Water Quality in Thorp and Kimball Brooks

Summary Report 2014-2015

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Prepared for

VT DEC Watershed Management Division

Volunteer Water Quality Monitoring

LaRosa Analytical Services Partnerships

Prepared by

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Water quality monitoring in Thorp and Kimball Brooks during 2014 and 2015 targeted high flows. Past investigations indicated that flow rates in these streams tend to reflect those in McCabe's Brook and the LaPlatte River at Falls Road in Shelburne. Targeting was based on rainfall forecasts, rainfall at the Shelburne Waste Treatment Facility adjacent to McCabe's Brook, and LaPlatte River discharge rates at Falls Road. Often samples collected during 2014-2015, nine were taken during periods of high flow, and one on October 4, 2015 when the flow was estimated to be moderate.

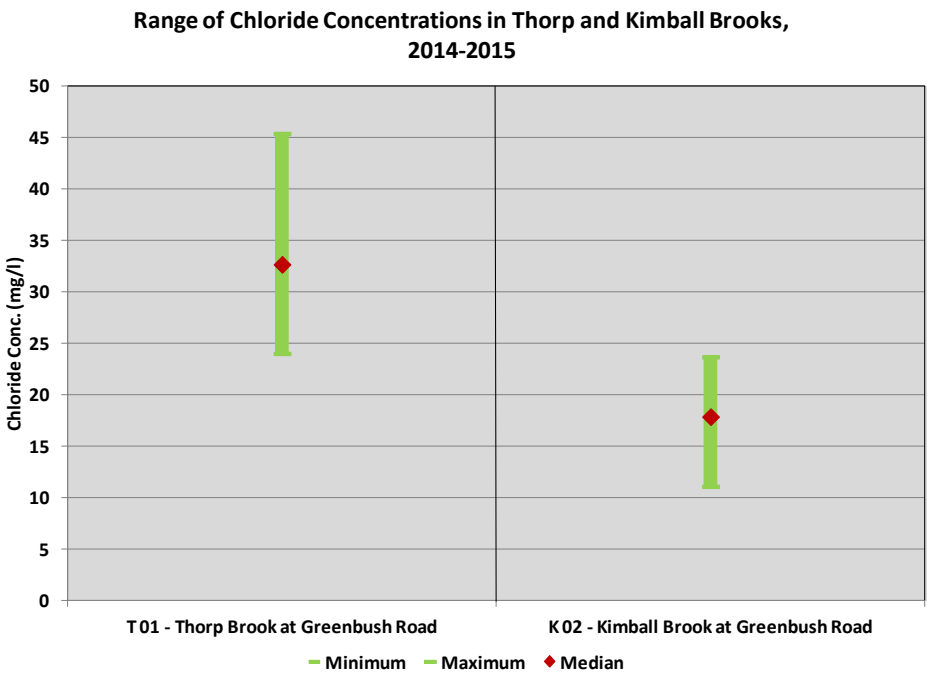
The SCRW monitoring program initiated targeting of high flows for two principal reasons. Firstly, it was the objective to sample within a range of discharge rates that would enhance the comparability of data from year to year and provide a sense of change in water quality over time, and more importantly, sediment and nutrient loadings to receiving waters. Secondly, a combination of high discharge rates and associated high sediment and phosphorus concentrations results in total loadings on the lake far exceed the total of those contributed at low and moderate flows.

When assessing and interpreting water quality results collected at high flows in 2014 and 2015, it is important to bear in mind that these data are, in general, not comparable to earlier results collected at random flow rates ranging from very low to high without a knowledge of associated instantaneous flow rates.

Chloride

Chloride concentrations in streams may be influenced by human or animal wastes or by runoff from roads salted during the previous winter. In Champlain Valley streams unaffected by external sources of chloride, concentrations tend to vary between about 10 and 20 mg/l. Because chlorides occur in wastes and road salt, concentrations over and above background levels, they can serve as a useful indicator of external influences on water quality. Furthermore, because chloride is a non-reactive conservative element, it can serve also as a useful tool for interpreting other water quality data. In surface waters severely impacted by runoff from heavily salted roads, concentrations can exceed those which can harm aquatic life. The USEPA limit for acute toxicity is 860 mg/l, and that for chronic toxicity is 230 mg/l.

Chloride levels in Thorp and Kimball Brooks was initiated in 2013. Chloride levels in Kimball Brook in 2014-2015 were low and close to background levels, generally below 20 mg/l. The sampling site at station K 02 is located upstream from Greenbush Road, and thus appears not to be impacted by drainage from the roadway.

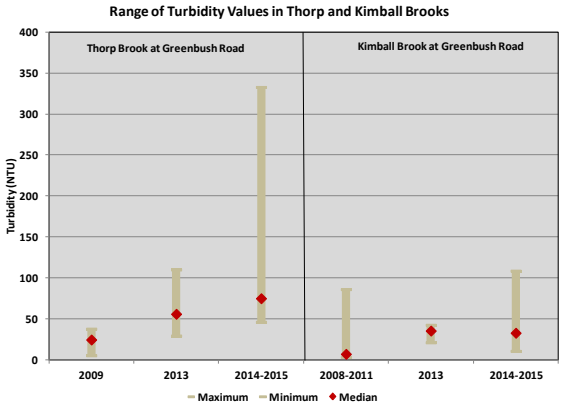


Chloride concentrations at station T 01 in Thorp Brook located just downstream from Greenbush Road fall generally around 32-33 mg/l, suggesting the effect of road drainage.

Concentrations of chlorides in Thorp and Kimball Brooks at Greenbush Road inform and reinforce the interpretation of solids and phosphorus data in the two streams.

Suspended Solids

General levels of solids at sampling locations in both Thorp and Kimball Brooks were higher in 2014-2015 than in previous years, reflecting the high flow rates sampled during those years. Solids levels observed in 2013 were higher than earlier years, but lower than in 2014-2015, probably reflecting intermediate flow rates.



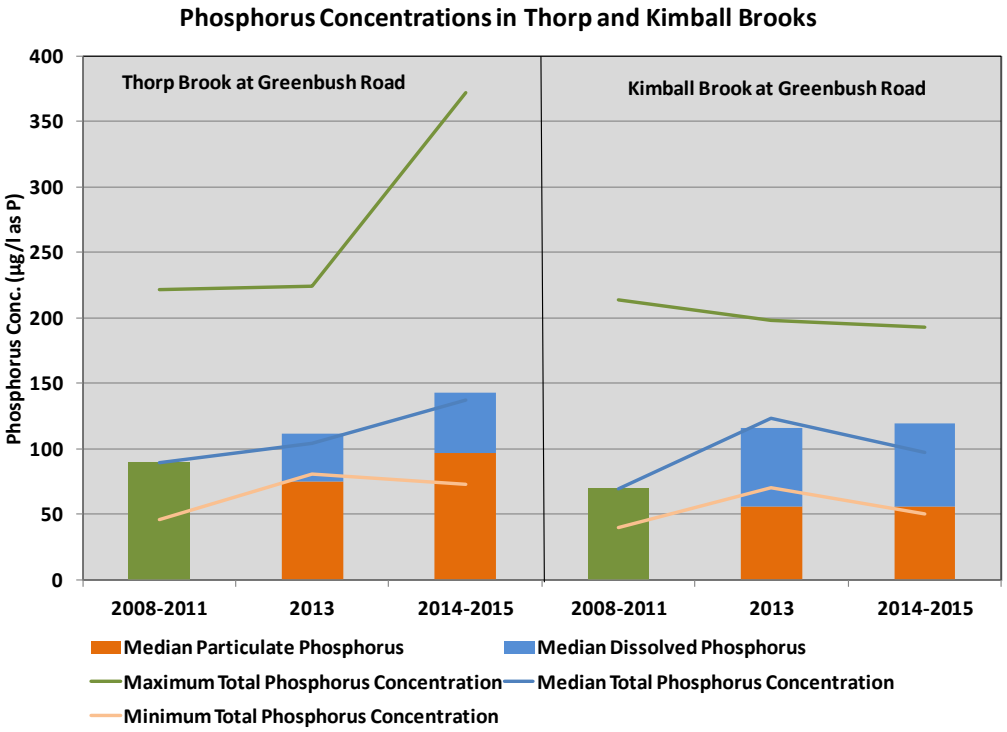
Levels of solids in Kimball Brook were generally low in 2014-2015, although higher than in 2008-2011, reflecting its forested watershed immediately upstream from Greenbush Road, although at times concentrations of total suspended solids exceeded 100 µg/l.

Levels of solids in Thorp Brook were generally higher than in Kimball Brook, at times reaching very high concentrations, again reflecting the impact of runoff carrying sediment from Greenbush Road. As in Kimball Brook, levels were generally higher in 2014-2015 than in previous years owing to higher flows targeted during those years.

Phosphorus

Monitoring of phosphorus levels in Thorp and Kimball Brooks was limited to total phosphorus prior to 2013. Monitoring of dissolved phosphorus concentrations was initiated in 2013, making it possible to determine particulate phosphorus concentrations as well.

Phosphorus concentrations in Kimball Brook were generally higher in 2013 and 2014-2015 than in previous years, again reflecting the higher flow rates sampled during these years. Of particular note were levels of dissolved phosphorus which tended to exceed those of particulate phosphorus. This relatively high ratio probably reflected runoff and leachate from decaying organic matter from the forested area immediately upstream from Greenbush Road.

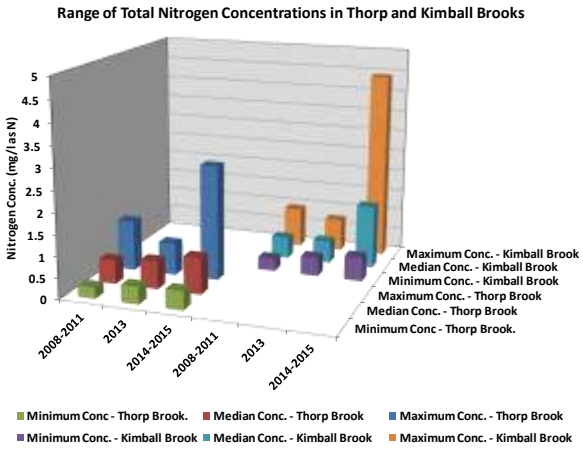


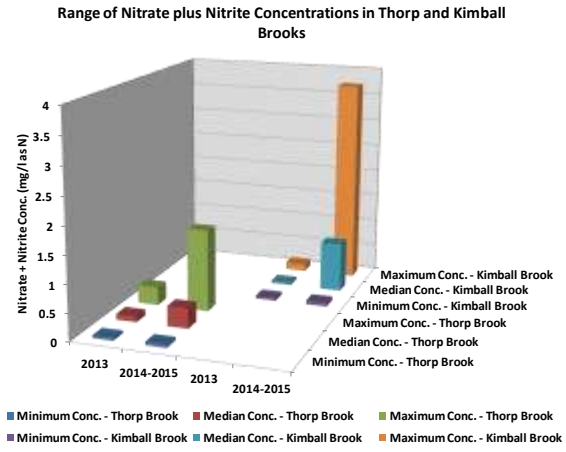
Increased levels of phosphorus in Thorp Brook at Greenbush Road in 2013 and 2014-2015 again reflect the influence of higher flow rates sampled during these years, particularly 2014-2015. Of particular note was the very high maximum total phosphorus concentration of 372 µg/l of total phosphorus observed in 2014-2015. Levels tended to be higher than in Kimball Brook, and at the highest flow rates maximum concentrations far exceeded those in Kimball Brook. The reason for the higher total phosphorus concentrations in Thorp Brook is evident in the high particulate concentrations relative to lower dissolved phosphorus concentrations, reflecting the higher solids levels entering the stream from Greenbush Road.

Nitrogen

Nitrogen levels on Thorp, and particularly, Kimball Brooks were relatively high, in 2014-2015 when at times they were higher than normally observed in surface waters not impacted by waste effluents, animal wastes, or runoff from agricultural fields.

In Kimball Brook, the total nitrogen concentration reached a high of 3.45 mg/l in 2014, and 4.42 mg/l in 2015. At the same time, nitrate plus nitrite concentrations reached 2.62 mg/l in 2014, and 3.72 mg/l in 2015. These are unusually high values, although still below the Vermont standard for nitrate of 5.0 mg/l. Two potential sources suggest themselves. The first, leachate from decaying organic matter in the forested area immediately upstream from Greenbush Road. The second, suggested by 2009 results of monitoring throughout the





watershed a high nitrogen concentration of 4.7 mg/l (accompanied by an extremely high total phosphorus concentration of 932 µg/l) was observed at station K 03 located downstream from Route 7. It is possible that at high flows, nitrogen levels at Greenbush Road were influenced by high concentrations upstream.

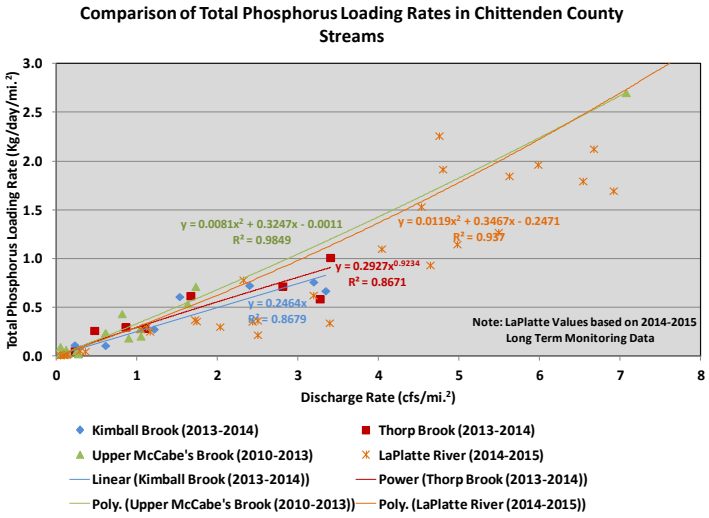
In view of the high nitrogen concentrations at Greenbush Road in 2014-2015, and 2009 results below Route 7, as well as high values of nitrogen (5.39 mg/l) and phosphorus (784 µg/l) observed at K 01 located at Town Line Road, it might be appropriate to resume watershed sampling within the Kimball Brook watershed.

Nitrogen levels in Thorp Brook at Greenbush Road were lower than in Kimball Brook, but still on occasion higher than normally observed in surface streams. In particular, the nitrate plus nitrite concentration that reached 1.49 mg/l in 2014. While unusual, this figure does not approach the Vermont State Standard, and has no apparent explanation.

Flow and Loading Rates

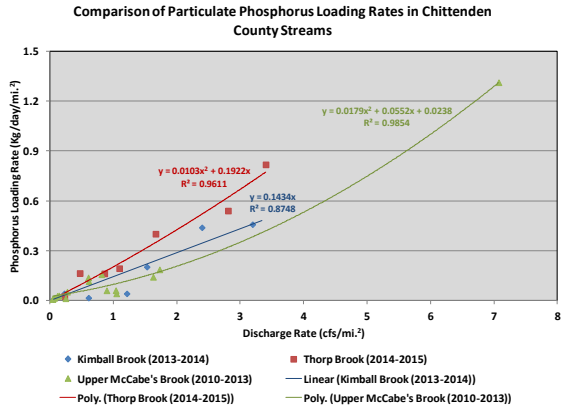
Discharge rates were measured on Thorp and Kimball Brooks in 2013 and 2014 in conjunction with sampling. The measurement of flow rates made possible the calculation of nutrient and suspended solids loading rates. Results are shown in separate tables in ANNEX IV. Loading and flow rates shown in the tables were calculated on the basis of contributing watershed areas to allow comparisons between river segments and watersheds.

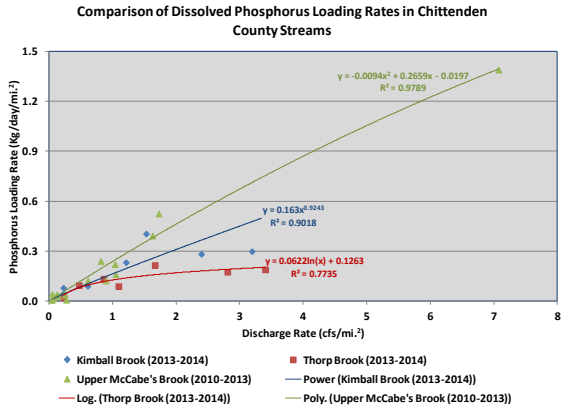
In the following graph, instantaneous loading rates for total phosphorus in Thorp and Kimball Brooks are shown together with loading rates for the upper McCabe's Brook, which is strongly influenced by runoff from agricultural fields and farms, and the LaPlatte River. It is noted, furthermore, that the highest reported discharge rates per square mile of drainage area reached in Thorp and Kimball Brooks were consistent with rates reached the LaPlatte River, and about twice those reached in McCabe's Brook.



In general, the total phosphorus loadings in Thorp and Kimball Brooks were similar. Loading rates in upper McCabe's Brook were somewhat higher and increased at a greater rate as the discharge rate increased, as would be expected given the impact of agriculture. Loading rates in the LaPlatte River were highly variable, but resembled those in upper McCabe's Brook, although they were, in general, slightly lower than in McCabe's Brook.

Particulate and dissolved phosphorus loading rates in Thorp and Kimball Brooks reflected the sources of phosphorus entering the streams: road runoff discharging sediment to Thorp Brook, and leachate in runoff from forested land discharging dissolved phosphorus to Kimball Brook. Comparison with upper McCabe's Brook allows comparison with an agricultural watershed. Particulate phosphorus loadings were lower than in either Thorp or Kimball Brooks. In contrast, loadings of dissolved phosphorus were significantly higher in McCabe's Brook.





Loading data thus provides a useful interpretive tool for understanding sources of nutrients and for the comparisons among watersheds as sources of nutrients.

CONCLUSIONS

General

- Sampling in 2014-2015 targeted high flows:
    - High flows main source of sediment and nutrients entering lake
    - Increased compatibility of results over time
- Concentrations of sediment and nutrients are higher at higher flow rates and on average are not comparable to those collected during random sampling.

Kimball Brook

- Chloride and solids concentrations low consistent with immediate upstream forested area
- Total phosphorus concentrations not exceptional for unpolluted area streams
- Predominance of dissolved phosphorus possibly originating from decaying organic matter
- Relatively high nitrogen concentrations, including nitrate plus nitrite approaching Vermont State standards.

Thorp Brook

- Chlorides higher than normal background levels, suggesting influence of runoff from Greenbush Road
- Solids levels influenced by runoff from Greenbush Road, at times reaching very high levels
- Phosphorus levels in general relatively high, dominated by particulate phosphorus associated with runoff from Greenbush Road. Levels on occasion very high
- Nitrogen levels, including nitrate plus nitrite, at times relatively high with no obvious cause.

Loading Rates

- Loading rates provide a useful interpretive tool for understanding sources of nutrients and for the comparison of watersheds as sources of nutrients.

RECOMMENDATIONS

Kimball Brook

- Consider re-establishing watershed-wide sampling plan to enhance understanding of nutrient sources, especially impacting on stations K 01 and K 03

Thorp Brook

- Consider re-establishing wider watershed sampling plan to enhance understanding of nutrient sources, especially impacting on the west branch of Thorp Brook and the upper Thorp Brook main stem.

ANNEX I

Sampling Stations

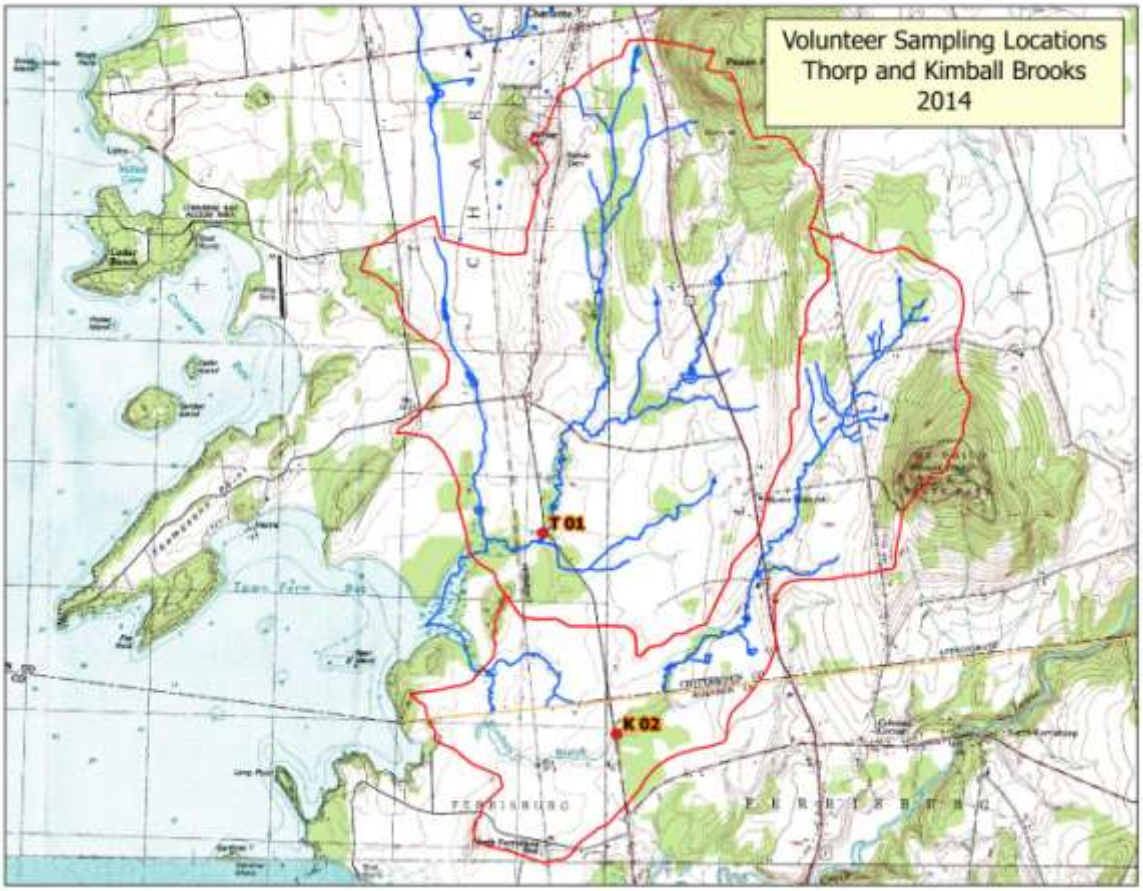
ANNEX IA

Station Descriptions

Site ID	Site Location	Site Latitude	Site Longitude	Upstream Area (mi2)	Staff Guage
T 01	T 01 - Thorp Brook at Greenbush Road	44.273073	-73.256597	2.93	Y
K 02	K 02 - Kimball Brook at Greenbush Road	44.25836	-73.249661	1.87	Y

ANNEX IB

Map


Volunteer Sampling Locations
Thorp and Kimball Brooks
2014
T 01
K 02

ANNEX II-A

Raw Data: Final – 2014

Chloride Concentrations in Thorp and Kimball Brooks - 2014

Station No.	4/17/2014	5/5/2014	6/26/2014	7/29/2014	Maximum	Minimum	Median
T 01	45.4	32	35.8	31.5	45.4	31.5	33.90
K 02	16.9	17.7	17.3	19.8	19.8	16.9	17.50

Solids Concentrations in Thorp and Kimball Brooks - 2014

	Station No.	4/17/2014	5/5/2014	6/26/2014	7/29/2014	Maximum	Minimum	Median
TSS	T 01	84	32.4	70	63	84.00	32.40	66.50
	K 02	40.5	23.4	14.5	20	40.50	14.50	21.70
Turbidity	T 01	107	46.2	74	75.8	107.00	46.20	74.90
	K 02	44	35.1	21.6	30.4	44.00	21.60	32.75
Specific	T 01	1.27	1.43	1.06	1.20	1.43	1.06	1.24
Turbidity	K 02	1.09	1.50	1.49	1.52	1.52	1.09	1.49

Phosphorus Concentrations in Thorp and Kimball Brooks - 2014

	Station No.	4/17/2014	5/5/2014	6/26/2014	7/29/2014	Maximum	Minimum	Median
TP	T 01	121	72.8	140	151	151	72.8	130.5
	K 02	96.8	81.4	92	162	162	81.4	94.4
PP	T 01	98.3		76.9	98.3	98.3	76.9	98.3
	K 02	58.6		13.9	54	58.6	13.9	54
DP	T 01	22.7		63.1	52.7	63.1	22.7	52.7
	K 02	38.2		78.1	108	108	38.2	78.1
PP/TSS	T 01	1.17		1.10	1.56	1.56	1.10	1.17
	K 02	1.45		0.96	2.70	2.70	0.96	1.45

Nitrogen Concentrations in Thorp and Kimball Brooks - 2014

	Station No.	4/17/2014	5/5/2014	6/26/2014	7/29/2014	Maximum	Minimum	Median
TN	T 01	0.68	0.48	1.47	2.71	2.71	0.48	1.08
	K 02	0.69	0.57	3.45	2.37	3.45	0.57	1.53
NOx	T 01	0.32	0.13	0.75	1.49	1.49	0.13	0.54
	K 02	0.31	0.07	2.62	1.17	2.62	0.07	0.74

ANNEX II-B

Raw Data: Final – 2015

Chloride Concentrations in Thorp and Kimball Brooks - 2015

Station No.	4/22/2015	5/13/2015	6/2/2015	6/10/2015	7/2/2015	10/1/2015	Maximum	Minimum	Median
T 01	45.09	38.6	33.34	27.08	24.01	27.92	45.09	24.01	30.63
K 02	21.52	19.06	18.03	11.09	11.57	23.68	23.68	11.09	18.545

Solids Concentrations in Thorp and Kimball Brooks - 2015

Parameter	Station No.	4/22/2015	5/13/2015	6/2/2015	6/10/2015	7/2/2015	10/1/2015	Maximum	Minimum	Median
TSS	T 01	146	53	51.14	332	62.6	32.5	332	32.5	57.8
	K 02	52.33	9.6	33.2	117	20.29	3.5	117	3.5	26.745
Turbidity	T 01	175	63.4	105.8	332.8	66.1	49.6	332.8	49.6	85.95
	K 02	59.3	11.5	37.7	108.6	22.4	10.7	108.6	10.7	30.05
Sp. Turbidity	T 01	1.20	1.20	2.07	1.00	1.06	1.53	2.07	1.00	1.20
	K 02	1.13	1.20	1.14	0.93	1.10	3.06	3.06	0.93	1.13

Phosphorus Concentrations in Thorp and Kimball Brooks - 2015

Parameter	Station No.	4/22/2015	5/13/2015	6/2/2015	6/10/2015	7/2/2015	10/1/2015	Maximum	Minimum	Median
TP	T 01	184	95.5	168	372	112	134	372	95.5	151
	K 02	103	49.9	114	193	89.2	98.3	193	49.9	100.65
PP	T 01	167	95.5	119.7	329.2	68.9	73.7	329.2	68.9	107.6
	K 02	71.7	14.2	51.5	130.1	89.2	18.7	130.1	14.2	61.6
DP	T 01	17		48.3	42.8	43.1	60.3	60.30	17.00	43.10
	K 02	31.3	35.7	62.5	62.9		79.6	79.60	31.30	62.50
PP/TSS	T 01	1.14	1.80	2.34	0.99	1.10	2.27	2.34	0.99	1.47
	K 02	1.37	1.48	1.55	1.11	4.40	5.34	5.34	1.11	1.52

Nitrogen Concentrations in Thorp and Kimball Brooks - 2015

Parameter	Station No.	4/22/2015	5/13/2015	6/2/2015	6/10/2015	7/2/2015	10/1/2015	Maximum	Minimum	Median
TN	T 01	0.91	0.44	1.04	0.81	0.66	1.3	1.3	0.44	0.86
	K 02	1.01	0.94	4.42	2.51	1.42	1.56	4.42	0.94	1.49
NOx	T 01	0.45	0.06	0.42	0.14	0.12	0.65	0.65	0.06	0.28
	K 02	0.59	0.57	3.72	1.97	0.9	0.9	3.72	0.57	0.9

ANNEX III-A

Quality Control Analysis - 2014

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Chloride	MB 05 - McCabes Brook at Lime Kiln Road	4/17/2014	20.4	mg/L	0.6000	0.6000	20.1000	2.9851
	MB 05 DUP - McCabes Brook at Lime Kiln Road	4/17/2014	19.8	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	4/17/2014	18.5	mg/L	-0.7000	0.7000	18.8500	3.7135
	LP 05 Dup - LaPlatte River at Carpenter Road	4/17/2014	19.2	mg/L				
	MB 04a - McCabes Brook at Teddy Bear Access Road	5/5/2014	40.4	mg/L	-0.3000	0.3000	40.5500	0.7398
	MB 04a DUP - McCabes Brook at Teddy Bear Access Ro	5/5/2014	40.7	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	5/5/2014	23.3	mg/L	0.5000	0.5000	23.0500	2.1692
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/5/2014	22.8	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	5/5/2014	21.4	mg/L	-0.1000	0.1000	21.4500	0.4662
	LP 05 DUP - LaPlatte River at Carpenter Road	5/5/2014	21.5	mg/L				
	MB 03 - McCabes Brook at Bostwick Road	6/26/2014	57	mg/L	3.0000	3.0000	55.5000	5.4054
	MB 03 DUP - McCabes Brook at Bostwick Road	6/26/2014	54	mg/L				
	LP 03 - LaPlatte River at Falls Road	6/26/2014	17.8	mg/L	0.0000	0.0000	17.8000	0.0000
	LP 03 - DUP - LaPlatte River at Falls Road	6/26/2014	17.8	mg/L				
	T 01 - Thorp Brook at Greenbush Road	6/26/2014	35.8	mg/L	0.4000	0.4000	35.6000	1.1236
	T 01 DUP - Thorp Brook at Greenbush Road	6/26/2014	35.4	mg/L				
	MB 03 - McCabes Brook at Bostwick Road	7/29/2014	48	mg/L	0.0000	0.0000	48.0000	0.0000
	MB 03 DUP - McCabes Brooka t Bostwick Road	7/29/2014	48	mg/L				
	LP 03 - LaPlatte River at Falls Road	7/29/2014	23.4	mg/L	-0.3000	0.3000	23.5500	1.2739
	LP 03 DUP - LaPlatte River at Falls Road	7/29/2014	23.7	mg/L				
	T01 - Thorp Brook at Greenbush Road	7/29/2014	31.5	mg/L	1.2000	1.2000	30.9000	3.8835
	T01 DUP - Thorp Brook at Greenbush Road	7/29/2014	30.3	mg/L				

Mean	1.98
Target	10%

Total N	MB 05 - McCabes Brook at Lime Kiln Road	4/17/2014	0.39	mg/L	0.0000	0.0000	0.3900	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	4/17/2014	0.39	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	4/17/2014	0.59	mg/L	-0.0200	0.0200	0.6000	3.3333
	LP 05 Dup - LaPlatte River at Carpenter Road	4/17/2014	0.61	mg/L				
	MB 04a - McCabes Brook at Teddy Bear Access Road	5/5/2014	0.44	mg/L	0.0000	0.0000	0.4400	0.0000
	MB 04a DUP - McCabes Brook at Teddy Bear Access Ro	5/5/2014	0.44	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	5/5/2014	0.39	mg/L	0.0200	0.0200	0.3800	5.2632
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/5/2014	0.37	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	5/5/2014	0.38	mg/L	-0.0200	0.0200	0.3900	5.1282
	LP 05 DUP - LaPlatte River at Carpenter Road	5/5/2014	0.4	mg/L				
	MB 03 - McCabes Brook at Bostwick Road	6/26/2014	3.85	mg/L	0.0000	0.0000	3.8500	0.0000
	MB 03 DUP - McCabes Brook at Bostwick Road	6/26/2014	3.85	mg/L				
	LP 03 - LaPlatte River at Falls Road	6/26/2014	0.98	mg/L	-0.0500	0.0500	1.0050	4.9751
	LP 03 - DUP - LaPlatte River at Falls Road	6/26/2014	1.03	mg/L				
	T 01 - Thorp Brook at Greenbush Road	6/26/2014	1.47	mg/L	0.0400	0.0400	1.4500	2.7586
	T 01 DUP - Thorp Brook at Greenbush Road	6/26/2014	1.43	mg/L				
	MB 03 - McCabes Brook at Bostwick Road	7/29/2014	6.23	mg/L	-0.1100	0.1100	6.2850	1.7502
	MB 03 DUP - McCabes Brooka t Bostwick Road	7/29/2014	6.34	mg/L				
	LP 03 - LaPlatte River at Falls Road	7/29/2014	1.5	mg/L	-0.1000	0.1000	1.5500	6.4516
	LP 03 DUP - LaPlatte River at Falls Road	7/29/2014	1.6	mg/L				
	T01 - Thorp Brook at Greenbush Road	7/29/2014	2.71	mg/L	-0.0600	0.0600	2.7400	2.1898
	T01 DUP - Thorp Brook at Greenbush Road	7/29/2014	2.77	mg/L				

Mean	2.90
Target	15%

NOx	MB 05 - McCabes Brook at Lime Kiln Road	4/17/2014	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	4/17/2014	0.05	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	4/17/2014	0.18	mg/L	-0.0300	0.0300	0.1950	15.3846
	LP 05 Dup - LaPlatte River at Carpenter Road	4/17/2014	0.21	mg/L				
	MB 04a - McCabes Brook at Teddy Bear Access Road	5/5/2014	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	MB 04a DUP - McCabes Brook at Teddy Bear Access Ro	5/5/2014	0.05	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	5/5/2014	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/5/2014	0.05	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	5/5/2014	0.09	mg/L	0.0000	0.0000	0.0900	0.0000
	LP 05 DUP - LaPlatte River at Carpenter Road	5/5/2014	0.09	mg/L				
	MB 03 - McCabes Brook at Bostwick Road	6/26/2014	2.52	mg/L	0.0000	0.0000	2.5200	0.0000
	MB 03 DUP - McCabes Brook at Bostwick Road	6/26/2014	2.52	mg/L				
	LP 03 - LaPlatte River at Falls Road	6/26/2014	0.15	mg/L	-0.0200	0.0200	0.1600	12.5000
	LP 03 - DUP - LaPlatte River at Falls Road	6/26/2014	0.17	mg/L				
	T 01 - Thorp Brook at Greenbush Road	6/26/2014	0.75	mg/L	0.0000	0.0000	0.7500	0.0000
	T 01 DUP - Thorp Brook at Greenbush Road	6/26/2014	0.75	mg/L				
	MB 03 - McCabes Brook at Bostwick Road	7/29/2014	4.99	mg/L	0.0000	0.0000	4.9900	0.0000
	MB 03 DUP - McCabes Brooka t Bostwick Road	7/29/2014	4.99	mg/L				
	LP 03 - LaPlatte River at Falls Road	7/29/2014	0.44	mg/L	-0.0100	0.0100	0.4450	2.2472
	LP 03 DUP - LaPlatte River at Falls Road	7/29/2014	0.45	mg/L				
	T01 - Thorp Brook at Greenbush Road	7/29/2014	1.49	mg/L	0.0000	0.0000	1.4900	0.0000
	T01 DUP - Thorp Brook at Greenbush Road	7/29/2014	1.49	mg/L				

Mean	2.74
Target	10%

Total P	LP 05 - LaPlatte River at Carpenter Road	4/17/2014	104	µg P/L	-25.0000	25.0000	116.5000	21.4592
	LP 05 Dup - LaPlatte River at Carpenter Road	4/17/2014	129	µg P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	4/17/2014	40.2	µg P/L	0.9000	0.9000	39.7500	2.2642
	MB 05 DUP - McCabes Brook at Lime Kiln Road	4/17/2014	39.3	µg P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	5/5/2014	34.7	µg P/L	-0.2000	0.2000	34.8000	0.5747
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/5/2014	34.9	µg P/L				
	MB 04a - McCabes Brook at Teddy Bear Access Road	5/5/2014	55	µg P/L	6.7000	6.7000	51.6500	12.9719
	MB 04a DUP - McCabes Brook at Teddy Bear Access Ro	5/5/2014	48.3	µg P/L				
	LP 05 - LaPlatte River at Carpenter Road	5/5/2014	46.5	µg P/L	1.5000	1.5000	45.7500	3.2787
	LP 05 DUP - LaPlatte River at Carpenter Road	5/5/2014	45	µg P/L				
	MB 03 - McCabes Brook at Bostwick Road	6/26/2014	196	µg P/L	1.0000	1.0000	195.5000	0.5115
	MB 03 DUP - McCabes Brook at Bostwick Road	6/26/2014	195	µg P/L				
	LP 03 - LaPlatte River at Falls Road	6/26/2014	149	µg P/L	-3.0000	3.0000	150.5000	1.9934
	LP 03 - DUP - LaPlatte River at Falls Road	6/26/2014	152	µg P/L				
	T 01 - Thorp Brook at Greenbush Road	6/26/2014	140	µg P/L	-4.0000	4.0000	142.0000	2.8169
	T 01 DUP - Thorp Brook at Greenbush Road	6/26/2014	144	µg P/L				
	MB 03 - McCabes Brook at Bostwick Road	7/29/2014	220	µg P/L	-2.0000	2.0000	221.0000	0.9050
	MB 03 DUP - McCabes Brooka t Bostwick Road	7/29/2014	222	µg P/L				
	LP 03 - LaPlatte River at Falls Road	7/29/2014	184	µg P/L	-3.0000	3.0000	185.5000	1.6173
	LP 03 DUP - LaPlatte River at Falls Road	7/29/2014	187	µg P/L				
	T01 - Thorp Brook at Greenbush Road	7/29/2014	151	µg P/L	-1.0000	1.0000	151.5000	0.6601
	T01 DUP - Thorp Brook at Greenbush Road	7/29/2014	152	µg P/L				
	K02 - Kimball Brook at Greenbush Road	7/29/2014	162	ug P/L	-1.0000	1.0000	162.5000	0.6154
	K02 DUP - Kimball Brook at Greenbush Road	7/29/2014	163	ug P/L				

Mean	4.14
Target	15%

Dissolved P	MB 05 - McCabes Brook at Lime Kiln Road	4/17/2014	23.3	µg P/L	-0.4000	0.4000	23.5000	1.7021
	MB 05 DUP - McCabes Brook at Lime Kiln Road	4/17/2014	23.7	µg P/L				
	LP 05 - LaPlatte River at Carpenter Road	4/17/2014	24.4	µg P/L	0.6000	0.6000	24.1000	2.4896
	LP 05 Dup - LaPlatte River at Carpenter Road	4/17/2014	23.8	µg P/L				
	MB 04a - McCabes Brook at Teddy Bear Access Road	5/5/2014	32.8	µg P/L	-0.1000	0.1000	32.8500	0.3044
	MB 04a DUP - McCabes Brook at Teddy Bear Access Ro	5/5/2014	32.9	µg P/L				
	LP 05 - LaPlatte River at Carpenter Road	5/5/2014	19.2	µg P/L	-0.4000	0.4000	19.4000	2.0619
	LP 05 DUP - LaPlatte River at Carpenter Road	5/5/2014	19.6	µg P/L				
	MB 03 - McCabes Brook at Bostwick Road	6/26/2014	137	µg P/L	-2.0000	2.0000	138.0000	1.4493
	MB 03 DUP - McCabes Brook at Bostwick Road	6/26/2014	139	µg P/L				
	LP 03 - LaPlatte River at Falls Road	6/26/2014	79.2	µg P/L	-4.6000	4.6000	81.5000	5.6442
	LP 03 - DUP - LaPlatte River at Falls Road	6/26/2014	83.8	µg P/L				
	T 01 - Thorp Brook at Greenbush Road	6/26/2014	63.1	µg P/L	1.8000	1.8000	62.2000	2.8939
	T 01 DUP - Thorp Brook at Greenbush Road	6/26/2014	61.3	µg P/L				
	LP 03 - LaPlatte River at Falls Road	7/29/2014	68.3	µg P/L	2.4000	2.4000	67.1000	3.5768
	LP 03 DUP - LaPlatte River at Falls Road	7/29/2014	65.9	µg P/L				
	MB 03 - McCabes Brook at Bostwick Road	7/29/2014	114	µg P/L	0.0000	0.0000	114.0000	0.0000
	MB 03 DUP - McCabes Brooka t Bostwick Road	7/29/2014	114	µg P/L				
	K02 - Kimball Brook at Greenbush Road	7/29/2014	108	ug P/L	-4.0000	4.0000	110.0000	3.6364
	K02 DUP - Kimball Brook at Greenbush Road	7/29/2014	112	ug P/L				

Mean	2.38
Target	15%

TSS	LP 05 - LaPlatte River at Carpenter Road	4/17/2014	31.7	mg/L	-2.3000	2.3000	32.8500	7.0015
	LP 05 Dup - LaPlatte River at Carpenter Road	4/17/2014	34	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	4/17/2014	7.33	mg/L	0.3300	0.3300	7.1650	4.6057
	MB 05 DUP - McCabes Brook at Lime Kiln Road	4/17/2014	7	mg/L				
	MB 04 - McCabes Brook at Route 7	5/5/2014	6.27	mg/L	-0.1000	0.1000	6.3200	1.5823
	MB 04a DUP - McCabes Brook at Teddy Bear Access Ro	5/5/2014	6.37	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	5/5/2014	3.23	mg/L	0.2700	0.2700	3.0950	8.7237
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/5/2014	2.96	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	5/5/2014	13.2	mg/L	-0.8000	0.8000	13.6000	5.8824
	LP 05 DUP - LaPlatte River at Carpenter Road	5/5/2014	14	mg/L				
	MB 03 - McCabes Brook at Bostwick Road	6/26/2014	25.4	mg/l	-2.3000	2.3000	26.5500	8.6629
	MB 03 DUP - McCabes Brook at Bostwick Road	6/26/2014	27.7	mg/l				
	LP 03 - LaPlatte River at Falls Road	6/26/2014	49	mg/l	-5.7000	5.7000	51.8500	10.9932
	LP 03 - DUP - LaPlatte River at Falls Road	6/26/2014	54.7	mg/l				
	T 01 - Thorp Brook at Greenbush Road	6/26/2014	70	mg/l	-2.3000	2.3000	71.1500	3.2326
	T 01 DUP - Thorp Brook at Greenbush Road	6/26/2014	72.3	mg/l				
	MB 03 - McCabes Brook at Bostwick Road	7/29/2014	38	mg/l	0.0000	0.0000	38.0000	0.0000
	MB 03 DUP - McCabes Brooka t Bostwick Road	7/29/2014	38	mg/l				
	LP 03 - LaPlatte River at Falls Road	7/29/2014	67	mg/l	-5.0000	5.0000	69.5000	7.1942
	LP 03 DUP - LaPlatte River at Falls Road	7/29/2014	72	mg/l				
	T01 - Thorp Brook at Greenbush Road	7/29/2014	63	mg/l	3.0000	3.0000	61.5000	4.8780
	T01 DUP - Thorp Brook at Greenbush Road	7/29/2014	60	mg/l				

Mean	5.71
Target	15%

Turbidity	MB 05 - McCabes Brook at Lime Kiln Road	4/17/2014	7.37	NTU	-0.1200	0.1200	7.4300	1.6151
	MB 05 DUP - McCabes Brook at Lime Kiln Road	4/17/2014	7.49	NTU				
	LP 05 - LaPlatte River at Carpenter Road	4/17/2014	31.9	NTU	0.0000	0.0000	31.9000	0.0000
	LP 05 Dup - LaPlatte River at Carpenter Road	4/17/2014	31.9	NTU				
	MB 04a - McCabes Brook at Teddy Bear Access Road	5/5/2014	8.82	NTU	-0.0300	0.0300	8.8350	0.3396
	MB 04a DUP - McCabes Brook at Teddy Bear Access Ro	5/5/2014	8.85	NTU				
	LP 05 - LaPlatte River at Carpenter Road	5/5/2014	12.9	NTU	-1.0000	1.0000	13.4000	7.4627
	LP 05 DUP - LaPlatte River at Carpenter Road	5/5/2014	13.9	NTU				
	MB 03 - McCabes Brook at Bostwick Road	6/26/2014	32.3	NTU	4.2000	4.2000	30.2000	13.9073
	MB 03 DUP - McCabes Brook at Bostwick Road	6/26/2014	28.1	NTU				
	LP 03 - LaPlatte River at Falls Road	6/26/2014	46.3	NTU	-1.9000	1.9000	47.2500	4.0212
	LP 03 - DUP - LaPlatte River at Falls Road	6/26/2014	48.2	NTU				
	T 01 - Thorp Brook at Greenbush Road	6/26/2014	74	NTU	-0.6000	0.6000	74.3000	0.8075
	T 01 DUP - Thorp Brook at Greenbush Road	6/26/2014	74.6	NTU				
	MB 03 - McCabes Brook at Bostwick Road	7/29/2014	40.4	NTU	-4.7000	4.7000	42.7500	10.9942
	MB 03 DUP - McCabes Brooka t Bostwick Road	7/29/2014	45.1	NTU				
	LP 03 - LaPlatte River at Falls Road	7/29/2014	67.2	NTU	-4.2000	4.2000	69.3000	6.0606
	LP 03 DUP - LaPlatte River at Falls Road	7/29/2014	71.4	NTU				
	T01 - Thorp Brook at Greenbush Road	7/29/2014	75.8	NTU	1.0000	1.0000	75.3000	1.3280
	T01 DUP - Thorp Brook at Greenbush Road	7/29/2014	74.8	NTU				
							Mean	2.49
							Target	15%

E. coli	MB 04a - McCabes Brooka tTeddy Bear Access Road	4/17/2014	6	MPN/100 ml	-13.0000	13.0000	12.5000	104.0000
	MB 04a DUP - McCabes Brook at Teddy Bear Access R	4/17/2014	19	MPN/100 ml				
	MB 04a - McCabes Brook at Teddy Bear Access Road	5/5/2014	60	MPN/100 ml	5.0000	5.0000	57.5000	8.6957
	MB 04a DUP - McCabes Brook at Teddy Bear Access Ro	5/5/2014	55	MPN/100 ml				
	MB 05 - McCabes Brook at Lime Kiln Road	5/5/2014	31	MPN/100 ml	8.0000	8.0000	27.0000	29.6296
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/5/2014	23	MPN/100 ml				
	MB 03 - McCabes Brook at Bostwick Road	6/26/2014	2419.6	MPN/100 ml	0.0000	0.0000	2419.6000	0.0000
	MB 03 DUP - McCabes Brook at Bostwick Road	6/26/2014	2419.6	MPN/100 ml				
	T 01 - Thorp Brook at Greenbush Road	6/26/2014	2419.6	MPN/100 ml	0.0000	0.0000	2419.6000	0.0000
	T 01 DUP - Thorp Brook at Greenbush Road	6/26/2014	2419.6	MPN/100 ml				
	MB 03 - McCabes Brook at Bostwick Road	7/29/2014	2419.6	MPN/100 ml	0.0000	0.0000	2419.6000	0.0000
	MB 03 DUP - McCabes Brooka t Bostwick Road	7/29/2014	2419.6	MPN/100 ml				
	T01 - Thorp Brook at Greenbush Road	7/29/2014	2419.6	MPN/100 ml	0.0000	0.0000	2419.6000	0.0000
	T01 DUP - Thorp Brook at Greenbush Road	7/29/2014	2419.6	MPN/100 ml				
							Mean	23.72
							Target	100%

Sampling Targets

	No. of Stations	Date	No. of Stations Sampled	Chloride	Turbidity	TSS	Total P	DP	TN	NOx	*E. coli*
No. Scheduled	66		66	66	66	66	66	66	66	66	32
	11	4/17/2014	11	11	11	11	11	11	11	11	6
	11	5/5/2014	11	11	11	11	10	8	11	11	8
	11	6/26/2014	11	11	11	11	11	11	11	11	8
	11	7/29/2014	11	11	11	11	11	11	11	11	8
Total No. of Stations	44		44	44	44	44	43	41	44	44	30
Percent	66.67		66.67	66.67	66.67	66.67	65.15	62.12	66.67	66.67	93.75
Target Percent			≥80%	≥80%	≥80%	≥80%	≥80%		≥80%	≥80%	≥80%

Summary of Blanks

	Chloride	TSS	Turbidity	TP	DP	TN	NOx	*E. coli*
4/17/2014	<2	<1	<0.2	<5	5.25	<0.1	<0.05	-
5/5/2014	-	-	-	-	-	-	-	-
6/26/2014	<2	<1	<0.2	<5	9.91	<0.1	<0.05	<1
7/29/2014	<2	<1	0.2	-	-	<0.1	<0.05	-

Summary of Duplicates

	Chloride	TSS	Turbidity	TP	DP	TN	NOx	*E. coli*
Number of Duplicates	11	11	10	12	10	11	11	7
Percent of Total	20.0	20.0	18.5	21.8	19.6	20.0	20.0	18.9
Target Percent	10%	10%	10%	10%	10%	10%	10%	10%

Summary of RPD Results

	Chloride	Turbidity	TSS	Total P	Diss. P	Total N	NOx	E. coli
Mean RPD	1.98	2.49	5.71	4.14	2.38	7.28	2.74	23.72
Target Precision	10%	15%	15%	15%	15%	15%	10%	100%

ANNEX III-B

Quality Control Analysis - 2015

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Chloride	MB 03 - McCabes Brook at Bostwick Road	4/22/2015	40.12	mg/L	-0.0200	0.0200	40.1300	0.0498
	MB 03 DUP - McCabes Brook at Bostwick Road	4/22/2015	40.14	mg/L				
	LP 03 - LaPlatte River at Falls Road	4/22/2015	21.37	mg/L	1.5700	1.5700	20.5850	7.6269
	LP 03 - DUP - LaPlatte River at Falls Road	4/22/2015	19.8	mg/L				
	T 01 - Thorp Brook at Greenbush Road	4/22/2015	45.09	mg/L	-0.3000	0.3000	45.2400	0.6631
	T 01 DUP - Thorp Brook at Greenbush Road	4/22/2015	45.39	mg/L				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	5/13/2015	32.3	mg/L	0.0800	0.0800	32.2600	0.2480
	MB 04a DUP - McCabes Brook at Teddy Bear Access Rd	5/13/2015	32.22	mg/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	5/13/2015	35.54	mg/L	14.9600	14.9600	28.0600	53.3143
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	5/13/2015	20.58	mg/L				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	6/2/2015	23.38	mg/L	0.3200	0.3200	23.2200	1.3781
	MB 04a CUP - McCabes Brook at Teddy Bear Access Rd	6/2/2015	23.06	mg/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/2/2015	23.83	mg/L	0.3700	0.3700	23.6450	1.5648
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	6/2/2015	23.46	mg/L				
	MB 02 - McCabes Brook at Harbor Road	6/10/2015	21.91	mg/L	0.3800	0.3800	21.7200	1.7495
	MB 02 DUP - McCabes Brook at Harbor Road	6/10/2015	21.53	mg/L				
	MB 02 - McCabes Brook at Harbor Road	7/2/2015	20.24	mg/L	0.1900	0.1900	20.1450	0.9432
	MB 02 DUP - McCabes Brook at Harbor Road	7/2/2015	20.05	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/1/2015	15.88	mg/L	0.0900	0.0900	15.8350	0.5684
	MB 50 DUP - McCabes Brook at Lime Kiln Road	10/1/2015	15.79	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	10/1/2015	36.02	mg/L	2.3600	2.3600	34.8400	6.7738
	LP 05 DUP - LaPlatte River at Carpenter Road	10/1/2015	33.66	mg/L				

Mean	6.81
Target	10%

Total P	MB 03 - McCabes Brook at Bostwick Road	4/22/2015	92.6	ug P/L	2.5000	2.5000	91.3500	2.7367
	MB 03 DUP - McCabes Brook at Bostwick Road	4/22/2015	90.1	ug P/L				
	LP 03 - LaPlatte River at Falls Road	4/22/2015	147	ug P/L	-3.0000	3.0000	148.5000	2.0202
	LP 03 - DUP - LaPlatte River at Falls Road	4/22/2015	150	ug P/L				
	T 01 - Thorp Brook at Greenbush Road	4/22/2015	184	ug P/L	-2.0000	2.0000	185.0000	1.0811
	T 01 DUP - Thorp Brook at Greenbush Road	4/22/2015	186	ug P/L				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	5/13/2015	68.5	ug P/L	0.4000	0.4000	68.3000	0.5857
	MB 04a DUP - McCabes Brook at Teddy Bear Access Rd	5/13/2015	68.1	ug P/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	5/13/2015	47.9	ug P/L	4.4000	4.4000	45.7000	9.6280
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	5/13/2015	43.5	ug P/L				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	6/2/2015	91	ug P/L	-3.9000	3.9000	92.9500	4.1958
	MB 04a CUP - McCabes Brook at Teddy Bear Access Rd	6/2/2015	94.9	ug P/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/2/2015	56.7	ug P/L	-0.2000	0.2000	56.8000	0.3521
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	6/2/2015	56.9	ug P/L				
	MB 02 - McCabes Brook at Harbor Road	6/10/2015	285.9	ug P/L	-7.2000	7.2000	289.5000	2.4870
	MB 02 DUP - McCabes Brook at Harbor Road	6/10/2015	293.1	ug P/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/10/2015	167	ug P/L	7.0000	7.0000	163.5000	4.2813
	LP 09 DUP - LaPlatte River above Hinesburg STP Out	6/10/2015	160	ug P/L				
	MB 02 - McCabes Brook at Harbor Road	7/2/2015	105	ug P/L	-20.0000	20.0000	115.0000	17.3913
	MB 02 DUP - McCabes Brook at Harbor Road	7/2/2015	125	ug P/L				
	LP09 - laPlatte River above Hinesburg STP Outfall	7/2/2015	57	ug P/L	4.9000	4.9000	54.5500	8.9826
	LP09 DUP - LaPlatte River above Hinesburg STP Outf	7/2/2015	52.1	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/1/2015	106	ug P/L	1.0000	1.0000	105.5000	0.9479
	MB 50 DUP - McCabes Brook at Lime Kiln Road	10/1/2015	105	ug P/L				
	LP 05 - LaPlatte River at Carpenter Road	10/1/2015	104	ug P/L	2.0000	2.0000	103.0000	1.9417
	LP 05 DUP - LaPlatte River at Carpenter Road	10/1/2015	102	ug P/L				

Mean	4.36
Target	15%

Dissolved P	MB 03 - McCabes Brook at Bostwick Road	4/22/2015	27.2	ug P/L	-1.6000	1.6000	28.0000	5.7143
	MB 03 DUP - McCabes Brook at Bostwick Road	4/22/2015	28.8	ug P/L				
	LP 03 - LaPlatte River at Falls Road	4/22/2015	28.5	ug P/L	-2.6000	2.6000	29.8000	8.7248
	LP 03 - DUP - LaPlatte River at Falls Road	4/22/2015	31.1	ug P/L				
	T 01 - Thorp Brook at Greenbush Road	4/22/2015	17	ug P/L	0.8000	0.8000	16.6000	4.8193
	T 01 DUP - Thorp Brook at Greenbush Road	4/22/2015	16.2	ug P/L				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	5/13/2015	68.5	ug P/L	0.4000	0.4000	68.3000	0.5857
	MB 04a DUP - McCabes Brook at Teddy Bear Access Rd	5/13/2015	68.1	ug P/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	5/13/2015	47.9	ug P/L	4.4000	4.4000	45.7000	9.6280
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	5/13/2015	43.5	ug P/L				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	6/2/2015	66.5	ug P/L	0.3000	0.3000	66.3500	0.4521
	MB 04a CUP - McCabes Brook at Teddy Bear Access Rd	6/2/2015	66.2	ug P/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/2/2015	15.6	ug P/L	-8.0000	8.0000	19.6000	40.8163
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	6/2/2015	23.6	ug P/L				
	MB 02 - McCabes Brook at Harbor Road	6/10/2015	73.6	ug P/L	0.4000	0.4000	73.4000	0.5450
	MB 02 DUP - McCabes Brook at Harbor Road	6/10/2015	73.2	ug P/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/10/2015	141	ug P/L	1.0000	1.0000	140.5000	0.7117
	LP 09 DUP - LaPlatte River above Hinesburg STP Out	6/10/2015	140	ug P/L				
	MB 02 - McCabes Brook at Harbor Road	7/2/2015	57.4	ug P/L	-1.3000	1.3000	58.0500	2.2394
	MB 02 DUP - McCabes Brook at Harbor Road	7/2/2015	58.7	ug P/L				
	LP09 - laPlatte River above Hinesburg STP Outfall	7/2/2015	28	ug P/L	1.2000	1.2000	27.4000	4.3796
	LP09 DUP - LaPlatte River above Hinesburg STP Outf	7/2/2015	26.8	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/1/2015	78.6	ug P/L	2.4000	2.4000	77.4000	3.1008
	MB 50 DUP - McCabes Brook at Lime Kiln Road	10/1/2015	76.2	ug P/L				

Mean	6.81
Target	15%

Total N	MB 03 - McCabes Brook at Bostwick Road	4/22/2015	0.74	mg/L	0.0000	0.0000	0.7400	0.0000
	MB 03 DUP - McCabes Brook at Bostwick Road	4/22/2015	0.74	mg/L				
	LP 03 - LaPlatte River at Falls Road	4/22/2015	0.79	mg/L	0.0000	0.0000	0.7900	0.0000
	LP 03 - DUP - LaPlatte River at Falls Road	4/22/2015	0.79	mg/L				
	T 01 - Thorp Brook at Greenbush Road	4/22/2015	0.91	mg/L	-0.0100	0.0100	0.9150	1.0929
	T 01 DUP - Thorp Brook at Greenbush Road	4/22/2015	0.92	mg/L				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	5/13/2015	0.66	mg/L	0.0100	0.0100	0.6550	1.5267
	MB 04a DUP - McCabes Brook at Teddy Bear Access Rd	5/13/2015	0.65	mg/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	5/13/2015	0.4	mg/L	0.0000	0.0000	0.4000	0.0000
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	5/13/2015	0.4	mg/L				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	6/2/2015	0.87	mg/L	-0.0100	0.0100	0.8750	1.1429
	MB 04a CUP - McCabes Brook at Teddy Bear Access Rd	6/2/2015	0.88	mg/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/2/2015	0.5	mg/L	0.0300	0.0300	0.4850	6.1856
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	6/2/2015	0.47	mg/L				
	MB 02 - McCabes Brook at Harbor Road	6/10/2015	0.66	mg/L	-0.2400	0.2400	0.7800	30.7692
	MB 02 DUP - McCabes Brook at Harbor Road	6/10/2015	0.9	mg/L				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/10/2015	0.89	mg/L	0.0100	0.0100	0.8850	1.1299
	LP 09 DUP - LaPlatte River above Hinesburg STP Out	6/10/2015	0.88	mg/L				
	MB 02 - McCabes Brook at Harbor Road	7/2/2015	0.67	mg/L	0.0100	0.0100	0.6650	1.5038
	MB 02 DUP - McCabes Brook at Harbor Road	7/2/2015	0.66	mg/L				
	LP09 - laPlatte River above Hinesburg STP Outfall	7/2/2015	0.41	mg/L	0.0100	0.0100	0.4050	2.4691
	LP09 DUP - LaPlatte River above Hinesburg STP Outf	7/2/2015	0.4	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/1/2015	0.83	mg/L	0.0100	0.0100	0.8250	1.2121
	MB 50 DUP - McCabes Brook at Lime Kiln Road	10/1/2015	0.82	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	10/1/2015	0.74	mg/L	-0.0100	0.0100	0.7450	1.3423
	LP 05 DUP - LaPlatte River at Carpenter Road	10/1/2015	0.75	mg/L				

Mean	3.72
Target	15%

NOx	MB 03 - McCabes Brook at Bostwick Road	4/22/2015	0.16	mg-N/l	0.0300	0.0300	0.1450	20.6897
	MB 03 DUP - McCabes Brook at Bostwick Road	4/22/2015	0.13	mg-N/l				
	LP 03 - LaPlatte River at Falls Road	4/22/2015	0.18	mg-N/l	-0.0300	0.0300	0.1950	15.3846
	LP 03 - DUP - LaPlatte River at Falls Road	4/22/2015	0.21	mg-N/l				
	T 01 - Thorp Brook at Greenbush Road	4/22/2015	0.45	mg-N/l	0.0000	0.0000	0.4500	0.0000
	T 01 DUP - Thorp Brook at Greenbush Road	4/22/2015	0.45	mg-N/l				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	5/13/2015	0.05	mg-N/l	0.0000	0.0000	0.0500	0.0000
	MB 04a DUP - McCabes Brook at Teddy Bear Access Rd	5/13/2015	0.05	mg-N/l				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	5/13/2015	0.09	mg-N/l	0.0000	0.0000	0.0900	0.0000
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	5/13/2015	0.09	mg-N/l				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	6/2/2015	0.17	mg-N/l	0.0000	0.0000	0.1700	0.0000
	MB 04a CUP - McCabes Brook at Teddy Bear Access Rd	6/2/2015	0.17	mg-N/l				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/2/2015	0.08	mg-N/l	0.0000	0.0000	0.0800	0.0000
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	6/2/2015	0.08	mg-N/l				
	MB 02 - McCabes Brook at Harbor Road	6/10/2015	0.14	mg-N/l	0.0000	0.0000	0.1400	0.0000
	MB 02 DUP - McCabes Brook at Harbor Road	6/10/2015	0.14	mg-N/l				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/10/2015	0.05	mg-N/l	0.0000	0.0000	0.0500	0.0000
	LP 09 DUP - LaPlatte River above Hinesburg STP Out	6/10/2015	0.05	mg-N/l				
	MB 02 - McCabes Brook at Harbor Road	7/2/2015	0.05	mg-N/l	0.0000	0.0000	0.0500	0.0000
	MB 02 DUP - McCabes Brook at Harbor Road	7/2/2015	0.05	mg-N/l				
	LP09 - laPlatte River above Hinesburg STP Outfall	7/2/2015	0.05	mg-N/l	0.0000	0.0000	0.0500	0.0000
	LP09 DUP - LaPlatte River above Hinesburg STP Outf	7/2/2015	0.05	mg-N/l				
	MB 05 - McCabes Brook at Lime Kiln Road	10/1/2015	0.05	mg-N/l	0.0000	0.0000	0.0500	0.0000
	MB 50 DUP - McCabes Brook at Lime Kiln Road	10/1/2015	0.05	mg-N/l				
	LP 05 - LaPlatte River at Carpenter Road	10/1/2015	0.17	mg-N/l	0.0100	0.0100	0.1650	6.0606
	LP 05 DUP - LaPlatte River at Carpenter Road	10/1/2015	0.16	mg-N/l				

Mean	3.24
Target	10%

TSS	MB 03 - McCabes Brook at Bostwick Road	4/22/2015	70.5	mg/l	-11.0000	11.0000	76.0000	14.4737
	MB 03 DUP - McCabes Brook at Bostwick Road	4/22/2015	81.5	mg/l				
	LP 03 - LaPlatte River at Falls Road	4/22/2015	70	mg/l	-6.5000	6.5000	73.2500	8.8737
	LP 03 - DUP - LaPlatte River at Falls Road	4/22/2015	76.5	mg/l				
	T 01 - Thorp Brook at Greenbush Road	4/22/2015	146	mg/l	-3.0000	3.0000	147.5000	2.0339
	T 01 DUP - Thorp Brook at Greenbush Road	4/22/2015	149	mg/l				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	5/13/2015	8	mg/l	1.2000	1.2000	7.4000	16.2162
	MB 04a DUP - McCabes Brook at Teddy Bear Access Rd	5/13/2015	6.8	mg/l				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	5/13/2015	16.6	mg/l	-0.4000	0.4000	16.8000	2.3810
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	5/13/2015	17	mg/l				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	6/2/2015	9.33	mg/l	-4.0000	4.0000	11.3300	35.3045
	MB 04a CUP - McCabes Brook at Teddy Bear Access Rd	6/2/2015	13.33	mg/l				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/2/2015	13.79	mg/l	-0.9600	0.9600	14.2700	6.7274
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	6/2/2015	14.75	mg/l				
	MB 02 - McCabes Brook at Harbor Road	6/10/2015	160	mg/l	10.0000	10.0000	155.0000	6.4516
	MB 02 DUP - McCabes Brook at Harbor Road	6/10/2015	150	mg/l				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/10/2015	7.14	mg/l	-57.3800	57.3800	35.8300	160.1451
	LP 09 DUP - LaPlatte River above Hinesburg STP Out	6/10/2015	64.52	mg/l				
	MB 02 - McCabes Brook at Harbor Road	7/2/2015	44.75	mg/l	2.5500	2.5500	43.4750	5.8654
	MB 02 DUP - McCabes Brook at Harbor Road	7/2/2015	42.2	mg/l				
	LP09 - laPlatte River above Hinesburg STP Outfall	7/2/2015	19.6	mg/l	1.0000	1.0000	19.1000	5.2356
	LP09 DUP - LaPlatte River above Hinesburg STP Outf	7/2/2015	18.6	mg/l				
	MB 05 - McCabes Brook at Lime Kiln Road	10/1/2015	7	mg/l	0.2900	0.2900	6.8550	4.2305
	MB 50 DUP - McCabes Brook at Lime Kiln Road	10/1/2015	6.71	mg/l				
	LP 05 - LaPlatte River at Carpenter Road	10/1/2015	22.2	mg/l	-3.2000	3.2000	23.8000	13.4454
	LP 05 DUP - LaPlatte River at Carpenter Road	10/1/2015	25.4	mg/l				

Mean	21.64
Target	15%

Turbidity	MB 03 - McCabes Brook at Bostwick Road	4/22/2015	63	NTU	2.2000	2.2000	61.9000	3.5541
	MB 03 DUP - McCabes Brook at Bostwick Road	4/22/2015	60.8	NTU				
	LP 03 - LaPlatte River at Falls Road	4/22/2015	58.5	NTU	-0.4000	0.4000	58.7000	0.6814
	LP 03 - DUP - LaPlatte River at Falls Road	4/22/2015	58.9	NTU				
	T 01 - Thorp Brook at Greenbush Road	4/22/2015	175	NTU	-14.8000	14.8000	182.4000	8.1140
	T 01 DUP - Thorp Brook at Greenbush Road	4/22/2015	189.8	NTU				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	5/13/2015	8.22	NTU	0.2400	0.2400	8.1000	2.9630
	MB 04a DUP - McCabes Brook at Teddy Bear Access Rd	5/13/2015	7.98	NTU				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	5/13/2015	11.9	NTU	0.4000	0.4000	11.7000	3.4188
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	5/13/2015	11.5	NTU				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	6/2/2015	14.5	NTU	3.9000	3.9000	12.5500	31.0757
	MB 04a CUP - McCabes Brook at Teddy Bear Access Rd	6/2/2015	10.6	NTU				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/2/2015	9.24	NTU	-0.4500	0.4500	9.4650	4.7544
	LP 09 DUP - LaPlatte R above Hinesburg STP Outfall	6/2/2015	9.69	NTU				
	MB 02 - McCabes Brook at Harbor Road	6/10/2015	121	NTU	9.8000	9.8000	116.1000	8.4410
	MB 02 DUP - McCabes Brook at Harbor Road	6/10/2015	111.2	NTU				
	LP 09 - LaPlatte River above Hinesburg STP Outfall	6/10/2015	12.2	NTU	0.2000	0.2000	12.1000	1.6529
	LP 09 DUP - LaPlatte River above Hinesburg STP Out	6/10/2015	12	NTU				
	MB 02 - McCabes Brook at Harbor Road	7/2/2015	32.5	NTU	-0.1000	0.1000	32.5500	0.3072
	MB 02 DUP - McCabes Brook at Harbor Road	7/2/2015	32.6	NTU				
	LP09 - laPlatte River above Hinesburg STP Outfall	7/2/2015	8.95	NTU	0.0700	0.0700	8.9150	0.7852
	LP09 DUP - LaPlatte River above Hinesburg STP Outf	7/2/2015	8.88	NTU				
	MB 05 - McCabes Brook at Lime Kiln Road	10/1/2015	11.6	NTU	-0.1000	0.1000	11.6500	0.8584
	MB 50 DUP - McCabes Brook at Lime Kiln Road	10/1/2015	11.7	NTU				
	LP 05 - LaPlatte River at Carpenter Road	10/1/2015	23.9	NTU	-0.1000	0.1000	23.9500	0.4175
	LP 05 DUP - LaPlatte River at Carpenter Road	10/1/2015	24	NTU				

Mean	5.16
Target	15%

E. coli	MB 03 - McCabes Brook at Bostwick Road	4/22/2015	47.11	mpn/100ml	-2.4800	2.4800	48.3500	5.1293
	MB 03 DUP - McCabes Brook at Bostwick Road	4/22/2015	49.59	mpn/100ml				
	T 01 - Thorp Brook at Greenbush Road	4/22/2015	198.9	mpn/100ml	-73.4000	73.4000	235.6000	31.1545
	T 01 DUP - Thorp Brook at Greenbush Road	4/22/2015	272.3	mpn/100ml				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	5/13/2015	141.37	mpn/100ml	-54.2200	54.2200	168.4800	32.1819
	MB 04a DUP - McCabes Brook at Teddy Bear Access Rd	5/13/2015	195.59	mpn/100ml				
	MB 04a - McCabes Brook at Teddy Bear Access Rd	6/2/2015	524.73	mpn/100ml	-161.9400	161.9400	605.7000	26.7360
	MB 04a CUP - McCabes Brook at Teddy Bear Access Rd	6/2/2015	686.67	mpn/100ml				

Mean	23.80
Target	100%

Sampling Targets

	No. of Stations	Date	No. of Stations Sampled	Chloride	Turbidity	TSS	Total P	DP	TN	NOx	*E. coli*
No. Scheduled	66		66	66	66	66	66	66	66	66	8
	11	4/22/2015	11	11	11	11	11	11	11	11	6
	11	5/13/2015	11	12	11	11	11	10	11	11	5
	11	6/2/2015	11	11	11	11	11	11	11	11	8
	11	6/10/2015	11	11	11	11	11	11	11	11	-
	11	7/2/2015	11	11	11	11	11	9	11	11	-
	11	10/1/2015	11	11	11	11	11	9	11	11	
Total No. of Stations	66		66	67	66	66	66	61	66	66	19
Percent	100.00		100.00	101.52	100.00	100.00	100.00	92.42	100.00	100.00	237.50
Target Percent				≥80%	≥80%	≥80%	≥80%	≥80%	≥80%	≥80%	≥80%

Summary of Blanks

	Chloride	TSS	Turbidity	TP	DP	TN	NOx	*E. coli*
4/22/2015	<2 mg/l	<1 mg/l	<0.2 NTU	<5 ug/l	<5 ug/l	<0.1 mg/l	<0.05 mg/l	<1
5/13/2015	<2 mg/l	<1 mg/l	<0.2 NTU	<5 ug/l	10.7 ug/l	<0.1 mg/l	<0.05 mg/l	-
6/2/2015	<2 mg/l	<1 mg/l	<0.2 NTU	<5 ug/l	<5 ug/l	<0.1 mg/l	<0.05 mg/l	-
6/10/2015	<2 mg/l	<1 mg/l	<0.2 NTU	<5 ug/l	<5 ug/l	<0.1 mg/l	<0.05 mg/l	-
7/2/2015	<2 mg/l	<1 mg/l	<0.2 NTU	<5 ug/l	<5 ug/l	<0.1 mg/l	<0.05 mg/l	-
10/1/2015	-	-	-	-	-	-	-	-

Summary of Duplicates

	Chloride	TSS	Turbidity	TP	DP	TN	NOx	*E. coli*
Number of Duplicates	11	13	13	13	12	13	13	4
Percent of Total	16.4	16.5	16.5	16.5	16.4	16.5	16.5	17.4
Target Percent	10%	10%	10%	10%	10%	10%	10%	10%

Summary of RPD Results

	Chloride	Turbidity	TSS	Total P	Diss. P	Total N	NOx	E. coli
Mean RPD	6.81	5.16	21.64	4.36	6.81	3.72	3.24	23.80
Target Precision	10%	15%	15%	15%	15%	15%	10%	100%

ANNEX IV

Nutrient and Suspended Solids Loadings

Thorp and Kimball Brooks, 2013-2014

Loading Rates in Thorp Brook at Greenbush Road based on Area 2013-2014

Date	Flow (cfs)	Flow/mi.^{2}	Total Phosphorus Kg/day/mi.^{2}	Particulate Phosphorus Kg/day/mi.^{2}	Dissolved Phosphorus Kg/day/mi.^{2}	Total Nitrogen Kg/day/mi.^{2}	Total Suspended Solids Kg/day/mi.^{2}
4/17/2014	11.26	3.40	1.01	0.82	0.19	5.66	699.31
5/5/2014	10.83	3.27	0.58			3.84	259.47
5/27/2013	9.30	2.81	0.71	0.54	0.17	4.74	413.75
7/9/2013	5.52	1.67				2.69	135.79
7/29/2014	5.52	1.67	0.62	0.40	0.21	11.05	256.91
9/13/2013	3.62	1.09	0.28	0.19	0.09	1.37	141.40
6/26/2014	2.85	0.86	0.29	0.16	0.13	3.09	147.27
10/8/2013	1.56	0.47	0.26	0.16	0.09	0.88	77.92
9/3/2013	0.76	0.23	0.05	0.03	0.02		17.70

Loading Rates in Kimball Brook at Greenbush Road based on Watershed Area 2013-2014

Date	Flow (cfs)	Flow/mi.^{2}	Total Phosphorus Kg/day/mi.^{2}	Particulate Phosphorus Kg/day/mi.^{2}	Dissolved Phosphorus Kg/day/mi.^{2}	Total Nitrogen Kg/day/mi.^{2}	Total Suspended Solids Kg/day/mi.^{2}
5/5/2014	6.12	3.34	0.67			4.66	191.43
4/17/2014	5.84	3.19	0.76	0.46	0.30	5.39	316.51
5/27/2013	4.39	2.40	0.72	0.44	0.28	2.58	212.29
7/29/2014	2.80	1.53	0.61	0.20	0.40	8.87	74.83
6/26/2014	2.22	1.21	0.27	0.04	0.23	10.23	43.01
7/9/2013	1.11	0.61	0.10	0.02	0.09	0.68	7.61
9/13/2013	0.41	0.23	0.08	0.04	0.04	0.42	23.28
10/8/2013	0.41	0.23	0.11	0.03	0.08	0.41	5.65
9/3/2013	0.10	0.05	0.01	0.01	0.01		3.04