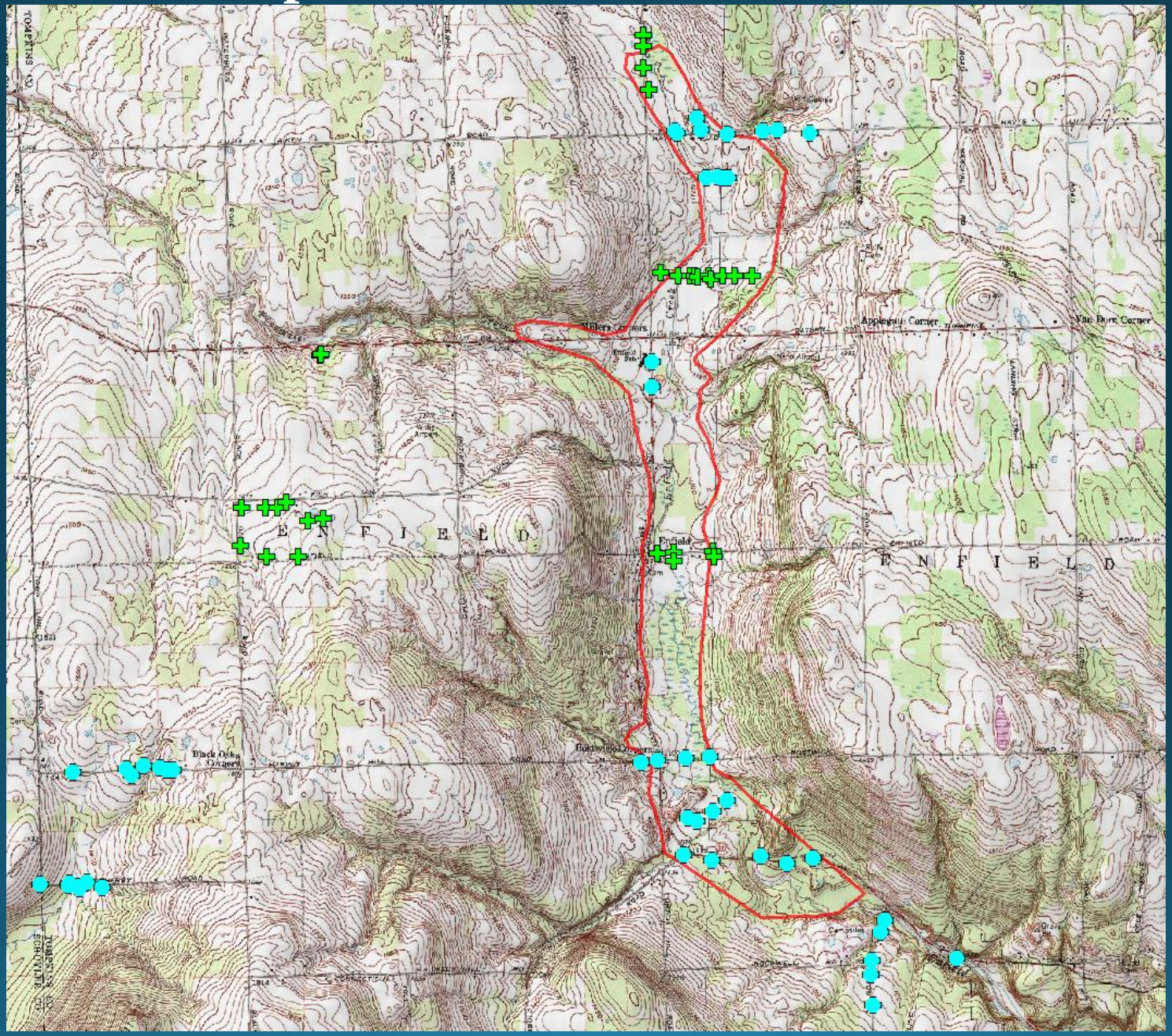




Accomplishments in FY-15

Seismic site added in FY-15

- Location of seismic sites added in FY-15
- 40+ sites added in FY-15



Upcoming FY-15 work

- Water-level collection devices installed

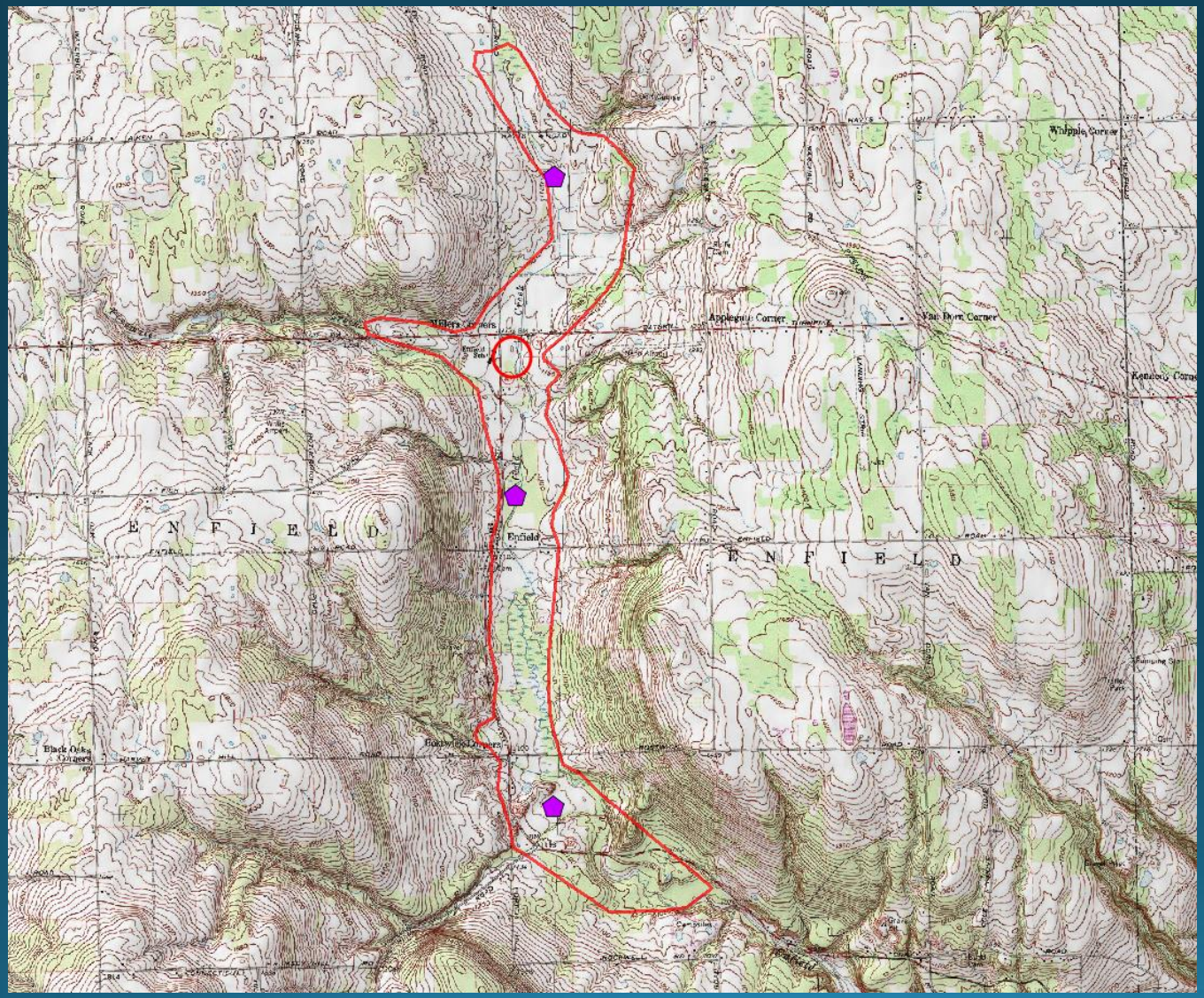
Budget

REVISED 5-YEAR BUDGET SUMMARY - ENFIELD AQUIFER							
	FY-2013	**FY-2014**	**FY-2015**	**FY-2016**	**FY-2017**	**Subtotals**	**% of total**
County study costs	$7,000	$13,000	$18,000	$25,000	$27,245	$90,245	35%
Drilling costs (paid by Town and/or County) 1			**$17,563**				
Town study costs	$7,000	$13,000	$18,000	$25,000	$27,245	$90,245	35%
USGS match w./ County	**$3,010**	**$5,590**	**$7,740**	**$10,750**	**$11,715**	**$38,805**	
USGS match w./ Town	**$3,010**	**$5,590**	**$7,740**	**$10,750**	**$11,715**	**$38,805**	
Total USGS match	$6,020	$11,180	$15,480	$21,500	$23,431	$77,611	30%
TOTAL PROJECT COST	**$20,020**	**$37,180**	**$51,480**	**$71,500**	**$77,921**	**$258,101**	**100%**

1 Not matched by USGS

Upcoming FY-16 work

- Continue well drilling
- about 2 more wells depending on depth

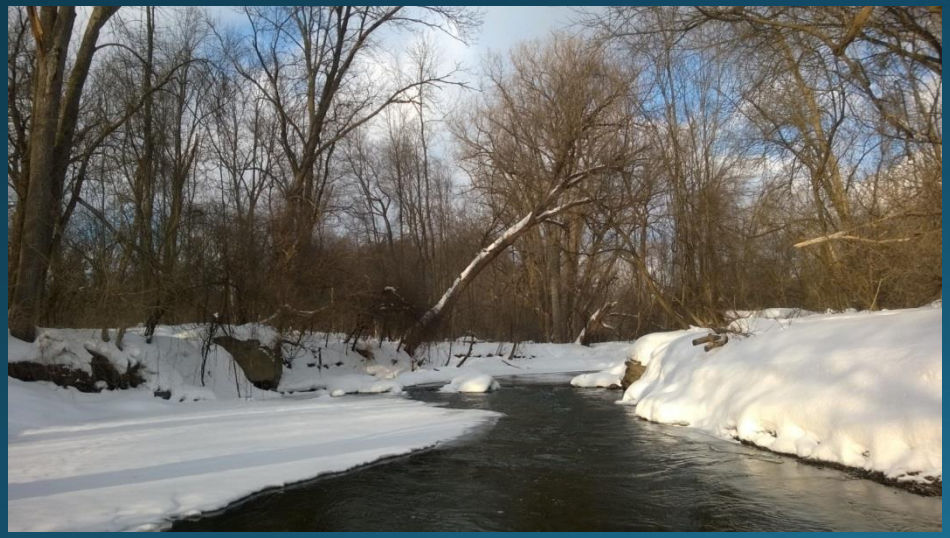


Upcoming FY-16 work

- Collect water quality from all wells drilled for aquifer study

Nutirents GW samples

Nitrogen, ammonia as N
nitrogen, ammonia + organic nitrogen
nitrogen, nitrite
nitrogen, nitrite + nitrate
phosphorus, phosphate, ortho



Inoraganics & trace elements

Alkalinity, laboratory
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Bromide
Cadmium
Calcium
Chloride
Chromium
Cobalt
Copper
Fluoride

Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
pH, laboratory
Potassium
Residue, 180 degrees Celsius (TDS)
Selenium
Silica
Silver
Sodium
specific conductance, laboratory
Strontium
Sulfate
Uranium, natural
Zinc

Upcoming FY-16 work

- **Interpret aquifer sections**
- **Analyze geologic and water-level data to construct potentiometric surface map**
- **Start report draft**

Thank You!

Questions or more information contact:

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